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FOREWORD

I am pleased to put into the hands of readers Volume-6; Issue-10: 2019 (Oct, 2019) of "International Journal of Advanced Engineering Research and Science (IJAERS) (ISSN: 2349-6495(P) | 2456-1908(O)", an international journal which publishes peer-reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has also been indexed in Qualis (Interdisciplinary Area) (Brazilian system for the evaluation of periodicals, maintained by CAPES).

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Swapnesh Taterh Editor-in-Chief November 2019

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Dissociative Identity Disorder (IDD) and Drug Trafficking: Comparison between Brazil and Argentina Legislations - Part I

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Abstract—This paper analyzes the incorporation of the criminal law theory of the enemy of Gunther Jakobs in the criminal drug policy in Brazil and Argentina, providing a vision of how individual and collective interests in narcotics trafficking are by criminal law. This qualitative research was based on the comparative method, between the drug laws of both countries, with an exploratory descriptive approach. After the elaboration of two categories of analysis, starting from the paradigm of the theory of the criminal law of the enemy, the laws were compared and confronted with the characteristics of the theory, analyzed from the concepts of Durkheim. The common terms, found in the legislations of States, show the criminalization of conducts practically the same way, with very similar expressions and sentences, marked by restrictions of procedural and legal guarantees. **Keywords—Third-rate criminal law, drug law, comparative study, human rights.**

I. INTRODUCTION

This paper analyzes comparatively the anti-drug laws of Brazil and Argentina, in the light of the theory of the criminal law of the enemy. To this end, two main characteristics were chosen by the doctrine of Jakobs's theory, as categories: the anticipation of punibility with the typification of preparatory acts; Creation of types of mere conduct.

From these categories of analysis, we sought in both laws, convergent or divergent points, assuming not only the theory of the criminal law of the enemy, but also the concepts of Durkheim, among others, the social coercion, understood as the power, or strength, with which the cultural patterns of a society impose on the individuals who integrate it, forcing these individuals to fulfill them.

1.1. ANTICIPATION OF PUNIBILITY WITH THE TYPIFICATION OF PREPARATORY ACTS: ANTICIPATION OF CRIMINAL GUARDIANSHIP

Were listed in both legislations, the typification of preparatory acts, understood as being the path traveled from the cultivation of psychotropic plants, until reaching the narcotic final product, namely, the paths taken by the Agent for the practice of a fact provided for in law as a criminal offense.

It is the preparation of the delituous action that constitutes the so-called preparatory acts, which are external to the agent, which passes from the question to the objective action; of the instruments necessary for the practice of the criminal offence, seeks the most appropriate place or the most favorable time for the achievement of the crime (BITENCOURT, 2012, p.523).

To get to the trafficking itself, some steps are needed to obtain the product, for example, the agent, with intent to traffick Psychotropic (cogitation), acquires a property (preparatory acts), sows and cultivates plants Psychotropic (preparatory Acts) harvest, manufacture the product (execution) and finally, commercialize it (consummation). In both legislations, it is seen that conducts are punished as preparatory, that is, it is punished from the mere size of seeds and plantations, for example. The following items were identified in this category, relevant for the analysis.

Table.1: Articles related to the category "Anticipation of	
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punibility"				
Themes	Brazil	Argentina		
Banning plantations	Art. 2°, art. 28, §2°,	Art. 5, a, b, c, d		
Criminalize trafficking	Art. 33 caput e p. 1°, I,	Art. 5, 6		
	II, III			
Criminalize criminal	Art. 35	Art. 29 BIS		
association				
Criminalize the	Art. 36	Art. 7		
financing agent				
Criminalize the	Art. 37	-		
informant				

SOURCE: The author

(2019).

In Brazil, drugs are prohibited throughout the country, as well as their simple planting, harvesting, and exploitation of vegetables, and extracted substrates for the production of drugs, except in the case of legal or regulatory authorization. In law 11,343, art. 28, §1, is criminalized the conduct of "who, for their personal consumption, sows, cultivates or crops plants intended for the preparation of a small amount of substance, or product capable of causing physical dependence, or psychic." See that it is criminalized the conduct of simple sowing, cultivation, harvesting, albeit of small quantity, and is independent of its use, in clear anticipation of state punishment (BRAZIL, 2006).

The same occurs in Argentina, in Law 23,737, in its art. 5°th:

- Art. 5.- It will be repressed with imprisonment or imprisonment of four to fifteen years and a fine of six thousand to five hundred thousand australes who without authorization or with illegitimate destiny:
- a) Sow or grow plants or store usable seeds to produce narcotics, or raw materials, or items intended for production or manufacturing;
- b) Produce, manufacture, extract or prepare narcotics;
- c) Trade with narcotic drugs or raw materials for production or manufacturing or have them for marketing purposes, or distribute them, or give in payment, or store or transport (ARGENTINA, 1989).

Therefore, the entire production chain of psychotropic preparation is criminalized in both countries, with penalties equivalent to the offence of the sale, itself. In Brazil, if for personal consumption, the penalty is milmer, because it is not imprisonment, but rather a warning about the effects of drugs, provision of services to the community or educational measure of attendance to program or educational course. Therefore, the entire production chain of psychotropic preparation is criminalized in both countries, with penalties equivalent to the offence of the sale, itself. In Brazil, if for personal consumption, the penalty is bland, because it is not imprisonment, but rather a warning about the effects of drugs, provision of services to the community or educational measure of attendance to program, or educational course.

In relation to the criminalization of trafficking itself, however, not the mere sale of the narcotic, but those conducts equated and punished such as, for example, the simple import (bring into the country), export (take to another country), remit (send somewhere), prepare (get something through (composition of elements), produce (give rise to something), manufacture (produce), acquire (Buy), Expose for sale (present for disposal), offer (make offer), have in deposit (keep in vessel), carry (take from one place to another), bring with you (carry along the body), prescribe (prescribe), save (Protect), drugs. These conducts are complemented by Brazilian law, by the expression even if free, without authorization or in disagreement with legal or regulatory determination [1] (BRAZIL, 2006). The verbs listed express presumed danger of injury to the legal good tutored, regardless of whether there is profit or not in the conduct, and the criminal type is mixed alternative, that is, the agent can practice one or more conducts, answering for a single offence.

The fact is repeated in Argentine legislation, which predicts similar conducts in its art. 5 °, by punishing not only the trade, but also the planting, production, extraction or preparation of narcotics, storing or transporting, delivering, supplying, applying or facilitating other narcotics drugs with, or without profit purpose. Article 6° establishes the punishment for those who introduce in the country, narcotics manufactured or at any stage of production or even raw materials. (ARGENTINA, 1989).

It can be seen, therefore, that the legislators of both countries have been far beyond criminalizing the narcotics trade, but intend to punish any stage of the productive chain of narcotic substances, establishing in various crimes, the so-called crimes of Mere conduct. This equaled the punitive rigor of the trafficker and the mere passer, as well as the negotiator who enriches it unlawfully. In the modalities of acquiring, storing, having in storage, transporting or bringing with them these substances, the agent must prove that the purpose is for personal consumption, or otherwise, will be punished with the same rigor as a usual trafficker.

In relation to the Brazilian doctrine, Nucci (2006, p. 770), suggests the bipartition of the offence of illicit trafficking in narcotics: with or without profit purpose, generating the natural improvement of the description of the drug user conducts. However, even such a suggestion does not denature the anticipation of the punibility of conducts of preparatory acts of the merchant.

In relation to the offence of criminal association, a crime which by its nature receives the classification of abstract hazard crime, not demanding for its consummation, no injury to the legal good tutored, importing into the crime, only the danger of the junction of people For the criminal purpose. It is not ignored here the knowledge of the other doctrinary classifications for these offenses, however, what interests in this analysis, is only the fact of being of abstract danger the junction of people with intent to practice crimes punished in the drug law, regardless of your consummation or not. [1] Emphasis on the Author.

In Brazilian law, it is typified in art. 35° which requires for configuration, the association (meeting, junction) of at least two people to practice, repeatedly or not (waiving habit), any of the crimes provided for in art. 33° and 34° of the law. Please note that the description of the criminal type, including the practice of any crime of trafficking or equivalent is not necessary. (BRASIL, 2006).

Argentina follows the same guideline when punishing in art. 29° Bis, with the penalty of imprisonment from one to 6 years, "he who shall take part in a confabulation of the bad personas, to commit any of the offenses set forth in articles 5° , 6° , 7° , 8° , 10° and 25° present law, and article 866° of the Customs Code " (ARGENTINA, 1989).

In Argentina, the protected legal good is public health, in a diffuse way, because it does not require danger of real injury, but abstract. Hence the wellfounded objections to the criminalization of the conduct of possession of drugs for personal use, which, based on the principle of harm, or the principle of full protection of legal rights, was declared unconstitutional by the Argentine Supreme Court, in several precedents throughout of your story.

In Brazil, the taxable person of the crime is always the collectivity, that is, the society in general, in order to protect the health of it. Both dismiss the guilty form, punishing themselves by direct intent.

The punishment of the funding agent, fourth theme, happens in Brazil, in art. 36°, and in Argentina art. 7°. In both the punishable conduct is to finance or to cover the practice of any of the crimes provided for in the arts. 33°, Caput and $\S1\circ$, and $34\circ$ of this law. The distinguishing factor between the two countries is that Argentina punishes similarly, both those who organize trafficking, and who finances. Art. 7º.- It will be repressed with imprisonment or imprisonment of eight to twenty years and a fine of thirty thousand to nine hundred thousand australes, the one that organizes or finances any of the illegal activities referred to in articles 5° and 6° above. (ARGENTINA, 1989). By financing, it is the conduct of the banker who pays all the expenses of the crime of illicit drug trafficking. This type in Brazil is unprecedented because, in the previous laws, there was no punishment for this conduct.

The criticism is that punishing the financier more severely than the trafficker creates an unnecessary type because such conduct could be predicted with a special cause of increased punishment in the very crime of drug trafficking. Likewise, anyone who contributes to criminal practice disorder responds, under Brazilian law, to the same penalties as the crimes applicable to him, and could well be punished as a participant or co-author of a crime of illicit drug trafficking.

Again, the offenses described here are of abstract danger and do not depend on any harm to the legal good for their consummation in either country. Because they have such severe penalties, there are virtually no criminal benefits provided for in the legislation, which will benefit the criminal agent of this criminal type.

The fifth and last theme of this category refers to criminalizing the figure of the informant, which, in Brazilian law, is provided for in art. 37, punishing with imprisonment for two to six years, the agent who collaborates as an informant, with a group, organization or association for the practice of drug trafficking (BRAZIL, 2006). Argentine law does not present a similar crime.

Collaboration means cooperation, assistance with the practice of the crime of illicit drug trafficking, by group or organization (NUCCI, 2006). The crime indicates the author's way of acting, that is, acting as an informant, passing data to third parties about something or someone. Obviously, no, it is any information, but only information that is significant, relevant to the realization of crimes. The goal of this crime is to soften the punishment of the informant, otherwise, it would incur the main crime of trafficking, with a more severe penalty (5 to 15 years). Thus, it punishes less severely relevant but less significant participation than drug trafficking itself.

The conclusion is that there is a criminalization of all the intricacies of the narcotics supply chain, as well as any activity related to the trafficking itself, from the simple information given to a trafficker, regarding the gathering of people with the purpose of committing crimes related to the narcotics trade. There is a concern of the legislator not to leave out of the "criminal chain" any conduct eventually practiced, even the simple aid, criminalizing all preparatory acts of the narcotics trade, in a clear adoption of prospective and non-retrospective criminal law, in which It considers as an enemy to be intercepted in the previous stage of its dangerousness, any person who is part of this productive cycle.

This model of criminalization of conduct would function as a social fact, which, according to Durkheim (1963, 2003), being external to the individual, is also of a coercive nature, has the power to "compel" him to act in a certain way, under the threat of punishment such as social isolation, for example in the case of socially unacceptable behavior in a general manner, affecting everyone without exception.

In the specific context of anti-drug legislation, legislation typifies and formally fits the mandatory conduct for the one that produces, benefits, transports, sells or consumes illicit drugs. In other words, the transgressor of the norm, is obliged to adopt certain behaviors, or abstain from these, due to the prevailing norm, which is independent of his will, and whose coercion, in Durkheimiana's meaning, implies the receipt of sanction, provokes him the Social isolation, reaching everyone, indistinctly. In this way, human refugees are being created, labeling citizens of transgressors, enemies to be contained.

1.2. CREATION OF TYPES OF MERE CONDUCT, AS WELL AS TYPES OF ABSTRACT HAZARD

According to Gomes (2007, p. 524), crimes of mere conduct is what describes only the conduct and consumes itself with its realization, without describing any naturalistic result. That is, there is no reference to any naturalistic result. Already dangerous crimes are those that jeopardize the well-protected, and the risk may be concrete or abstract. Abstract, are those that do not need to be proven concretely, and concrete, depending on proof.

In Argentine law, there are no numerations in paragraphs so that the item P. 2 Here was created by the author to distinguish the punishment of the dealer's user, provided by the law. In the Brazilian drug law, the crimes foreseen are of abstract danger, there is a legal presumption of threat or offense to the legal good.

Table.1: Articles related to the category "Creation of type	S
of mere conduct and types of abstract hazard".	

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Themes	Brazil	Argentina
Use drugs	27 a	Art. 5, p. 2° e p. 3°, art
	30	14
Drug dealing	33	Art. 5
Use place or the good of any	33, §	Art. 10
kind for trafficking	1° III	
Use machinery, apparatus,	34	Art. 5, c, d
instrument or objects		
intended for preparation		
Join for Trafficking	Art. 35	Art. 29 Bis
Finance or Cost Trafficking	Art. 36	Art. 7
Collaborate with Trafficking	Art. 37	Art. 29 ter
Prescribing or Administering	Art. 38	Art. 204 (willful), 204
Drugs		bis (guilty), art. 204 ter.,
		204 quarter, art. 9
Drive after drug use vessel or	Art. 39	
aircraft		

SOURCE: The Author (2019)

Both Brazilian and Argentine law criminalizes the conduct of the person who acquires (buys), keeps (hides, protects), holds (keeps somewhere), transports (takes from one place to another), or brings (carries by the body), a narcotic substance intended for self-consumption. User typification in Argentine drug law occurs in the same article of the drug offense, with the same verbs, describing the conduct in a paragraph2 that says: In the case of subsection a), when for the small amount sown or cultivated and other circumstances, it arises unequivocally that she is destined to obtain narcotics for personal consumption, the penalty will be from one month to two years in prison and articles 17° will be applicable, 18° and 21° (ARGENTINA, 1995).

In Brazil, there is no provision for prison sentences for drug users, while in Argentina the penalty is from one month to two years in prison, without prejudice to detoxification treatment. Brazil provides for a sanction of warning about the effects of drugs, provision of community services or educational program attendance, or educational course for the drug user, provided that the judge, aware of the nature and quantity of the substance seized, place and the conditions under which the action took place, the social and personal circumstances and the conduct and background of the agent so understand. Penalties for community service and attendance at an educational program or course may be applied for a maximum of 5 months, and in case of recurrence, double (BRASIL, 2006).

The conduct of anyone who uses a property or place of any nature, owned by him, or permits others to use it, for the purpose of trafficking, is punished in Brazil as conduct equivalent to trafficking, subject to the same penalties, whereas in Argentina, another article 10 is punished, with milder penalty, imprisonment from three to twelve years.

Both laws punish the conduct of those who manufacture (build), acquire (conquer in any way), use (use), transport (take from place to place), offer (offer, donate), sell (trade), distribute (sharing), delivering in any capacity, owning, storing, or providing apparatus, or any machinery for the manufacture, preparation or processing of drugs, without authorization or in violation of the law. In Brazil, the penalty is imprisonment from 3 to 10 years and in Argentina, the penalty is the same as trafficking, from four to fifteen years.

The association for trafficking, trafficking financing, and collaborator has already been described in the previous item, and here we avoid redundancy. Only the penalties provided for are: Brazil, 3 to 10 years and Argentina, 1 to 6 years. As for the penultimate item of the theme, prescribe or administer drugs, in Brazilian law is described in art. 38°, namely: prescribing (prescribing), administering (applying), guilty (unintentionally) drugs without the need for the patient, or overdosing on them, or in disagreement with legal or regulatory determination, is punished. with a penalty of six months to two years and fine, without prejudice to the communication of the fact the authority in charge of the profession of a criminal agent.

In Argentina, the conduct of the person who simply sells the product in disagreement with the prescription, punishment of six months to three years, and in cases of negligence, is also punished with a fine. (art. 204°, bis), Also punishes itself with fine the individual who, having been responsible for the management, administration, control or supervision of an establishment for the expenditure of medicines, omits to comply with the s a su cargo posibilitando la comisión de alguno de los hechos previstos en el art. 204º (ARGENTINA, 1989). It also punishes the subject who sells medicinal substances without a prescription, when the law requires it, with imprisonment from six months to three years. See that the conduct of prescri- ing or administering these drugs are criminalized in art. 9°, with imprisonment of two to six years, and fine, besides the professional disqualification, different from what occurs in Brazil. There is also a qualifier when the subject prescribing or minister medication outside the therapeutic dosage, and for illegitimate purposes.

Unlike Argentina, in Brazil is punished the conduct of the subject who drive (guide, drive) vessel, that is, any construction able to sail on water, airspace, after the consumption of narcotics, whose penalty is six months to three years. This criminal type is derived from the Brazilian transit code, which punishes the conduct of those who guide the vehicle in a public way, intoxicated, endangering the collectivity. It's a criminal type of abstract danger. The penal type uses the expression after the consumption of drugs, in the condition of a normative element of the type, abandoning the expression soon after that, although it contains a certain degree of temporal imprecision, has been adopted by the positive right and is already assimilated by the doctrine and Brazilian jurisprudence. In this crime, it is no longer known how long, after the consumption of drugs, can be imputed to the driver of vessel or aircraft, this crime.

Finally, this criminal type creates a factor of asymmetry in the Brazilian penal system, since in art. 306 of the Brazilian Traffic Code, there is already a similar incrimination of the person who drives a motor vehicle on public roads, under the influence of alcohol or substance of similar effects.

It is clear that both countries have defined in drug law crimes aimed at guaranteeing the structure of the normative system, and the penalty is a necessary measure to guarantee the credibility of the institutions in order to ensure the social stability that a balanced system provides. Therefore, the penalty that should be imposed on a citizen after an externalization of conduct will be given before any injury or attempted injury to a legal asset, with the sole purpose of restoring the violated rule. An individual who is involved in any circumstance with drugs, whether in the production chain, trade or use, does not express a minimal cognitive guarantee and should, therefore, be permanently or permanently removed from the law, as it poses a threat to society. maintenance of the current rule, therefore, the treatment given to it becomes non-person, which is why the definition of Jakobs by individual applies, with very well-defined recipients.

Thus, the enemy should not be punished for his culpability, as in functionalist criminal systems, but for his dangerousness, since certain people carry out such serious or habitual activities as to presuppose objective and significant dangerousness, since they possess greater social harm. The model adopted for drug legislation in both countries was a prospective criminal law, whose actors are subject to coercion, which must be intercepted at a previous stage, due to their dangerousness.

Thus, for Jakobs, the "imposition of penalties must have an eminently preventive character. A typical fact, in view of this, would not constitute an injury to legal assets, but as a lesion to the juridicity itself. " In this sense, the author "reveals-perhaps unconsciously-his true purpose, which is to legitimize a criminal law of war, a criminal right that adopts a warring posture, of combat, of elimination, of the destruction of the neighbor to keep a given order stable. In summary, the destruction of the human in favor of the preservation of the legal order " (MUÑOZ COD E; BUSATO, 2011, p.192).

The typicity not only describes actions but refers to a specific situational context that shapes the reality of this description, which implies a process of subsumption of the real complex in the abstract and general prescription of the legal type. In this respect, the subsidiary protection of Legal assets as a criminal law mission constitutes a basic guarantee of a constitutional state of law, and an effort is essential to justify the creation and enforcement of criminal rules.

There is the creation of types of mere conduct an abstract danger, with high deprivation of liberty, which hinder the receipt of other criminal benefits provided for in the legislation, disproportionate and unjustified to the conducts practiced for the Certain cases, whose external effect is limited, in addition to mass incarceration, the sensation of the legislator, of having done something in favor of public peace, and to the citizens, the false impression that the problem of crime of drugs and related offences, if Under the control of the authorities, transmitting to the public opinion the soothing impression of an attentive and determined legislator.

Therefore, the maximization of the penal intervention focused on the idea of minimizing the fundamental rights of the infringer, establishes a dichotomy between what is called the Defense of Society (Social Defense) and, on the other hand, the preservation of the interests of the infringing or deviant individual. The rise of such exacerbated punitivism ends up serving as a mask to conceal the absence of serious, realistic and committed public policies with the social environment. And, in this wake, it is verified that instead of preventing criminal conduct and guaranteeing security, criminal law and the state, by disproportionately elevating the sentences, in response to social cry and the mass disclosure of news by the media, does not diminish the Levels of violence.

Barata explains that the policy of criminalizing the use of certain drugs is an autorefential system that reproduces ideologically and materially. The first is the legislative conception that the consumption of narcotic drugs is a crime, which stimulates a negative posture of society under the influence of the ground. The material reproduction occurs next and "It is the process by which the system reproduces a reality according to the image from which it surrenders and that it legitimizes" (BARATA, 1991, p. 51).

Angriman, judging a case in Argentina, sentences:

It's like Muñoz Conde says "... Certainly, criminal law has a moral basis and social ethics, but a total correspondence between criminal and moral law cannot be accomplished "because-following Jellinek postulates that:"... The right the criminal law has only a minimum ethical to fulfill "(Muñoz Conde, Francisco" Introduction to Criminal Law ", Editorial B of F, 1975, pp. 129 and segs). In the same sense, Roxin says that "... The mission of the State is to guarantee the external order and not to morally protect its citizens "(cited by Muñoz Conde, p. 130). (ANGRIMAN, 2009, p. 13).

Important, now, to observe the concepts of Durkheim (1985), on social fact and social coercion,

because according to the author, efficacy is a consequence of the validity of the law, is the force of the Act to produce desired effects, social effects for which it was elaborated. For the positive effects of the laws, there is social, educational, conservative and transformational control. Negative effects would be the ineffectiveness of the law, the omission of the authorities to enforce laws, and lack of adequate structure to law enforcement.

The policy on drugs, Argentine and Brazilian rights predicted the social control of the conducts related to the use of narcotics, and with this control, predicted to transform society into this behavior. However, it is evident from the numbers of the populations arrested and also by the number of users of licit and illicit narcotic substances, which the countries did not foresee the negative effects presented by Durkheim, for which the authorities of the system of Justice apply punishments, in the external plan, lacks the proper structure for law enforcement, this increases its inefficiency, evidencing the contradiction between the principles of criminal law, especially the principle of humanity and the Resocialization of the penalty, which foresee the gradual re-insertion of the detainee in society.

The crime of drug trafficking and peripheral conducts to these should be seen as something natural, a phenomenon that is socially inherent to social coexistence. However, it became an act forbidden by the collective consciousness and the criminal being, a subject condemned by the state through laws and sanctions, these views as punishment, which promotes the reparation of the act, imposed by the state.

II. FINAL CONSIDERATIONS

Considering that the present study sought to exploit the incorporation of the criminal law of the enemy within the criminal policy of drugs (Argentina and Brazil) incorporated the criminal law of the enemy, subjecting it to criticism of human rights, it is possible to establish, the following considerations:

The pillars of this theory are needed for the anticipation of the punishment of the enemy, punishing themselves including preparatory acts, creation of types of mere conduct, as well as types of abstract hazard, restriction of criminal and procedural guarantees, and finally, prediction of punishment of the enemy with a security measure. Such sustainacles served as categories to compare drug laws in Brazil and Argentina.

The repression of the trade and use of psychoactive substances brings characteristics of another enemy created by the Argentine and Brazilian legislator, a factor of human scrap in Latin America, consistent in the growing number of people trapped under this Justification. The numbers of prisoners in both countries demonstrate the option of the justice system for the policy of mass incarceration, with the trafficking of drugs and related crimes, one of the most punished offenses in both countries.

Legislative interventions such as those present in the drug laws of both countries (Brazil and Argentina) cause a breakthrough in the state of police or authoritarian, as the consequent weakness of the rule of law, insofar as it demonizes the person of the trafficker, in The detriment of legal, procedural, and mainly guarantees of his human condition.

Ao longo da discussão, resta evidente a adoção integral deste modelo meramente punitivo na sua política interna de drogas, a qual é copiada dos Estados Unidos, sem um estudo mais aprofundado da criminologia, por parte do legislador latino americano, sobre o tema. Os tratados internacionais ratificados pelos dois países demonstram esta opção.

Likewise, the common terms found in the laws of the States, the criminalization of conducts practically in the same way, with very similar expressions and sentences, marked by restrictions of procedural and legal guarantees, establishing Differences between people convicted of crimes of narcotics and other criminals, high feathers, and especially the adoption of safety measures for the chemical dependents leave no doubts as to this.

People related to narcotics trafficking are punished by the future danger they represent, and intercepted in their preparatory stages, criminalizing any and all stages of the production chain of narcotic substances, several crimes are established, the so-called mere conduct. This equaled the punitive rigor of both the trafficker and the mere passer, as well as the negotiator who enriches it unlawfully. It is striking the legis- latter's concern not to leave out the "criminal chain" any conduct eventually practiced, even the mere aid, criminalizing all preparatory acts of the narcotics trade, in a clear adoption of criminal law prospective and non-retrospective, in which it is considered as an enemy to be intercepted in the previous stage of its dangerousness, any person integral to this productive cycle.

It remains evident that both countries have defined in the law of drugs, crimes with a view to guaranteeing the structure of the normative system, and the penalty is necessary to guarantee the credibility of the institutions in order to ensure the social stability that a system in Balance provides. Therefore, the penalty that should be imposed on a citizen after an externalization of conduct, will be before any injury or attempted injury to a legal good, with the sole scope of restoring the standard violated.

The social institutions, like the legislative power, did not advance scientifically, and the imbalance between the knowledge sciences and the social institutions further aggravated the social problems, because there are no transformations in social life as a result Of the worsening of social problems, due to the loss of its main objective, man, insofar as the legislative power tries to dominate the human being (in this case people related to the trade of narcotics), without considering their individualities (Reasons why it uses a certain substance, type, quantity, local or regional trade, funding agent, among others), its notion of lawfulness or not about the consumption of narcotics, allowing a climate conducive to the struggle of classes, domination, shocks Ideological, increased crime and prison population related to trafficking.

In relation to the human rights issue, both Brazilian and Argentine legislation is totally incompatible with the enemy's criminal law theory. The main characteristic for this assertion is the fact that the enemy's criminal law theory puts two categories to the individual: on one side the citizen and the other the enemy. As they are framed as enemies are fully aligned with fundamental rights and guarantees foreseen for the other citizens, establishing differentiation of one individual with the other. The best effectiveness of criminal law, limited by its requirement, is respect for fundamental rights. Its violation disbelieves the state, puts in check its legitimacy of intervention, with the aggravating of the increasing impunity, through the way of nullity, among others.

REFERENCES

- ANGRIMAN, Graciela J. Medios extraordinarios de investigación y tráfico de estupefacientes. Su problemática a partir de la desfederalización de la competencia. Revista INECIP, Buenos Aires N° 2, Ed. Lajouane, Buenos Aires, 2007, pp.89 y ss.
- [2] APONTE, A. Derecho Penal de Enemigo vs. Derecho Penal del Ciudadano. Revista Brasileira de Ciências Criminais (51).
 SP: RT, 2004.
- [3] ARGENTINA. Ley n. 23.737, 1989. Disponível em < <u>https://twiki.ufba.br/twiki/pub/Observa/LeisInternacionais/Le</u> <u>iArgentina.pdf</u>> Acesso: 12 Dez. 2017.
- [4] ARGENTINA. Ley n. 24072, Aprobación de la Convencion de NU contra el tráfico ilícito de estupefacientes y sustancias psicotrópicas. Disponível em < <u>http://federacionuniversitaria21.blogspot.com.br/2008/05/ley-</u> <u>24072-aprobacin-de-la-convencion-de.html</u>> Acesso: 12 Dez. 2017.
- [5] ARGENTINA. Ley n. 25.632. Convenção Internacional contra a Criminalidade Organizada Transnacional e protocolos complementares. Disponível em

<<u>http://servicios.infoleg.gob.ar/infolegInternet/anexos/75000-</u> 79999/77329/norma.htm> Acesso: 12 Dez. 2017.j

- [6] ARGENTINA. Ley N° 23.984. Codigo Procesal Penal. Disponível em <u>http://servicios.infoleg.gob.ar/infolegInternet/anexos/0-</u> 4999/383/texact.htm Acesso: 12 Dez. 2017.
- [7] BARATTA, A. Criminologia Crítica e Crítica do Direito Penal: introdução à Sociologia do Direito Penal. 6. ed. Rio de Janeiro: Revan, 2011.
- [8] BITENCOURT, C. R. Tratado de direito penal. Parte geral. 17 ed. Rev. Ampl e atual. São Paulo: Saraiva, 2012.
- [9] BRASIL, Código Penal. Decreto-Lei n. 2.848, de 7 de dezembro de 1940. Disponível em < <u>http://siabi.trt4.jus.br/biblioteca/direito/legislacao/codigos/cp/</u> <u>del %201940 2848 cp.pdf</u>> Acesso em: 03 Out 2017.
- [10] BRASIL. Constituição da República Federativa do Brasil. Brasília: Senado Federal, 1988.
- [11] BRASIL. Lei 11.343, de 23 de agosto de 2006. Disponível em <<u>http://www.planalto.gov.br/ccivil 03/ ato2004-</u> 2006/2006/lei/111343.htm>Acesso em: 03 Out 2017.
- [12] BRASIL. Lei 6.368/76. 1976. Disponível em <<u>http://www.planalto.gov.br/ccivil_03/leis/L6368.htm</u>>Acess o em: 03 Out 2017.
- [13] BRASIL. Lei 3689/41. 1941. Disponível em < <u>http://www.planalto.gov.br/ccivil 03/decreto-</u> <u>lei/del3689.htm</u>> Acesso em: 18 ago. 2019.
- [14] COMISSÃO INTERAMERICANA SOBRE DIREITOS HUMANOS - CIDH. Convenção Americana sobre Direitos Humanos ou do Pacto de San José de Costa Rica. 1969. Disponível em <</p>
 http://www.cidh.oas.org/basicos/portugues/c.convencao_ame ricana.htm> Acesso em: 09 Out.2017.
- [15] CONDE, F. M; ARÁN, M. G. Derecho penal: parte general.2. ed. Valencia: Tirant lo Blanch, 1996.
- [16] DURKHEIM, E. Lições de sociologia: a Moral, o Direito e o Estado. São Paulo: T. A.
- [17] DURKHEIM, E. A ciência social e a ação. Lisboa: Bertrand, 1975.
- [18] DURKHEIM, E. L'e éducation morale. Paris: Presses Universitaires de France, 1963.
- [19] DURKHEIM, E. Ética e sociologia da moral. São Paulo: Landy, 2003.
- [20] GOMES, L. F. Direito Penal do Inimigo (ou Inimigos do Direito Penal). 2012. Disponível em: <<u>http://www.revistajuridicaunicoc.com.br/midia/arquivos/Ar</u> quivoID _47.pdf>. Acesso em: 10 Out.2017
- [21] JAKOBS, G. Direito Penal do Inimigo. Rio de Janeiro: Lumen Juris, 2009.
- [22] JAKOBS, G. MELIÁ, M. C. Direito Penal do Inimigo: Noções e Críticas. 6. ed, Porto Alegre: Livraria do Advogado, 2012.
- [23] MUNOZ, F. C. Crítica ao Direito Penal do Inimigo. Rio de Janeiro: Lúmen Juris, 2011.
- [24] NUCCI, G. de S. Código de Processo Penal Comentado. 5. ed. São Paulo: Revista dos Tribunais, 2006.
- [25] ORGANIZAÇÃO DAS NAÇÕES UNIDAS. Declaração dos Direitos dos Homens e Cidadão. 1969. Disponível em:

http://www.ohchr.org/EN/UDHR/Documents/UDHR Transl ations/por.pdf. Acesso em 16 Dez.2017.

- [26] RIBEIRO, P. S. Durkheim e o Fato Social. In: Brasil Escola.
 2012. Disponível em <http://brasilescola.uol.com.br/sociologia/durkheim-fatosocial.htm>. Acesso em: 24 Jan. 2018.
- [27] ZAFFARONI, E. R. O Inimigo no Direito Penal. 3 ed. Rio de Janeiro: Revan & Instituto Carioca de Criminologia, 2011.

Social and Environmental Responsibility as a factor of Productivity in a small Construction Company

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Abstract— The construction industry is a major generator of environmental impacts, yet it is an activity that has great potential for progress in a region. Even a small business has the potential to leverage an economy and thinking about it this project sought to verify the impact that employee valuation and environmental responsibility must make it more competitive in the face of such a demanding market. Thus, based on the principles of ISO 26000, several social and environmental changes in the company were proposed and implemented that generated significant financial returns for the organization.

Keywords—Building Industry, Social Responsibility, Environmental Responsibility.

I. INTRODUCTION

In an increasingly competitive and dynamic market, companies have sought to strengthen themselves through environmental policies that are interconnected with the increasingly demanding demands of customers.

For the implementation of social and environmental policies in the company must be made behavioral and structural changes in the corporation. According to Dechezleprêtre (2017), environmental regulations generally require facilities to perform pollutant reduction activities and may impose costs on companies, these costs are diluted over time by reducing consumption and energy waste.

Relatively simple measures can become a great waste and cost reducer such as replacing plastic cups with mugs, switching from ordinary bulbs to LED bulbs among others. By reducing the environmental impact, the company can enhance its image and increase its profitability and competitiveness in the market (ALMEIDA, 2017).

From 2005 the first international standard of corporate social and environmental responsibility began to be considered, and its publication took place in Geneva, Switzerland in 2010 (NUVES, 2015; OLIVEIRA, 2015; ROSA, 2019). Completed under the name of ISO 26000, it has a very different characteristic from the others as there is no certification, its guidelines are voluntary, as guidelines rather than rules (DE SOUZA, 2016).

This standard has 07 basic principles such as: responsibility, transparency, ethical behavior, Respect for

stakeholder interests, legality, international standards and human rights (GONÇALVES, 2018; ALVES, 2016).

The construction company studied, source of this article, sought to meet at least six of the seven principles previously mentioned, leaving only international standards to the background. Partly because it has a limited size and does not operate in the foreign market.

As main objective this work sought to make a diagnosis of the problems that the company had and to present the changes achieved from the implementation of social and environmental responsibility actions.

II. METHODOLOGY

2.A. DIAGNOSIS

The company studied operates in the construction industry, having as its main source of cash small industrial and domestic reforms, with 26 scheduled services on average per month with annual revenues of approximately 4 million reais in 2018.

The company office, with 50m2, worked in a house bought by one of the partners of the construction company and was partially adapted, but with great limitations of access, safety, comfort and brightness.

The company had 4 employees working in its own office: the director who also assumes the position of engineer and technician responsible for the works, 01 administrative assistant who accumulated the function of technician in occupational safety and responsible for the licensing of the works and the attendance of phone calls, 01 general services and a concierge.

There was no clear definition of what the role of each employee was, and actions were provided as the needs of the company emerged.

In the field, the external collaborators, that is, those who are available on site are hired as the services appear and all work in the form of service provided by providing municipal invoices for each service performed. The construction company has an average of 90 employees in this situation. This creates a major administrative problem for the company and a disruption for employees who cannot plan in the long run.

Most external employees did not have adequate training for their duties, this problem was due to the high turnover of employees and often the company had to quickly find available professionals for a service.

2.B. WORK ACCIDENTS

Accidents have always been constant and there was no complete follow-up by the occupational safety technician who had difficulties to follow alone all the company's works.

Although the use of PPE's (personal protective equipment) was required, there was no guarantee that employees would wear them. It was fatal to the potential for damage to the accident.

According to surveys of the occupational safety technician, between March 2014 and July 2019, the company accounted for 208 accidents in various services in the capital, as shown in figure 01.



Fig. 1: Graph of accidents between March 2014 and July 2019.

2. C. CUSTOMER COMPLAINTS FOR SERVICE ISSUES

Cases of complaints about delay in construction, services below customer expectations, lack of education of contractors and inadequate rubble management were raised. As for the delay of the works, the biggest complaint from customers was about the beginning of the service. In part, because of the amount of service the company had, it was normal for the delay in completing one service to interfere with the start of another.

There were also high rates of complaints about the poor quality of service. There were several cases where clients refused to pay for the work given such frustration, some more punctual cases the client even allowed the company to redo the work.

The most emphatic observation of customers was due to two aspects, the lack of education with which the employees dealt with a suggestion on site and the destination given by the company to the generated debris.

Because most of the renovations were carried out in condominiums and they had very strict living rules and procedures, many customers reported that they were required to pay fines for rubble left on the solid waste sites of residents. All these complaints are best verified in figure 02.



Fig. 2: Graph of demand between March 2014 and July 2019.

2.D. ENVIRONMENTAL MANAGEMENT

Not only the waste left unevenly on site, but other simpler environmental issues, such as replacing fluorescent lamps, which have high energy consumption.

Regarding the company's lamps, it was verified that two of them were never turned off, since they were directly connected to the network. These lamps are located at the front and the other in the side garage area.

Water consumption was another factor that directly influenced the company's high costs, as there were several leaks in the toilets and vehicle wash area.

2.E. RESPECT FOR STAKEHOLDER INTERESTS

During the first four years of the company, decisionmaking has always been aimed at meeting the needs of the main partner and the two investing partners. That way, what was good for the directors was good for the company.

With the proposed valuation of employees, they became important in the decision-making chain of the construction company, so that they could decide, for example, if a material or PPE was appropriate over its price, or if food suppliers were or unable to continue providing to the company.

III. RESULTS

In order to value the employee as well as care for the environment and the community inserted in it, basic principles of social and environmental responsibility, were implemented some guiding measures for the future of the company.

3.A. EXPANSION OF OFFICE STAFF.

New employees were hired to compose the company's administrative team. Although the contraction by itself does not correspond to a social and environmental action, it came as a support for the decentralization of functions accumulated by the company director and his occupational safety technician.

One civil engineer, one environmental technician, one cadist, one attendant and one accounting assistant were hired.

3.B. EMPLOYEE TRAINING

For each employee a training was set up based on their role within the company, so the company can form a more efficient employee and, mainly, engaged in the company's culture and mission.

POPs (Standard Operating Plans) were created, a detailed description of all measures required to perform a task, enabling employees to have a standard as a reference.

For each service a playbook was created based on their respective POPs. As a result, even hard-working employees may have made it easier for them to access content. Thus, in the execution of a certain service, instead of having the bricklayer must be willing to read long and tiring POPs, just read a booklet with images and simpler language developed by the company, as in figure 03.



Fig. 3: Procedure books for employees.

3.C. ENVIRONMENTAL PROJECTS

As verified in the diagnostic phase it was possible to conclude that the company wastes large amounts of financial resources, mainly with electricity, water and plastic cups.

For electricity expenses it was possible to analyze the history of the company with ELTROBRÁS since 2014, it was possible with surveys of water consumption expenses. For the consumption of plastic cups, the company only has records from 2017 to 2019, when the company's security technician began accounting for this cost. Thus, it was possible to verify the exponential cost reduction, falling almost in half with only small behavior changes. Each year was taken a monthly average and reached very favorable numbers, as shown in figure 04



Fig. 4: Graph of the costs of water, electricity and plastic cups.

IV. CONCLUSION

It was possible to conclude that the project executed in the company had several favorable results for the organization as reduction of costs of electricity, water and glasses, avoiding the ordinary waste of the company.

The change in employee behavior came in part because they felt more valued at the construction company, both because they were embedded in company policy and decision making.

The results were also favorable for the community, as employees are more likely to volunteer, as they are more motivated to become knowledge multipliers.

This project lasted only 4 months but considerably reduced costs and increased the company's competitiveness as customers already feel the change in company culture, especially in customer service and treatment of construction debris.

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REFERENCES

- [1]ALMEIDA, Roseane et al. DIAGNÓSTICO AMBIENTAL DE UMA INSTITUIÇÃO DE ENSINO TÉCNICO, INTEGRADO E SUPERIOR. **Revista Gestão & Sustentabilidade Ambiental**, v. 6, n. 3, p. 223-243, 2017.
- [2]ALVES, Jordania Louse Silva. Proposta para implementação da ISO 26000 e GRI G4 em PMES de serviços hoteleiros utilizando a tipologia estratégica de Miles e Snow. 2016.
- [3]DE SOUZA, Abel Correa et al. RESPONSABILIDADE SOCIAL CORPORATIVA E A INTEGRAÇÃO ENTRE POLÍTICAS E PRÁTICAS DA MEXICHEM BRASIL E OS INDICADORES DO INSTITUTO ETHOS. 2016.
- [4]DECHEZLEPRÊTRE, Antoine; SATO, Misato. The impacts of environmental regulations on competitiveness. **Review of Environmental Economics and Policy**, v. 11, n. 2, p. 183-206, 2017.
- [5]GONÇALVES, Ana Paula et al. AS ORGANIZAÇÕES E A SOCIEDADE: A RELAÇÃO ENTRE A GOVERNANÇA CORPORATIVA E A RESPONSABILIDADE SOCIAL. REGRAD-Revista Eletrônica de Graduação do UNIVEM-ISSN 1984-7866, v. 11, n. 01, p. 161-177, 2018.
- [6]NUVES, Cassia Roberta Alves et al. AS CONTRIBUIÇÕES DA ISO 26000. Maiêutica-Estudos Contemporâneos em Gestão Organizacional, v. 3, n. 1, 2015.
- [7]OLIVEIRA, Mónica; FERREIRA, Marisa Roriz; LIMA, Vanda. Responsabilidade social corporativa: conceito, instrumentos de gestão e normas. Revista Brasileira de Administração Científica, v. 6, n. 2, p. 161-172, 2015.
- [8]ROSA, Guilherme Soares. Responsabilidade Social das empresas: um estudo cross country. 2019. Tese de Doutorado.

The Flipped Classroom and Higher Education -Experiences with Computer Science Students

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Abstract—This paper presents the main results of the experiments carried out during a field investigation on the teaching and learning methodology of the flipped classroom, variant of b-learning education, within the scope of the PhD program in Information Sciences (in Systems, Technologies and Information Management) from Fernando Pessoa University in Porto - Portugal. The field research was methodologically oriented around Action-Research and was conducted between 2015 and 2019 with one hundred and fifty-two (n = 152) students from the higher education in Computer Science courses of two higher education institutions. The students were subjected to the methodological context of the flipped classroom, and the study focused on finding answers around the efficiency and effectiveness of this teaching methodology, by collecting data in two specific approaches, one related to behavioral aspects and the other around students affective aspects, given their individual experience in the teaching and learning process of the flipped classroom.

Keywords—flipped classroom, b-learning, teaching and learning process, active teaching methodologies.

I. INTRODUCTION

The exponential growth and popularization of the Internet over the last twenty-five years and the consequent advancement of digital technologies has significantly influenced the interaction of people in their relationship with information and knowledge, giving rise to a network society with directly impacts the educational environment, at different levels of education, which stimulates the development of new teaching methodologies, such as the flipped classroom example, one of the variants of blearning that takes advantage of the digital resources of computing that are being executed[1](Gokalp, 2013), implementing them specifically in the context of the faceto-face class (F2F) as in an e-learning environment.

The implementation of the flipped classroom emerged in the 1990s, empirically and with methodological variations, initially without the denomination that is currently used to invert the class. [2](Moran e Milsom, 2015).

Since 2006 K12American teachers Jonathan Bergmann and Aaron Sams, authors of the title reference book, "Reverse Your Classroom: Reach Every Student in Every Class Every Day," start promoting and implement an flipped classroom in US schools, period when the flipped classroom methodology becomes increasingly visible in the educational environment [3](Lopes, Gouveia e Reis, 2016).

The teaching methodology of the flipped classroom is initially to provide students with online theoretical content of the subject that will be worked later with the teacher in F2F, aiming to concentrate the classroom in an environment of debates, exercise resolutions, project design, practice activities, etc. Among the most used techniques in the flipped classroom, we highlight the availability of short videos in an e-learning environment [4](Bergmann e Sams, 2012), in which the teacher presents the fundamental content of the subject to the students, which can be accessed through the Virtual Learning Environment (VLE) on the Internet. In a F2F class, in general, the teacher puts himself most of the time in active conduct when explaining the subject, while students remain passive listening to the explanations. The flipped classroom as an active teaching methodology proposes a modification of this posture, aiming to streamline and modify the interaction between the teacher and the students, so that they are jointly active during the whole class in F2F context, concentrated predominantly in the accomplishment of activities, due to the fact that the introduction to the content of the subject was previously

done in an e-learning [5](Valente, 2014), as shown in the Fig. 1[6](The University of Texas at Austin, 2019).



Fig.1: The Flipped Classroom

The flipped classroom presents methodologically, a specific organization proposal about the distribution of the contents of the subject and the realization of classroom activities in the VLE and the F2F context, as shown in the example of Table 1 [4].

Table 1: Traditional versus flipped classroo
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Traditional Class		Flipped Classroom		
Activity	Time	Activity	Time	
Warm up activity	5 min.	Warm up activity	5 min.	
Go over previous night's homework	20 min.	Question & answer time on video	10 min.	
Lecture of new content	30-45 min.	Practical and	75 min.	
Practical and independent guided and/or lab. activity	20-35 min.	independent guided and/or lab. activity		

Analyzing Table 1, we found that the flipped classroom methodology significantly reduces the approach of the expository method during the classroom in the context of F2F, assuming that the stage of exposure of the contents of the subject (theoretical materials, manuals, videos, multimedia resources, etc.), was already fulfilled by the students in the previous class in e-learning environment, being viewed the video on the subject of the class, read and studied the theoretical contents in digital format. In In the flipped classroom methodology, the F2F class has as its main purpose to make students concentrate most of the class time on the development of individual and/or group practical activities, laboratory or not, according to the specificities of each class teaching area, with the objective of providing a dynamic of strong interaction between the students and the teacher, with the student having the opportunity to be a protagonist in his teaching and learning process, supported by the teacher who guides the development of student learning, acting as an "experienced guide".

About to the context of the flipped classroom, the need for protagonism of the students, especially in the online class,

is a critical factor for the effectiveness of the teaching and learning process in the context of the methodology, as the study of the contents made available to students in the VLE is an introductory and preparatory pre-class for the classroom, requiring a high level of autonomy and engagement by students, with the need for intense dedication in online study and monitoring constant performance of students by the teacher at risk of the flipped classroom methodology will not result in practice if students do not join the study of the online component of the class, which will require the teacher to change the teaching methodology, probably by returning of the implementation of the traditional expository teaching methodology [7](Jovanovic *et al.*, 2019).

The scientific literature shows that the flipped classroom teaching methodology can be implemented at any educational level, in different areas of knowledge, whether in academic or corporate teaching. Within this assumption, the main objective of this paper is to present the results obtained from the field experiments conducted around the implementation of the flipped classroom in the context of Higher Education.

II. METHODOLOGY

The research methodology of this study is action research, whose creation has an indefinite origin, although recurrently the scientific literature credits the creation of the method to the German psychologist Kurt Lewin, due to the fact that he defined the term "action research" [8](Tripp, 2005). Within the context and characteristics of this study, we consider the action research approach, as the one that is best adjusted to the investigative process performed, about the potentialities and challenges provided by the implementation of the flipped classroom teaching methodology, due to the possibility of autonomy of the teacher-researcher in the active conduct of the research process, intervening and interacting directly with the experimental sample, being a participant element of the field experiments. The target population of this study is the student (n = 152) of Higher Education from two institutions located in the city of Porto (Portugal), Fernando Pessoa University and the Higher Institute of Advanced Technologies. In the present study, four research instruments were used, divided into two categories, namely: 1 - procedural instruments, composed by the teacher's protocol and the student's guide, and 2 data collection instruments, composed by the observation grid and the survey.

In the fieldwork of this study, about data collection, some research techniques related to descriptive and correlational quantitative approaches were adopted in the experiments, respectively by questionnaire surveys, hypothesis testing, and qualitative research approaches. using the participant observation technique, supported by observation grids. Within this assumption, four hypotheses were also elaborated for statistical testing, to obtain some information considered relevant and that cannot be perceived, only by statistical analysis of relative and absolute frequencies.

RESULTS AND DISCUSSION III.

The results of the field investigation, which were obtained by performing a total of nine experiments, one pilot and eight more, with part of the data obtained through the observation grid and the other part by the questionnaire survey, instruments already mentioned in this paper.

Statistical analysis involved measures of descriptive statistics (absolute and relative frequencies, means and their respective standard deviations) and inferential statistics. The significance level for rejecting the null hypothesis was set at (α) <= 0,05. Exploratory Factor Analysis, Cronbach's alpha internal consistency coefficient, Pearson's correlation coefficient, Student's ttest for one sample, Manova Repeated Measures, Fisher's test, and Mann-Whitney test were used. The normal distribution of the variables was analyzed with the Shapiro-Wilk test. The homogeneity variance was analyzed with the Levene test.

According to the frequencies presented in Table 2, about the consolidation of the data obtained in the experiments through part 1 of the observation grid about the e-learning component of the class, the students mostly watched the video available (69,7%), in contrast to adherence to the theoretical study of the subject was relatively low (36,2%) and median understanding of the content provided (51,3%).

	Table 2: Objectives of students in the e-learning environment				
	Have you studied the subject available on the e-learning platform?	Did you watch the video available on the e-learning platform?	Did you understand the material available on the e-learning platform?		
Yes	55 students (36,2%)	106 students (69,7%)	78 students (51,3%)		
No	97 students (63,8%)	46 students (30,3%)	74 students (48,7%)		
Totality	152 students (100%)	152 students (100%)	152 students (100%)		

Table 2:	• Obiectives	of students	in the	e-learning	environment

About student surveys supported by the Google Forms online tool, volunteer students were required to answer all of the questions, which were organized into three (3) parts: 1-Sociodemographic characterization (5 questions); 2-Affective perception about ICT in e-learning and classroom teaching (2 questions); 3-General perception about the flipped classroom methodology (20 questions). One hundred and twenty-two students (N = 122)collaborated in the study, equivalent to 80,3% of the total sample of one hundred and fifty-two students (N = 152) with a mean age of 20,6 years and predominantly male gender as shown in Table 3.

Table 3: Gender of surveyed students

Frequency (N)	Percentage (%)
• • • · ·	i ci centage (70)
115	94,3
7	5,7
122	100
	122

In the questionnaire survey, students were asked to choose up to four words out of a total of fifteen words representing feelings, which best represented their affective perception about the use of Information and Communication Technologies (ICT) in F2F teaching and e-learning. As shown in Table 4, when asked students about "The use of ICT in classroom teaching causes me", the most mentioned affective perceptions are Enthusiasm (72,1%) and Joy (59,8%). The same question made in the context of distance education, when stated to students about "The use of ICT in e-learning education causes me", the most mentioned affective perceptions are Enthusiasm (59%) and Joy (45,9%) as shown in Table 5.

	Tuble 1. Hijt	converpenception with	i i ciussi oom iedem	ing (1 21)	
Affective perception	Frequency (N)	Percentage (%)	Affective perception	Frequency(N)	Percentage (%)
Enthusiasm	88	72,1	Anxiety	12	9,8
Joy	73	59,8	Affection	5	4,1
happiness	56	45,9	Boredom	5	4,1
pleasure	54	44,3	Anger	4	3,3
Inspiration	52	42,6	Contempt	3	2,5
Excitement	39	32	Fear	2	1,6
Indifference	21	17,2	Hate	0	0
Frustration	13	10,7			

Table 4: Affective perception with ICT in classroom teaching (F2F)

Table 5. Affective perception with ICT in distance learning (e-learning	Table 5: Affective	perception wi	th ICT in	distance	learning	(e-learning
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Affective perception	Frequency(N)	Percentage (%)	Affective perception	Frequency(N)	Percentage (%)
Enthusiasm	72	59	Anxiety	14	11,5
Joy	56	45,9	Affection	9	7,4
happiness	40	32,8	Boredom	6	4,9
pleasure	35	28,7	Anger	6	4,9
Inspiration	31	25,4	Contempt	5	4,1
Excitement	29	23,8	Fear	5	4,1
Indifference	27	22,1	Hate	3	2,5
Frustration	26	21,3			

In the last and third part of the questionnaire survey, the students underwent a series of affirmation about the flipped classroom to demonstrate their level of agreement or disagreement (Likert scale). The Table 6 presents the data consolidation (frequencies, means, and standard deviation) of the third part of the survey, highlighted in light gray in the most frequent answers. The answers that motivated the highest levels of agreement were: "The possibility of using videos as an aid in solving exercises

for the preparation of tests and exams is a facilitating aspect" (mean = 3,4) and "The video allows to revisit the contents when I do not understand them well, which is more difficult to do during a classroom class "(mean = 3,27). The survey affirmation that recorded the highest levels of disagreement was: "Video quality is not good, so content is not noticeable" (mean = 1,97).

	5 11					
Subtitle: 1 - Totally disagree 2 - Partly disagree						
3 - Partially agree 4 - Totally agree	1	2	3	4	Μ	SD
M – Mean SD – Standard deviation						
1. I found it difficult to solve the exercises proposed in the flipped classroom classes,						
regardless of the viewing of the videos.	23,0%	42,6%	31,1%	3,3%	2,15	,81
2. If I had summarized the requested video, my performance in solving the exercises						
on this video would have been better	9,0%	24,6%	50,0%	16,4%	2,74	,84
3. In the flipped classroom classes it took me less time to realize what was required in						
the proposed exercises when compared to the traditional classes.	4,1%	18,9%	57,4%	19,7%	2,93	,74
4. In the flipped classroom classes I felt less difficulty in solving the proposed						
exercises when compared to the classes without the flipped classroom.	5,7%	17,2%	59,0%	18,0%	2,89	,76
5. In the flipped classroom classes I took less time to perform the proposed exercises						
when compared to classes without the flipped classroom.	4,9%	23,0%	54,1%	18,0%	2,85	,77
6. In the classes with flipped classroom I had less difficulty in solving the proposed						
exercises because I felt more identified with this type of class.	4,9%	19,7%	58,2%	17,2%	2,88	,74
7. I consider the flipped classroom approach to be an advantage in my learning						
process.	3,3%	6,6%	50,8%	39,3%	3,26	,73

Table 6: The general perception of students about the flipped classroom

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8. The content on the subject of the video made me know how to select what I needed						
to use in solving exercises.	1,6%	15,6%	63,1%	19,7%	3,01	,65
9. The mode of exemplification that was done in the video made me understand it						
better and thus know how to use it in solving classroom exercises.	0,8%	13,9%	68,0%	17,2%	3,02	,59
10. I felt "somehow" that the videos had the teacher's presence, so I paid more						
attention to the contents of the video than to read them in a book or manual.	3,3%	17,2%	52,5%	27,0%	3,03	,76
11. Video allows you to revisit content when I don't understand it well, which is more						
difficult to do during face-to-face class.	1,6%	6,6%	54,9%	36,9%	3,27	,66
12. The ability to use videos as an aid in solving exercises for test and exam						
preparation is a facilitating aspect.	0,0%	3,3%	53,3%	43,4%	3,40	,56
13. The teacher gives me more attention to flipped classroom classes.	10,7%	19,7%	50,8%	18,9%	2,78	,88
14. The exercises proposed in the classroom classes required content that was not						
explained in the videos.	16,4%	33,6%	43,4%	6,6%	2,40	,84
15. The video content is static, if I don't understand it, I can't apply the concepts in						
solving exercises in the classroom.	7,4%	33,6%	52,5%	6,6%	2,58	,73
16. I do not have enough time to watch the videos outside of classroom classes.	24,6%	28,7%	37,7%	9,0%	2,31	,95
17. The flipped classroom is a very laborious approach to teaching in the subject study						
process.	4,9%	32,8%	48,4%	13,9%	2,71	,77
18. The video quality is not good, so it makes the content unnoticeable.	36,1%	35,2%	24,6%	4,1%	1,97	,88
19. I better understand the subject when I watch the video and the teacher focuses the						
classroom with exercises.	4,9%	11,5%	59,8%	23,8%	3,02	,74
20. The flipped classroom allowed me to solve more classroom exercises and better						
clarify my doubts with the teacher.	2,5%	11,5%	52,5%	33,6%	3,17	,72

We developed four hypotheses for statistical testing, to obtain some information considered relevant and not perceived only by the statistical analysis of relative and absolute frequencies. The following are the hypotheses elaborated for the present study:

Hypothesis 1 (H1) - Students, independently of age, gender, academic level and semester, have similar affective perceptions in dealing with digital technologies, in the F2F and e-learning environment in the context of the flipped classroom.

The statistical analysis of H1, indicates that students of courses in computer systems, especially in the 3rd and 4th semesters, in e-learning and classroom classes, present a significantly higher positive affective perception than students of the undergraduate degree in Computer Engineering of any degree without significant differences in age and gender.

Hypothesis 2 (H2) - Students, regardless of age, gender, academic level and semester they are in, similarly evaluate flipped classroom classes (analysis carried out through the dimensions obtained by Exploratory Factor Analysis: "advantages", "difficulties", "video advantages", "video/teacher relationship" and "obstacles").

The statistical analysis of H2, indicates that female student regardless of the course and students of courses in computer systems regardless of gender, in the dimensions "advantages" and "video/teacher relationship" are the ones who most positively evaluate their experience with flipped classroom methodology, no matter the semester.

Hypothesis 3 (H3) - The students who understood the subject were the students who watched the video and studied the subject available on the e-learning platform.

In the statistical analysis of H3, students who claim to have understood the subject online, through video viewing and reading of complementary theoretical material, are proportionally and significantly superior to students who claim to have understood the subject, only based on video viewing or reading of the theoretical material. Some few students, who claim to have understood the subject without even viewing the video or studying the theoretical content, tend to indicate that they have prior knowledge of the subject or answered randomly when asked.

Hypothesis 4 (H4) - The number of students per group and the academic level does not significantly influence the completion of the proposed activities in the F2F component of the flipped classroom.

In the statistical analysis of H4, it is concluded that the number of students per group is not significant in the performance of the activities resolution, and the students coming from the computer systems courses completed significantly more activities compared to the students of the computer engineering courses.

IV. CONCLUSION

In this study we focus mainly on the flipped classroom b-learning teaching methodology, having verified that this methodological approach has a positive potential in its structure to balance the relationship between teachers and students in synchronous and asynchronous teaching environments involving digital technologies. In F2F classes or the context of e-learning, because the flipped classroom has a set of specific procedures that guide its methodological implementation, this aspect allows mitigating some challenges in the context of the teaching and learning process in the context of e/b-learning.

We found in the study that the students of the Higher Education sample investigated, have a relevant disposition for the use of digital technologies in their teaching and learning process, either in F2F or e-learning, demonstrated by the significant positive affective perception presented in the results experimental, whether in the implementation of b-learning teaching methodologies such as the flipped classroom, with the teacher prioritizing the form and strategy of content implementation.

Regarding the VLE digital resources in the e-learning context, students tend to show greater motivation, when they somehow feel the "presence" of the teacher, this is made clear by the high adherence to the didactic video available in the field experiments. We also observed in direct contact with students in F2F, during the experiments, a strong motivation about the use of videos, in contrast, we noticed a resistance of students to adhere to the study of theoretical content in e-learning.

Regarding the efficiency of the flipped classroom, this study showed us that efficiency varies around some relevant characteristics, such as:

- 1. It requires a high level of teacher work and creativity in developing content and then properly organizing it into the F2F and e-learning components of the class, which may take some time before the content is properly adjusted;
- 2. Demands a high degree of student role in wanting to be self-directed in their teaching and learning process, especially in the e-learning component of the class, which implies a cultural change from an academic point of view, which can be persistently achieved mainly in the context of Higher Education;
- 3. Demands that teachers receive training and guidance on active methodologies, with the encouragement of higher education institutions, concerning the purely technical aspects of digital technologies, but mainly how to generate educational value in methodological terms in the

field teaching and learning process in an inverted classroom context.

4. The efficiency of the flipped classroom may increase through the elaboration of specific procedures around teaching techniques, adapted to the academic reality of higher education institutions, regarding the interaction between teachers and students with the methodology, providing a gradual increase of expertise over time, composing a set of "lessons learned" that will be helpful to the process of practical evolution about the implementation of the flipped classroom.

REFERENCES

- Gokalp, Muhammed Sait Perceptions of the Internet and Education: A Study with Physics Education Website Users. International Journal of Environmental and Science Education. ISSN 1306-3065. 8:2 (2013) 289–302.
- [2] Moran, Kristen; Milson, Amy The Flipped Classroom in Counselor Education. Counselor Education and Supervision. ISSN 1556-6978. 54:1 (2015) 32–43. doi: 10.1002/j.1556-6978.2015.00068.x.
- [3] Lopes, Sergio Francisco Sargo Ferreira; Gouveia, Luís Manuel Borges; REIS, Pedro Alexandre da Cunha - O modelo de ensino do «flipped classroom» (sala de aula invertida) no âmbito do ensino superior. Em Atas dos Dias da Investigação na UFP Research Days Proceedings 2016. Porto: Universidade Fernando Pessoa, 2016 [Accessed 11 Apr. 2019]. Available at WWW:<URL:http://gadi.ufp.pt/dias-da-investigacao-naufp/ebooks-atas-dos-dias-da-investigacao-na-ufp/>. ISBN 978-989-643-141-9
- Bergmann, Jonathan; Sams, Aaron Flip Your Classroom: Reach Every Student in Every Class Every Day. [S.l.]: International Society for Technology in Education, 2012. ISBN 978-1-56484-560-3.
- [5] Valtente, José Armando Blended learning e as mudanças no ensino superior: a proposta da sala de aula invertida. Educar em Revista. ISSN 0104-4060. SPE4 (2014) 79–97. doi: 10.1590/0104-4060.38645.
- [6] The university of texas at austin Flipped Classroom, 2019. [Accessed 26 Nov. 2018]. Available at WWW:<URL:https://facultyinnovate.utexas.edu/flippedclassroom>.
- Jovanovic, Jelena *et al.* Predictive power of regularity of pre-class activities in a flipped classroom. Computers & Education. ISSN 0360-1315. 134:2019) 156–168. doi: 10.1016/j.compedu.2019.02.011.
- [8] Tripp, David Pesquisa-ação: uma introdução metodológica. Educação e Pesquisa.ISSN 1517-9702. 31:3 (2005) 443–466. doi: 10.1590/S1517-97022005000300009.

A Proposed Model of IT Governance within Cloud Computing and Data Management in Higher Education

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Abstract— The organization strategic design is able to be synced and supported through accurate and proper governance implementation. IT Governance reflected as a success key for organizations, including higher education's institutions. In supporting the sustainability and the organization stride, IT governance for the higher education organization needs regular assessment to maintain the dynamic technological and business circumstances. Recently, we see technology management in IT services is experiencing transformations phase to service management. Cloud computing (CC) which viewed as an IT transformation, is introducing the enhanced IT innovation system that works at a management budget throughout the concept of IT services. Despite its benefits, CC has not commonly embraced due to many factors, in particular, associated with the transfer of business data and its security. This makes one of today's organizations problems, especially concerning how cloud technology influenced data management. However, IT governance eventually will proceed to switch forward to CC technology. Organizations such higher educations will need to overcome these matters and afford to develop policies related to the cloud to manage the capabilities brought by CC and meet their conditions. Based on above conditions, this paper tries to proposed IT governance with CC and the data management model framework which formed based on primary aspects in governance processes with its COBIT 5 instructions and also data management with its principle for data assets managing.

Keywords— COBIT 5 Framework, Data Management, Higher Education, IT Governance, ISO/IEC 38500.

I. INTRODUCTION

IT governance provides perceptibility and IT mechanism; consequently, the attempts performed in institutions governance made their operational processes risks decreased, gain more commitment to compliance procedure and give additional preservation of invested value. Although information technology has merits, it has contributed to the consequences of its presence. Various forms of IT risk emerging along with the advancement in the perspective of Information, Communications and technology, which also lead to organizations like higher education's institutions, require more directing and readjusting on its governance in IT with different concept. According to [1] IT Governance is needed by institutions like higher education to generate a process of disseminating knowledge in more interactive and dynamic learning activities, transparencies in their operational governance of institutional activities, and evaluation-based performance improvement assessment, then data and information security which is associated to intellectual rights. Nowadays, along with vast technology development, cloud with its technology has the capability

resources vigorously, which gains a quite common focus. Besides being very interested in using the cloud within data management with its capabilities; which almost all higher education institution has, regrettably some of them remain entirely unacquainted within the cloud then the further data management significance variables. Cloud computing must be introduced as a matter of urgency as many scientific study and research currently address cloud computing technologies. Previous investigations done by [5] conclude in their paper which undoubtedly presents the divergence between the competencies needed for conventional IT outsourcing associated with the services of cloud technology. Also, centered on the experiments to hundreds of Australian institutions [6], the organization's addition to cloud alternatives was proposed. The examination aims to underline the significance of IT governance in the improvement of the IT scheme and to highlighting the influence in the business field. Emphasizing on the following phase of the IT governance and its passages to adopt cloud technology within data management has become this project objective.

to offers another way for its clients to manage their

II. IT GOVERNANCE AND CORPORATE GOVERNANCE

The idea of IT governance [17] and corporate governance [18] are considered well familiar among us. The general definitions of "governance," pointing out to the drill of how an organization makes sure its strategic policies are established supervised and implemented [19]. Implementing good corporate governance which linked in a strategic way to performance measures allows organizations at first to focus on the fundamental effort who promote their activities, and secondly to ensure strategic objectives line up by business purpose. Corporate governance encompasses many essentials areas, one of which is IT governance. IT governance, as an essential feature of business strategy and as a corporate governance constituent, is by necessity, the cornerstone for every organization. Many terms found in literature that suggested to employing IT governance. However, our paper tries to observe the interpretation of IT governance offered by [3], which says that it represents the "organizational capacity of the Board, the Executives and Management of IT in the application and construction of IT strategy." It also concerns the series of practices, customs, policies, laws, and an institution that prejudices the management, administration or supervision of an institution [7], and integrates IT approaches and organization in performs [8].

Considering to the advanced use of technology, a critical IT dependence needs to focus specifically on IT governance, and the needs to take the risks of business transparent and conserve the shareholder value [9]. IT governance also acknowledged as an applicable design to resolve IT changes and issues developed. The IT governance mechanism will lean on its properties and organization's needs. IT governance performs as an anticipation to facilitate performance in the IT utilization to an accountability framework including the making of decision process [10]. The organization possessed the right and sufficient capacity and structure following above IT governance definitions to implement effective governance that aligns IT with its institution's strategy. Institutions governance will be affected when current technology requires to get introduced to the existing system.

The institution of higher education considered as a unique non-profit organization that needs a periodic examination to change the governance framework of IT as the reflection of the expanding industry situation and technology. A higher education's institution also has a distinct IT infrastructure; it has unique apps that differ from other organizations, like educational and technologyrelated systems [11]. In Indonesia for an example, IT is to be used for promoting the continuation of management processes to enable the higher educations (universities) "Tri Dharma" (teaching, research, and community-based services) to get appropriately carried out. It is necessarily for university to be a pattern for the completion of Good University Governance as Indonesia's highest educational organization. It represents several factors why higher education with principles in it so important. The IT governance mechanism of an organization will, however, depend on its characteristics and requirements [14]. In this case, the organization executives can be assisted by utilizing COBIT 5 with the ISO/IEC 38500 to encourage their legal responsibilities, laws, and conduct alongside of the applications by contributes its essential values.

2.1 COBIT 5

COBIT 5 which stands for the Control Objectives for Information and Technology related is "a comprehensive framework that helps enterprise leaders to create optimal value from information and technology by maintaining balance amongst realizing benefits and optimizing risk levels and resource use"[12]. With offering necessary structure and tools to convey value, risk reductions, and optimizing opportunities COBIT 5 foundations are on its process reference model, which describes in detail many governance and the processes of management which familiar to every institution. Such pattern is offering IT organizational and company executives a broadly acknowledged field. The involvement of this operating model is a basic and crucial stage in good governance and presents a structure for IT parameter and monitoring. [13]. In short, it supports organizations to bear maximum IT values by balancing the applications of advantages and optimizing the levels of risk and resources utilizations. COBIT 5 is universal and beneficial for organizations of any dimensions [17].

COBIT 5 splits the process of IT governance into two primary method areas, First one is Governance areas; it covers another five processes where evaluation, direct, and monitoring (EDM) practices defined in every process. The second areas is management, includes four fields, sequential with the plan, build, run, and monitor (PBRM) area of responsibility, and provides end-to-end IT coverage. The dimension of processes is covered in their field, respectively. While the predominance of procedures involve "planning," implementing," and "monitoring" practices in or through the mechanism (e.g., quality, security) they are positioned in the domain that is usually equipped with the most well-suited field of operation when considering IT incorporate stage [18].



Fig.1: Governance and Management Key of COBIT 5

The suggested model is well-developed, integrated model, but not the only feasible model of the method. Due to their particular scenario, each company must identify its method selection. good governance most significant and critical parts measures is to include an operational structure and the universal language for all IT projects components of the corporation. The framework provided also ensures the measurement and monitoring of IT performance, IT security, communication with service providers, and integration of good management practices. **2.2 ISO 38500**

ISO 38500 ISO 38500 seek to provide the directors including the owners, board memberships, managers, partners and executives with a packed of principles when assessing, instructing and controlling IT usage to comprehend and achieve its legal, regulatory and ethical obligations in organizations. The fundamentals range is to develop guidelines to confirm that IT use within their companies is efficient, adequate and suitable for any size of organization irrespective of the objectives, design or ownership [19].

I IT governance framework is considered a necessity; nevertheless, the framework itself not informing the way to pertain it; it merely guides its determined processes. The prominence of IT governance has risen to encourage the effectual output of the IT organization or to meet legal policies (ISO/IEC 38500, 2008) [17]. The popular frameworks of IT governance and standards give alternatives and instruments that can contribute to IT management.

Centered on the work proposed by [20][21][22], IT governance could be delivered through a different mixed from several structures, processes, and relational framework methods which could embraced by any organizations [22][23]. The proposed framework establishes a well-structured mechanism, making it easier to apply and implement a clear guideline similar as COBIT or the ITIL and ISO standards. Six principles of corporate IT governance are useable by most organizations entitled to the ideal performance which will support the decision making processes. Those six principles are Responsibility, Strategy, Acquisition, Performance, Conformance, and Human Behavior [43]. The IT governance directors are accountable for three functions international standard under ISO/IEC 38500, and those functions model demonstrated below.



Fig.2: ISO 38500 Corporate Governance of IT Model

III. CLOUD COMPUTING (CC) AND BUSINESS TRANSFORMATION

During CC technology expansions, IT governance is treated into account. Without the utilizations of the CC facilities, the proper functions of an IT will not be accomplished anymore. CC, which mostly offers an innovative preference for organizations to preserve their infrastructure easily, yet also presents a risk, and the deficiency of a cloud governance strategy which is become our major attention. CC Governance is termed as the processes for controlling cloud-based service adoption and implementation, followed with recognized policies, audit procedures, and management policies [15]. However, cloud governance is beyond only management of policies and defining procedures to certify they have appropriately implemented. It is designed to support business strategy and provide value, security, and quality of service, irrespective of the location of data and services control.

Since it conveys an innovative computing idea, governance had to get supported, implemented and operated efficiently. In association to the conventional information system setting, attributable to its prevalent and various designs, and the virtual environment is more challenging to control. A fresh governance idea should have been developed to suit with and comply with cloud features. Therefore the organization must be prepared for efficient governance regarding cloud capabilities and constructions, in an attempt to implement efficient alternatives. An organizational design with the necessary abilities and knowledge is, therefore, necessary in the favor of proven IT governance. After evaluating the IT management structure suggested by [4][5] for instance, they analyzed that the existing organizational buildings must be given extra capacities to get the requirements of CC accomplished. They also suggested to incorporating cloud company policy capacities that would strategically integrate company goals with cloud/IT goals, proposed request, and relationship management expertise to facilitate business-IT interaction, and to preserve cloud problems in the various business sectors. Moreover, they have also recommended data security, IT network management, software acquisition, hazard and enforcement governance, contract management, etc. [5].

3.1 CLOUD COMPUTING

The NIST describes it as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [2]. The cloud, besides offering efficiencies and reliabilities, also allows the customer to view data and apps in any approach and anytime or anywhere. Followed by the high emerged of new device and appliances every day, the demand for the cloud increased quickly. Cloud's facilities are transparent and straightforward, and can thus meet this increasing requirement [16]. The cloud have a model supports accessibility and it is covering five necessary characteristics (On-demand self-service, Ubiquitous network access, Resource pooling, Rapid elasticity, and Pay per use) [2], three service models (Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS))[41], and four deployment models (Public Cloud, Private Cloud, Community Cloud, Hybrid Cloud) [44].

Regardless of the basic feature of the above definition and the compromise between suggestion and requirements, some aspects should be accounted during the usage stage [24]. They are user profiling adaptability, individual use based on billing and metering, user-centric privacy, and SLA assurance. These criteria are described to distinguish the responsibility and perimeter on each level and to shorten the scheme and applications of an adapted architecture.

Governing cloud is not probably a new term for IT, but a clear definition has not yet been provided [25]. The definition offered by Microsoft is "defining policies around managing the factors: availability, security, privacy, cloud services location and compliance and tracking for enforcing the running policies when the applications are running" [26]. Cloud Governance primary focuses on provider/consumer interactions across various business models [27]. The corporate system should determine the method by which a proposition is completed and how it is going to spend. However, definition which arises indicates that the cloud is a profoundly evolving environment. Therefore it required some moment to categorizing its main features and depending on its domain methods areas [28].

3.2 DATA MANAGEMENT

D Data management or so-called as data governance definition from IT Encyclopedia is "the overall management of the availability, usability, integrity, and security of the data employed in an enterprise. Moreover, a good data governance program includes a governing body or council, a defined set of procedures, and a plan to execute those procedures" [29]. The Association for Data Management (DAMA) refers it as top-level design and monitoring over data management, then also strengthen the definitions as: "the exercise of authority, control and shared decision-making (planning, monitoring, and enforcement) over the management of data assets" [31]. The literature might have various opinions on what drives these fields of governance. Nevertheless, data management undeniably essentials for both governance in corporate and IT governance, and it is being convinced with systematic analysis on a published paper [32]. Parts of cloud governance which regarded a crucial element are data governance [33]. With concerns to functions and accountability, the association among cloud performers or stakeholders necessary to get acknowledged [34]. Interoperability focused is nearly available in every current research report on cloud then data management despite accountability [30]. Decision making centered on cloud by organizations, likewise data store distribution and management, regulation, the audit procedures can be reinforced by the data management function [35]. To equip adequate decisions which the trust encouragement and self-assurance of cloud users, it will require effective data with management transparencies aspects and accountabilities as compulsories [36].

Five significant performers referenced by NIST's cloud computing composition are consumer, provider, auditor, carrier, and broker [2]. Thus every cloud performer has unique functions and duties in each cluster, so the data management program must describe precisely all cloud performer's parts and positions [37]. In outlining governance strategy for data which the organizations may select to transfer to a cloud provider will required Service-Level-Agreement (SLA) which contains protocols and rules assistance [38]. Meanwhile, data issues which influence the decision in switching to cloud and the data management applications for cloud services are includes in the technical background. As for the legal aspect, it defines the external and internal data laws and regulatory provisions that could impact the intention to embrace cloud technology [39], Inability to conform with the regulations, primarily related to private information will diminish the assurance of cloud providers and can severely harm the judgment from organizations management. Some prevalent positions in data management have recognized, such as the data management committee, cloud provider constituent, IT participant, and legal representative [40]. These functions must cooperate in developing data management forms. Collected after the analysis of relevant literature and review from the systematic literature, we encapsulate the affiliation concerning the Corporate/IT governance, CC, with data management in figure 3.



Fig.3: Corporate/IT governance, CC with data management affiliation

IV. PROPOSED IT GOVERNANCE WITH CC AND DATA MANAGEMENT

C Cloud computing get widely supported in the changing of the conventional IT governance and also the data management strategies [42]. IT governance is increasingly getting more crucial for organizations to adopt solution of CC and the data management to perform a new framework for cloud management, establishment, and controlling. The framework chosen should be flexible, practical, and be better reuse the recognized IT framework/standard management practice likewise COBIT and ISO / IEC 38500 series. COBIT 5 frameworks are providing direction on how to attain higher education benefits of IT modeling, property improvement, and hazard or danger optimization. The governance of CC and data should also allow for the service and the deployment models, which each requires security and concept in another level. The following proposed model of IT with CC and the data management (figure 4) show higher education's attempt could never be distinguished from its three main tasks; education and teach. research. and service to community in accomplishing the organization's purposes.



Fig. 4: proposed IT governance with CC and the data management

V. CONCLUSION

O Organizations especially higher educations are require holding a key to optimizing value from its investment in IT by having effective governance. Many elements still have to be reanalyzed and reconsidered. Within this paper, an outline description of the architecture of CC (deployment systems and operations model), data management, and the need in IT function also provided. We also deliberate the IT governance with cloud and the data management requirements, and then we illustrate the needs for IT governance with CC and the data management framework which would be the important condition for establishment, directing, and supervising IT governance with the purpose of organizations. The utilization of the main principles of the IT governance process will verify that all phase is consistent with the institution's stakeholder's requirements. CC and the data management framework adoption should influenced on the information technology function since it also offers cost-effective, quicker, more flexible resources and services IT direction and security. This suggested model shows how IT governance should be created along with the scheme of the governance corporate which then implies that IT governance is not merely become the commitment of the IT department, but becoming an essential component of institutions; therefore corporate governance conformity can be improved.

REFERENCES

- [1] Albrecht, B., & Pirani, J. A. (2004). Using an IT Governance structure to achieve alignment at the University of Cincinnati. ECAR.
- [2] Mell, P. M., & Grance, T. (2011). Sp 800-145. the nist definition of cloud computing.
- [3] Van Grembergen, W. (Ed.). (2004). Strategies for information technology governance. Igi Global.
- [4] Feeny, D. F., & Willcocks, L. P. (1998). Core IS capabilities for exploiting information technology. Sloan management review, 39(3), 9-21.
- [5] Joha, A., & Janssen, M. F. W. H. A. (2012). Transformation to cloud services sourcing: required it governance capabilities. ICST Transactions on e-Business, 12 (7-9) 2012.
- [6] Prasad, A., Green, P., & Heales, J. (2014). On governance structures for the cloud computing services and assessing their effectiveness. International Journal of Accounting Information Systems, 15(4), 335-356.
- [7] De Leusse, P., Dimitrakos, T., & Brossard, D. (2009, July).
 A governance model for SOA. In 2009 IEEE International Conference on Web Services (pp. 1020-1027). IEEE.
- [8] International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC), ISO/ IEC 38500:2015 (2015). Corporate governance of information technology retrieved from http://www.iso.org/iso/catalogue_detail.htm?csnumber=628 16
- [9] The IT Governance Institute (2003). Board Briefing on IT Governance. IT Governance Institute
- [10] Weill, P., & Ross, J. W. (2004). IT governance: How top performers manage IT decision rights for superior results. Harvard Business Press.
- [11] Majid, H. A., Majid, M. A., Ibrahim, M. I., Manan, W. N. S. W., & Ramli, M. R. (2015, April). Investigation of security awareness on e-learning system among lecturers and students in Higher Education Institution. In 2015 International Conference on Computer, Communications, and Control Technology (I4CT) (pp. 216-220). IEEE.
- [12] ISACA, IT Governance Institute (2012). "COBIT 5 Executive Overview," Retrieved from: www.isaca.org/Knowledge-Center/cobit/Documents/COBIT-5-Executive-Overview.PDF
- [13] Information Systems Audit and Control Association, ISACA (2012). Cobit 5: A business framework for the governance and management of enterprise IT. Rolling Meadows. IL.
- [14] Hicks, M., Pervan, G., & Perrin, B. (2012). A study of the review and improvement of IT governance in Australian universities. In CONF-IRM (p. 22).
- [15] Guo, Z., Song, M., & Song, J. (2010, August). A governance model for cloud computing. In 2010 International Conference on Management and Service Science.
- [16] Sultan, N. (2010). Cloud computing for education: A new dawn?. International Journal of Information Management, 30(2), 109-116.

- [17] International Organization for Standardization (ISO), ISO/IEC 38500:2008 (2008). Corporate governance of information technology, Switzerland.
- [18] AC11069413, A. (Ed.). (2012). COBIT 5: A business framework for the governance and management of enterprise IT. Isaca.
- [19] Sylvester, D. (2011). ISO 38500—Why Another Standard?. COBIT Fokus, 2.
- [20] Peterson, R. (2004). Crafting information technology governance. Information systems management, 21(4), 7-22.
- [21] Peterson, R. R. (2004). Integration strategies and tactics for information technology governance. In Strategies for information technology governance (pp. 37-80). Igi Global.
- [22] De Haes, S., & Van Grembergen, W. (2004). IT governance and its mechanisms. Information systems control journal, 1, 27-33.
- [23] Patel, N. V. (2004). An emerging strategy for e-business IT Governance. In Strategies for information technology governance (pp. 81-98). Igi Global.
- [24] Rimal, B. P., Jukan, A., Katsaros, D., & Goeleven, Y. (2011). Architectural requirements for cloud computing systems: an enterprise cloud approach. Journal of Grid Computing, 9(1), 3-26.
- [25] Woldu, L. (2013). Cloud Governance Model and Security for Cloud Service Providers.
- [26] Saidah, A. S., & Abdelbaki, N. (2014). A New Cloud Computing Governance Framework. In CLOSER (pp. 671-678).
- [27] Wireko, J. K., & Azumah, K. K. (2017). Who" owns" the cloud? An empirical study of cloud governance in cloud computing in Ghana.
- [28] Zhang, L. J., & Zhou, Q. (2009, July). CCOA: Cloud computing open architecture. In 2009 IEEE International Conference on Web Services (pp. 607-616). Ieee.
- [29] Rouse, M. (2017). Data governance definition. Retrieved from http://www.whatis.techtarget.com
- [30] Felici, M., Koulouris, T., & Pearson, S. (2013, December). Accountability for data governance in cloud ecosystems. In 2013 IEEE 5th International Conference on Cloud Computing Technology and Science (Vol. 2, pp. 327-332). IEEE.
- [31] Cheong, L. K., & Chang, V. (2007). The need for data governance: a case study. ACIS 2007 Proceedings, 100.
- [32] Olaitan, O., Herselman, M., & Wayi, N. (2016). Taxonomy of literature to justify data governance as a pre-requisite for information governance.
- [33] Ko, R. K., Jagadpramana, P., Mowbray, M., Pearson, S., Kirchberg, M., Liang, Q., & Lee, B. S. (2011, July). TrustCloud: A framework for accountability and trust in cloud computing. In 2011 IEEE World Congress on Services (pp. 584-588). IEEE.
- [34] Al-Ruithe, M., Benkhelifa, E., & Hameed, K. (2016). A conceptual framework for designing data governance for cloud computing. Procedia Computer Science, 94, 160-167.
- [35] Ken, R., Harris, D., Meegan, J., Pardee, B., Le Roux, Y., Dotson, C., ... & Gershater, J. (2012). Security for cloud

computing: 10 steps to ensure sucess. Cloud Standards Customer Council (CSCC), Tech. Rep., August.

- [36] Council, C. S. (2012). Practical guide to cloud service level agreements version 1.0.
- [37] Badger, L., Grance, T., Patt-Corner, R., & Voas, J. (2012). Cloud computing synopsis and recommendations. NIST special publication, 800, 146.
- [38] Cochran, M., & Witman, P. D. (2011). Governance and service level agreement issues in a cloud computing environment. Journal of Information Technology Management, 22(2), 41-55.
- [39] Alkhater, N., Wills, G., & Walters, R. (2014, December). Factors influencing an organisation's intention to adopt cloud computing in Saudi Arabia. In 2014 IEEE 6th international conference on cloud computing technology and science (pp. 1040-1044). IEEE.
- [40] Wende, K. (2007). A model for data governance-Organising accountabilities for data quality management. ACIS 2007 Proceedings, 80.
- [41] Bulla, C. M., Bhojannavar, S. S., & Danawade, V. M. (2013). Cloud computing: Research activities and challenges. International Journal of Emerging Trends & Technology in Computer Science, 2(5), 206-214.
- [42] Trivedi, H. (2013). Cloud adoption model for governments and large enterprises. Unpublished MSc Thesis, Massachusetts Institute of Technology, Massachusetts.
- [43] Balgrosky, J. A. (2014). Essentials of Health Information Systems and Technology. Jones & Bartlett Publishers.
- [44] Rountree, D., & Castrillo, I. (2013). The basics of cloud computing: Understanding the fundamentals of cloud computing in theory and practice. Newnes.

The Beginner Teacher and School Culture Learning

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Abstract— This paper presents reflections about the beginner teacher and his school culture learning. The idea is to highlight the way the acquisition of this learning occurs, as well as to outline the school culture characteristic. The methodological platform was built through the ideas of the bibliographic review research of Brasileiro (2013), being the theoretical basis inspired by Faria Filho (2007), França-Carvalho (2007), Sacristán (2008), among others. The study pointed out that the school culture is systematized from the relationships between those who participate in the school community, resulting from their ideas, perspectives and actions built on behalf of the institution and those who enjoy it. It was also possible to realize that the school culture influences the beginning teacher professional development, promoting a resignification of his teaching activity, and thus contributing positively in the way of conducting the teaching and learning process. Keywords— Beginner teacher, learning, school culture.

I. INTRODUCTION

The Basic Education teacher when starting his career, comes across a school culture. It is also in this space of knowledge, that is, at school, as a formal educational institution, that he learns the teaching profession dynamics. From these first fruits, we sought evidence of how the acquisition of school culture learning occurs, as well as the delineation of the the school culture characteristics itself, in order to contribute also to the development of professional activities performed by the teacher. It is interesting to note that this relevant study is part of a Master's Dissertation in Education, belonging to the Graduate Program in Education - PPGEd, Federal University of Piauí - UFPI, which is located in Teresina city - Piauí.

For the work development was used the bibliographic revision research, that according to Brasileiro (2013, p. 47-48), "the bibliographic revision researches (or literature review) are those that make use of scientific publications in periodicals, books, annals of congresses, etc., not dedicated to collecting data in natura, but not configuring in a simple transcription of ideas ". This systematic contributed to the selection and studies of theoretical documents that address the subject in question, resulting in this important scientific record.

This article was built at first by means of a colloquium, presenting the considerations about the cultural process, where the concept of culture is first approached, and its importance for the historical context of the man until the present moment is highlighted. Then the correspondence / link between culture and capitalism and education is presented. Next, the cultural and social elements of the teaching profession are emphasized, and it is possible to know the customs and ways of the teacher developed over time, as well as the social issues that involve the professional at the beginning of his pedagogical activities.

the Following the approach, concept and characterization of school culture, and its influence on the development of the school and specifically the teacher, is debated. After, the school culture historic is approached, the function, the various concepts according to renowned authors and the terms school culture and school culture. To support the discussion, we have added the knowledge of Faria Filho (2007), França-Carvalho (2007), Sacristán (2008) and others. Such compilation in the chain of ideas became essential for the theme understanding, thus developing the possibilities of knowing the learning process of the school culture by the beginning teacher.

II. CONSIDERATIONS ABOUT CULTURAL PROCESS

Culture has commonly been termed as "[...] a set of human characteristics that are acquired, preserved or enhanced through communication, the interaction of individuals in society. Knowledge, techniques, traditions, characteristics, of a society or group. Civilization, progress" (QUEIROZ, 2011, p. 81). Culture is a dynamic process developed from the relations between men, considering as results their modes, customs, history, legitimation, concepts and experiences. It is from socialization among people that the objects can come to form, that the solution to a disease is discovered, that knowledge about particular causes is reviewed and that science becomes continuous. All these prominent aspects serve to demonstrate that society lives in a constant relationship, that one person survives to the detriment of others, and that a people, directly or indirectly, guides, suggests, or serves their actions or products to other societies.

Santos (2012, p. 7) understands culture as "[...] a contemporary concern, well alive in the present times. It is a concern to understand the many paths that have led human groups to their present relations and future prospects." Through the cultural process, a collectivity continually tries to pursue social development, drawing on past situations in order to analyze the process and launch a recurring study or proposal.

From the social recognition of an action, it may be that a local culture is agreed upon and it can often become a rule or even a law. It is a tradition consequence of the population, where the teachings are passed down the generations through language, communicative gestures, formal education and others. Through observation, too, children and adults internalize knowledge and practice their practices preceded by freedom or obligation. Since freedom is the first act of living according to its own principles and as a factor of creation. Man is therefore "[...] cultural as it is produced by the relationship with the environment, with the other one, with the culture participants, which makes it historical, contextualized", as stated by França-Carvalho (2007, p. 41). Through this understanding, it is understood that man learns and teaches through experiential contact with the environment and society.

In this sense, it is important to highlight the need for ethical principles in the axis of a people culture, being indispensable their links in the context of current experience. The social contact idea also involves respect that serves as an action divider within a culture, requiring a human look at the other's way of life. But unfortunately on the 21st century threshold, social and racial discrimination, infanticide, rape, limitation of certain activities for women, abuse of power and denial of ethics can still exist. All these actions are widely publicized by the media, where they have helped to understand such a situation and to publicize the social distortion still chosen by many. Through these considerations, the responsibility of attitudes has been discussed as a way of sensitizing people to their integrity, since it is no longer appropriate to "gag" a culture by not understanding it or simply by not "finding it right". " It is essential to rescue listening, the tangible relationship among people, social aid and the pluralization of culture, where it is desirable to perceive "the cultures" within a macro culture.

Cultures generally differ from each other in relation to basic postulates, although they have common characteristics" (LAKATOS; MARCONI, 2013, p. 135). In this cultures diversity that enriches the knowledge of the society, from common sense to systematized, with concepts and orientations, often passing on knowledge from generation to generation and contributing to the development of scientific studies.

Expanded to a more detailed context, Sacristán (2008) highlights three knowledge about culture. In the first ground, it is characterized by the understanding of being "cultured", being related to scientificity, the arts and others. In the second conception, it is a grouping of the experiences, ways and habits of a population, used since Kant. "In this second sense, the scope or content of culture is broadened, encompassing very different traits and aspects (including those of cultured culture, since all that is not nature in humans is culture)" (p. 33). Next, the author lists the contexts related to cultural globalization, as follows: as a result of communicative technologies and object exchanges, the various societies interact in a knowledge process and material exchange, not needing to address themselves; in the next, there are trips in which people can relate to other cultures and in the last, with the advent of industry, the population moved from rural to urban areas, where it was necessary for them to understand existing people.

> Cultural globalization, in this sense, has ambivalent consequences that imply contradictory attention calls for education. They assume possibilities of accessing and enriching others, revising and relativizing oneself, acquiring new skills and stimuli that complement and improve the school culture, etc. The recommendation would be to do all that is necessary to broaden and deepen one's knowledge of the other (SACRISTÁN, 2008, p. 35).

In the third, or mass', that is, the one that is most widespread among people, such as code, parts / utensils, actions related to culture, book admired by the people and product made by people's hands. However, these three
knowledge about culture are not separated by barriers, as they "dialogue" with each other.

For Sacristán (2008, p. 37), "globalization, configuring more complex realities and new inequality sources, it needs more intervention to be 'domesticated' for the benefit of all, [...]." Through this prerogative, It is important to have new ideas in view of the current world situation.

However, the information about the cultural process is exciting, and it should be noted that:

If the cultural elements disappear, there is the cultural decline. Often religious, social and environmental conditions lead to the disappearance or change of a cultural complex. On the one hand, if a single trait or an entire culture may disappear, on the other hand, cultural rebirth may occur as a result of endogenous or exogenous factors. When the new elements added to a culture are less significant than the previous ones, the culture remains stationary or declines (LAKATOS; MARCONI, 2013, p. 144).

However, it is important to study the cultural elements, plus the social elements of the teaching profession, and are reflected below.

III. THE CULTURAL AND SOCIAL ELEMENTS OF THE TEACHER PROFESSION

Every constitutive process of the teacher's pedagogical practice is based on the elements that support the action in the classroom, as well as in the other spaces of school. These elements can be divided into: cultural elements of the teaching profession and social elements of the teaching profession, and through these, the teacher develops a relationship of consolidation of his activities within the institution.

To this end, the teacher's professional development is also built from studies during undergraduate education, complemented by the beginning of the teaching exercise, thus stimulating an expansion process of their practices and concepts, with the presence of new thoughts and approaches. However, what was simple now becomes complex, because the teacher will use beyond the image and what is palpable, also, their actions, communication and socialization.

"In order to understanding the school and its result, it is necessary to resort to the broad meaning of the word culture, that is, the set of customs, the ways of living, [...] the ways of thinking, the language expressions, the values of a people or different social groups "(KRUPPA, 1994, p. 32). From this understanding it is possible to conceptualize cultural elements of the teaching profession as a set of ideas and actions that have been put into practice by the teacher since a certain historical time, becoming an integral part of school day by day and widely recognized by students, other professionals and society.

These elements include: the teacher's character, his commitment, his responsibility, the way he approaches a content, the education directed to the students' guardians, the way he treats the students, the respect for all independent of any situation, their language and communication, and others. It is interesting to note that "the teacher will mediate between the collective of society (the culture results) and the individual of the student. He plays the role of one of the social mediators between the whole society and the particular of the student." (LUCKESI, 1994, p. 115).

The teacher, having contact with the academy and the school, performs a cultural exchange, where he also incorporates concepts, making a new meaning of his practice in a constant future. The teacher comes to know new different theories, thoughts and visions, often abandoning common sense and validating common sense and elaborate knowledge.

The social elements of the teaching profession can be understood from the contribution of Cunha (1989, p. 39) by presenting that:

> The teacher's knowledge is built on his own daily life, but he is not only the result of life at school. It also comes from other areas and often excludes from its practice elements that belong to the school domain. Participation in social, religious, trade union and community movements may have more influence on the teacher's daily life than the academic training he or she received academically.

It is through contact, conviviality and experiences with people that the teacher develops the profession social elements. The relationship of socialization matures the knowledge, making the professional learn and develop their ideas. And in this coming and going of information, he acquires knowledge and reinvents new conceptions and principles.

However, "the human being is practical, active, since it is by action that modifies the environment that surrounds him, making it satisfactory to his needs; and while transforming reality, it builds itself within determined social relations" (LUCKESI, 1994, p. 110). Through the contact of the beginning teacher with other professionals from various sectors and other teams, he becomes aware of certain cases, enriching his classes due to this moment of interaction. It is also in formal relations of events or in other contexts that the teacher becomes familiar with different audiences, often trying to find answers to their questions in the classroom and also improve teaching.

It is in the classroom that many of the teacher's learning from other realities and everyday life are used as a source of inspiration and examples to initiate a content and contextualization of pedagogical practice. The teacher is a communicative agent, observing, researching and making a suggestion, even in the face of conflicting contexts. It is in their daily concerns that they use other professionals who have a value judgment and learn about some topics.

Thus, it is observed that the teacher practice at the beginning of his career is challenging, but that he seeks through the support coming from the other school components and family of the learner a possible solution or help to better perform their educational activities in the context of school culture. However, it is important to know what school culture is.

IV. CONCEPT AND CHARACTERIZATION OF SCHOOL CULTURE

The school is a formal educational institution, whose main objectives - socialization and teaching, and as justification - coexistence and learning. In this space of exchange of knowledge that is formed the student / citizen that society wants: whole, ethical, capable, human and educated.

School institutions change. They are a combination - among many others possible - change of tradition and change, consequence of decisions limited by external factors, technological constraints and a series of sedimented practices without progress, which are generally grouped under the denomination of school culture (VIÑAO, 2000, p. 9, our translation).

Studies at school culture are recent, few authors advocate a systemic concept with in-depth research that represents the nuances of the educational scenario, observing what actually happens and what is related in the extra and intra institutional context. Most of the listed works are found through copyrighted articles in organized books and scientific articles.

This literature is consensual in stating that in the school institution, there is a peculiar and exclusive culture, and even though the studies were started in 1980, only in 1990 that the conception of school culture was expanded, being observed today by various aspects, however, teachers, directors, students and their guardians, dialogues, institutional structuring and the solidified way of acting that is developed during the period, are the essential principles that outline this culture (SILVA, 2006). For this, "culture permeates all actions of daily school life, whether in influencing its rites or language, in determining its forms of organization and management, or in the constitution of curriculum systems" (p. 204).

The customs and ways are intertwined and related to different groups of the school institution, as well as in its idea of conceiving education, thus reflecting on the formation of the desired citizen. It is possible to know what type of student the institution intends to train through the development of its work or explicitly presented in the school pedagogical political project.

To this end, "the function of school culture would not be to promote the incorporation of values other than school goals, or even to serve as tools for the inculcation of values. At least these are not only the results promoted by the school culture" (SILVA, 2006, p. 204). In this sense, to know the school culture, we have the idea of launching a systematic look at the educational context.

For Vinão Frago (1995, p. 68-69, our translation),

The problem is that school culture, as a set of institutionalized aspects that characterize the school as an organization, it has several modalities or levels. [...]. Finally, the previous expression "set of institutionalized aspects" - includes practices and behaviors, ways of life, habits and rites the everyday history of schooling -, material objects - function, use, distribution in space, physical materiality, symbolism, introduction, transformation, disappearance ... -, and ways of thinking, then as shared meanings and ideas. Someone will say: all. And if, of course, school culture is all school life: facts and ideas, minds and bodies, objects and behaviors, ways of thinking, saying and doing.

The school, as a favorable space for the teaching and learning process, it also houses a social organization postulated through rules that need approved conducts for its daily development. For each component of the school community their respective duties are oriented, not least, each team has its own rights.

Specifically about the teacher, he presents among many responsibilities, the organization of the planning of the classes, as their intended activities and objectives; the maintenance of an enabling environment for the educational strategies to be implemented daily; and zeal for their professional dynamics as well as for the evolution of student learning. For further reflection, the contribution of Julia (2001, p. 10), To be brief, one could describe school culture as a set of norms that define knowledge to teach and behaviors to inculcate, and a set of practices that allow the transmission of this knowledge and the incorporation of these behaviors; coordinated norms and practices for purposes that may vary according to the times (religious, sociopolitical or simply socialization purposes).

In the school institution, social contacts take place between the teachers and the most diverse groups, whether these are with the students, the other teachers, the staff, the students' caretakers and others.

Through the next thought, a further understanding of the theme under construction is feasible:

[...], the category school culture is understood here as the way in which in a concrete and particular historical situation are articulated and represented by the school subjects, the spatio-temporal dimensions of the school educational phenomenon, knowledge, sensitivities and values to be transmitted and materiality and school methods. [...], thinking about a concept of school culture necessarily implies embracing a certain definition of culture [...] (FARIA FILHO, 2007, p. 195-196).

Culture develops through the expressions of a society in which man explores his potentialities, desires and concerns to dialogue with others who are inserted in his own social group as in other groups. Because of respect for people, friendly relations can exist internally and with different societies, so that there are no conflicts or even ruptures between themselves or with certain peoples. And in the school context, too, there is a dynamic to be experienced by all, where each participant in the community is oriented to follow an educational organization, as long as it does not reach human dignity and its moral principles.

Therefore, it is important to analyze also the school culture through the exposition of *Chart 1*.

Chart 1 – Th	ne dimen	sions of	school	culture
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DIMENSION	DEFINITION				
Anthropological	School culture is passed on to people				
Anthropological	successively.				
Sociological	School culture seeks to reach the most				
Sociological	diverse people and social strata.				
Dedegogical	School culture is inherent in the				
reuagogicai	curriculum and the teaching process.				

Source: Araújo e Araújo (2010).

These principles allow us to realize that school culture involves an idea of the sequence of ideas and actions to be considered and propagated in the school community, and a fourth dimension, that is, affectivity, in which the organizational climate is involved.

Faria Filho (2007, p. 196) corroborates the approached knowledge, providing the following idea:

[...] school culture may be synonymous with the notion of school culture (of that particular school), or even that of institutional culture. Even so, it must be considered that school cultures viewed from the place of a single school, or on this microanalytic scale, cannot be understood in their uniqueness and generality if the necessary mediations with the larger social processes are not realized.

Drawing a parallel with the author mentioned above, Silva (2006, p. 206) emphasizes that: "be it school culture or culture of the school, these concepts end up evidencing practically the same thing, that is, the school is an institution of society, [...]." Regarding school culture "however, in our opinion, the scope of the concept is practically unlimited" (POL et al, 2007, p. 75).

In the search for other information that fits with the previous characterizations, it is possible to present the following knowledge of various authors, this is:

> Seeking to understand the internal dynamics of school functioning, historical research in Brazilian education, especially since the 1990s, has been asking about the property of conceiving the school as a producer of its own and original culture, constituted by and constituent, also, of social cultural. In this sense, the dissemination of the works of André Chervel (1990) has been gaining importance in the field, because it highlights exactly this originality of school culture, by Dominique Julia (2001), which, in turn, emphasizes the idea of school culture as a set of Antônio Viñao Frago (1995), who underlines the importance of studies on school space and time and literacy as members of school culture and as conformers of cognitive and motor aspects of social subjects (VIDAL, 2005, p. 5).

Added to this information is the following thought: "[...] the issue had been dealt with earlier, at least since the 1980s, by André Chervel and Forquin, with works translated in Brazil, in 1990 and 1992., respectively, [...]" (GONÇALVES; FARIA FILHO, 2005, p. 34). In Brazil, even though still late on discussions related to school culture, there is already the possibility of knowing a few studies that involve this significant discussion.

The school as a historical institution, presents a maze of information to be unveiled and known not only by the scientific community, but by all, so that new communications can be provided among the various audiences that use its services. In this context, teachers need to know the daily dynamics of pedagogical work, with its challenges, but with possibilities that are tirelessly sought by them.

The authors Gonçalves and Faria Filho (2005, p. 39) reiterate that:

Keeping the specificities of the various disciplinary fields of each of the authors mentioned, either by their own nature in the construction of the concept or by the field in which they are committed, all contribute, in one way or another, to the understanding of the process of building the school culture. By explaining the concept, and this within the aspects cut out here, they present distinct characteristics and interpretations in some cases, but this does not exclude the possibility of being all used, through dialogue with each other, as an auxiliary option in understanding the object culture school. This is because it allows varying angles of view about the school culture.

And we, in this research, understand by school culture, as a set of actions that dynamize the school's daily life through the participation of each team - managers, teachers, other staff, students and others, and the relationship between everybody who share the school community, Also highlighting leadership, organization, professionalism, coexistence, mutual help, responsibility, common good and respect.

It is from this culture that we talk about that we are interested in researching its learning by the beginning teacher.

V. FINAL CONSIDERATIONS

The school institution is also a learning space for earlycareer teachers. In this sense, during the development of pedagogical activities, the beginning teacher needs systematic support from the management team, especially the director and pedagogical coordinator, to present and discuss together the various and real situations, as well as the possible activities to be developed according to the dynamics and norms of the teaching work. The teaching developed in Basic Education allows the teacher learn the school culture. This culture is built from the interaction between all those who participate in that institution. Thus, during dialogues with the teacher, there may be learning about planning, assessment dynamics, and other contextualizations. It is appropriate to understand that in this educational locus, there is a need for constant reflections, for the possible achievement of a satisfactory work to be presented by the teacher.

It is understood that this study provides a contextualization about the process of knowing the theoretical basis regarding school culture, seeking evidence of how the acquisition of learning of this school culture occurs, as well as its characterization. It is also noticed that this culture is presented in a certain context, and that it reflects the reality of the community. Moreover, the beginning teacher develops knowledge and skills in favor of actions that engage their own work, in the face of various school phenomena, which directly or indirectly influence their pedagogical practice.

It is relevant to present that, in this interactive space, the featured teacher appropriates specific themes, such as the available technologies and the necessary communication with the students and those responsible. Thus, it is in this continuous dynamics of the development of didactic actions, that possibly the school culture spreads, being known by society.

Finally, this research involves a diversity of theoretical assumptions, and provides the possibility of future investigations, that is, it can be listed through the following ideas: the forms of reproduction of school culture, other authors who discuss such theme, the validity of culture at the end of the teaching career, as well as the contradictions of ideas existing in the field of school culture. The present intentionality is that this document reaches the hands of both the scientific community and those interested in this subject, so that new knowledge relevant to the teaching profession and its respective reflections can be produced.

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REFERENCES

- ARAÚJO, Alberto Filipe; ARAÚJO, Joaquim Machado de. Da cultura escolar ao imaginário educacional. In: THOMAZ, Sueli Barbosa (organizadora). *Imaginário, educação e cultura da escola*. Rio de Janeiro: Rovelle, 2010, p. 31-54.
- [2] BRASILEIRO, Ada Magaly Matias. Manual de Produção de Textos Acadêmicos e Científicos. São Paulo: Atlas, 2013.
- [3] CUNHA, Maria Isabel da. O bom professor e sua prática. Campinas, SP: Papirus, 1989. (Coleção Magistério: Formação e Trabalho Pedagógico).
- [4] FARIA FILHO, L. M. de. Escolarização e cultura escolar no Brasil: reflexões em torno de alguns pressupostos e desafios.
 In: BENCOSTTA, Marcus Levy Albino (organizador). *Culturas escolares, saberes e práticas educativas*: itinerários históricos. São Paulo: Cortez, 2007, p. 193-211.
- [5] FRANÇA-CARVALHO, Antonia Dalva. A racionalidade pedagógica da ação dos formadores de professores: um estudo sobre a epistemologia da prática docente nos cursos de licenciatura da Universidade Federal do Piauí. 2007, 238 p. Tese (Doutorado em Educação). UFC, Fortaleza, 2007.
- [6] GONÇALVES, Irlen Antônio; FARIA FILHO, Luciano Mendes de. História das culturas e das práticas escolares: perspectivas e desafios teórico-metodológicos. In: SOUZA, Rosa Fátima de; VALDEMARIN, Vera Teresa (orgs.). A cultura escolar em debate: questões conceituais, metodológicas e desafios para a pesquisa. Campinas, SP: Autores Associados, 2005, p. 31-57. Apoio: Unesp/FCLAr (Coleção educação contemporânea).
- [7] JULIA, Dominique. A cultura escolar como objeto histórico. Tradução: Gizele de Souza. *Revista Brasileira de História da Educação*. V. 1, N. 1 [1]. Jan/jun, 2001, p. 9-43. Disponível em: http://www.rbhe.sbhe.org.br/index.php/rbhe/article/view/273/281>. Acesso em: 14 jul. 2017.
- [8] KRUPPA, Sonia M. Portella. Sociologia da educação. São Paulo: Cortez, 1994.
- [9] LAKATOS, Eva Maria; MARCONI, Marina de Andrade. Sociologia geral. 7. ed. rev. e ampl. 12. reimpr. São Paulo: Atlas, 2013.
- [10] LUCKESI, Cipriano Carlos. Filosofia da educação. São Paulo: Cortez, 1994.
- [11] POL, Milan [et. al.]. Em busca do conceito de cultura escolar: uma contribuição para as discussões actuais. *Revista Lusófona de Educação*. Universidade Lusófona de Humanidades e Tecnologias. Lisboa, Portugal. Núm. 10, 2007, pp. 63-79. Disponível em: < http://www.redalyc.org/pdf/349/34911872006.pdf> Acesso em: 04 ago. 2017.
- [12] QUEIROZ, Tânia Dias (coordenadora). Dicionário prático de pedagogia. 3. ed. São Paulo: Rideel, 2011.
- [13] SACRISTÁN, José Gimeno. A educação que ainda é possível: ensaios sobre a cultura para a educação. Porto: Porto Editora, 2008.
- [14] SANTOS, José Luiz dos. O que é cultura. São Paulo: Brasiliense, 2012. (Coleção Primeiros Passos; 110).

- [15] SILVA, Fabiany de Cássia Tavares. Cultura Escolar: quadro conceitual e possibilidades de pesquisa. *Educar em Revista*,
 [S.I.], v. 22, n. 28, p. p. 201-216, dez. 2006. ISSN 1984-0411. Disponível em:
 http://revistas.ufpr.br/educar/article/view/7620>. Acesso em: 11 fev. 2018.
- [16] VIDAL, Diana Gonçalves. Cultura e prática escolares: uma reflexão sobre documentos e arquivos escolares. In: SOUZA, Rosa Fátima de; VALDEMARIN, Vera Teresa (Orgs.). In: SOUZA, Rosa Fátima de; VALDEMARIN, Vera Teresa (orgs.). A cultura escolar em debate: questões conceituais, metodológicas e desafios para a pesquisa. Campinas, SP: Autores Associados, 2005. Apoio: Unesp/FCLAr (Coleção educação contemporânea), p. 3-30.
- [17] VIÑAO FRAGO, Antonio. Historia de la educación y historia cultural: posibilidades, problemas, cuestiones. *Revista Brasileira de Educação*. São Paulo, n.0, p. 63-82, set./dez. 1995. Disponível em: http://www.anped.org.br/sites/default/files/rbe/files/rbe_0. pdf> Acesso em: 05 ago. 2017.
- [18] VIÑAO, Antonio. Culturas escolares y reformas (sobre la naturaleza histórica de los sistemas e instituciones educativas). *Revista Teias*. v.1, n. 2 (2000), p. 1-25. ISSN 1982-0305. Disponível em: http://www.epublicacoes.uerj.br/index.php/revistateias/article/view/2385 5> Acesso em: 07 ago. 2017.

The demand of money in Islamic context Zouhair LAKHYAR¹, Mouttaki HLAL²

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Abstract— The demand for money differs in its conception, from one economic thought to another, the object of this article is to model this demand for money in an aspect that has practically not been made to know a modeling of the money demand and its balance with the money supply but under the Islamic context. *Keywords— Economic, Demand, Model, Money, Islamic.*

I. INTRODUCTION

This paper will focus on the determination of the macroeconomic balance in the money market but in an Islamic context, in other words we will try to answer the following question: is an economy governed by the Islamic religion can settle in economic equilibrium?

II. THE MONEY DEMAND

2.1: The money demand without speculation

If we denote by $M_T^d = f(R)$

 $M_T^d = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1} \mathbf{R}$ With: M^d is the more

With; M_T^d is the money for transactions

 $\alpha_0 \text{is the money for minimal transactions}$

 α_1 is the part of money for transactions

In addition let M_p^d is the money quantity for precaution,

then we have $M_T^d = \boldsymbol{\alpha}_2 \mathbf{R}$

 α_2 is the share of money demand for precaution

Finally a money for investment denoted by M_I^d then $M_I^d = \alpha_3 \pi$

Where π is the profit, and its well known that investment depends on profit (α_3 is the part of profit). The global demand of money in an Islamic context M_G^d is determined by the equality $M_G^d = M_T^d + M_P^d + M_I^d$

Which implies the linear equation

$$M_G^d = \alpha_0 + \alpha_1 \mathbf{R} + \alpha_2 \mathbf{R} + \alpha_3 \pi$$

= $\alpha_0 + (\alpha_1 + \alpha_2) \mathbf{R} + \alpha_3 \pi$

Let M^S the money supply, since at the equilibrium we have equality

 $M_G^d = M^S \text{ then}$ $M^S = \alpha_0 + (\alpha_1 + \alpha_2) \mathbf{R} + \alpha_3 \pi$

In particular, *if*
$$R = 0$$
 we have

$$M^S = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_3} \, \boldsymbol{\pi}$$

If we have $\pi = 0$, then

 $M^{S} = \boldsymbol{\alpha_{0}} + (\boldsymbol{\alpha_{1}} + \boldsymbol{\alpha_{2}})\mathbf{R}$

These points (R = 0 and $\pi = 0$) described the (Islamic liquidity of money curve, the ILM curve).

2.2: The demand of money and Zakat

In other hand if the investment capital is subject to the \ll *Zakat* \gg , it must be siliced from the profit then

 $M_G^d = \alpha_0 + \alpha_1 \mathbf{R} + \alpha_2 \mathbf{R} + \alpha_3 \pi - \alpha_3 \mathbf{Z}$ M_G^d then we have Z = zR, so the global demand of money become $M_C^d = \alpha_0 + \alpha_1 \mathbf{R} + \alpha_2 \mathbf{R} + \alpha_3 \pi - \alpha_3 \mathbf{Z}R$

Thus

$$M_G^d = \alpha_0 + (\alpha_1 + \alpha_2 - \alpha_3 z)\mathbf{R} + \alpha_3 \pi$$

$$M_G^d = \alpha_0 + (\alpha_1 + \alpha_2 - \alpha_3 z)\mathbf{R} + \alpha_3 \pi$$
At the equilibrium we have

$$M_G^d = M^S$$
In particular cases when R=0, we have

$$M^S = \alpha_0 + \alpha_3 \pi$$

And if = 0, we have

$$M^{S} = \boldsymbol{\alpha}_{0} + (\boldsymbol{\alpha}_{1} + \boldsymbol{\alpha}_{2} - \boldsymbol{\alpha}_{3} \boldsymbol{z})\mathbf{R}$$

The last equilibrium illustrate the Islamic liquidity of money curve (ILM curve).

III. THE DEMAND OF MONEY WITH SPECULATION

In the second part of this paper we consider an approach with speculation.

Consider $M_T^d = f(R)$, the money demand for transactions and $M_R^d = f(R, r)$ the money demand of reserve,

where *r* is the income of whatever participation because in Islam the interest is prohibited. If we denote by $M_s^d = f(r)$ the demand of money for speculation, then the global demand of money is obtained by

$$M_G^d = M_T^d + M_R^d + M_S^d$$

IV. EQUILIBRIUM

At the equilibrium we have $M_G^d = M^S$ then we see that $M^S = \omega \mathbf{R} - \mu \mathbf{r}$

Hence

$$M^{S} - \varphi R - \mu r = 0$$

In this case we have

$$R_{ILM}^* = \frac{M^S - \mu r}{\varphi}$$

In particular if:

r=0,
$$R_{ILM}^* = \frac{M^3}{\varphi}$$
 and

 $ifR_{ILM}^* = 0$, we have $r = -\frac{M^S}{\mu}$.

V. CONCLUSION

To conclude, it is enough to answer the previous question to say that in an Islamic context, the economy can settle in equilibrium, but under conditions

REFERENCES

- J. F. GOUX(2018), « MONETARY AND FINANCIAL ECONOMY. Theories, institutions, policies » 3rd edition, Edition Economica.
- [2] T. Guggenheim (1978). « Preclassical monetary theories » Collection, Social Science works , Éd. Librairie Droz
- [3] P. Maurice (1964), « Note on Milton Friedman's Monetary Theory » Revue economic Année 1964 15-5 pp. 677-712
- [4] M. Falise (1955). Theoretical approaches to the demand for money. Bulletin of the Institute of Economic and Social Research , 21e Année, No. 5 (août 1955), pp. 553-596

Construction and Demolition Waste Management Practices at Construction Sites

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Abstract — Most of the construction and demolition waste is disposed of in irregular or clandestine landfills, causing environmental, social and economic impacts. These impacts cause damage to the environment, society and public administration, since they cause silting up of rivers, obstruction of public roads and generate expenses with collection and cleaning. The objective of this study is to present practices applied on construction sites for the reduction and final disposal of waste (CDW) through an analytical-descriptive and qualitative field research, conducted in three construction companies located in the city of Manaus-Amazonas. Photographic records were used for simple and georeferenced images, in addition to the application of specific questionnaires. In the three companies evaluated (A, B and C), it was observed that only one correctly practiced the disposal of waste, while the other two did not know the laws and obligations regarding the correct management. Due to this problem, a new flowchart was defined with new stages of construction planning, based on CONAMA Resolution 307/2002, which defines waste management in terms of planning, responsibilities, practices, procedures and resources. Graphic materials containing good practices for waste management (RCD) were manufactured and disseminated in companies A, B and C, aiming at reducing, reusing or recycling waste on construction sites. The graphic materials, which were also disclosed through internal lectures, also presented alternative solutions through constructive technologies for storage, conditioning, transportation and reuse of waste.

Keywords — Construction and Demolition Waste, Waste Management, Demolition at Construction Site.

I. INTRODUCTION

Civil construction is an extremely important sector for a country. In addition to being an indicator of the economic situation, it is directly related to the Gross Domestic Product (GDP), which reveals how the growth of a given location is.

The 2018-2022 Industry Strategic Map, released by the National Confederation of Industry (CNI), can make Brazil double the growth speed of the economy. According to the entity, the goals of the document can take the Brazilian per capita income from the current US\$14,000 to US\$30,000 in 24 years. Without the proposed initiatives, the country would take 50 years to reach this level [11]. As the construction sector moves forward in accordance with the development of humanity, it is important that it is always updated. This happens through the use of new processes and materials, allowing greater productivity at a lower cost.

The growth of the civil construction market, driven by social programs, ease of financing, evolution of technologies and growth of Brazilian per capita income, made the sector reach the best moment in its history.

In recent decades, the Civil Engineering market has also experienced a real explosion in jobs, with growing investments and government programs such as the Growth Acceleration Program (PAC), which invested in infrastructure projects and works, the 2014 World Cup, the 2016 Olympics, among others.

The Construction Confidence Index (ICST) of Fundação Getúlio Vargas (FGV) advanced 1.5 points in October 2018, reaching 81.8 points, as can be seen in figure 1, which shows a quarterly average from August 2010 to May 2019 [12].



The growth of the portfolio of contracts boosted the consecutive high in the indicator, which is also measured by the Getulio Vargas Foundation (FGV). With confidence in recovery, the future scenario shows great expectations.

In this sense, the Expectations Index (IE-CST) grew 2.3 points and reaches 91, strongly influenced by the increase in expected demand for Civil Engineering. The Gross Domestic Product (GDP), which is the sum of all goods and services produced in the country, grew 1.6% and expanded 1.2% in construction [12].

Growth is expected for 2019, according to financial institutions. The evolution of demand indicators and expected employment can be seen in figure 2, where there is a high demand for jobs in the area of civil construction.



Simultaneously and directly proportional to the progress of civil construction, the high consumption of

natural resources and the generation of construction and demolition waste (CDW) also increased exponentially, causing numerous environmental, social and economic impacts, when collected and disposed of inappropriately.

The waste that makes up the construction site's rubble, commonly called limestone or shrapnel, is a mixture of vegetation, soil, aggregates, wood, cardboard, plastics, glass and metals. Such waste is usually contaminated with domestic waste of the need for consumption and human dumping. In the worst case, it is mixed with hazardous waste, such as painting equipment or maintenance products for machinery and equipment. Thus, all volume of debris becomes dangerous and difficult to dispose of.

Analyzing from the environmental point of view, the main impacts caused by the illegal disposal of CDW are siltation, contamination of watercourses and aesthetic impact. Regarding the social impact, several dangers are listed, from the obstruction of sidewalks and public roads, to possible damages to the community, due to the physical, chemical and biological properties of CDW. In addition, there is an economic impact due to the waste and public cost of cleaning and transportation.

The digital era adds even more to the segment, providing a new reality for professionals and technologies that create amazing possibilities. In short, industry 4.0 is the main trend today and an almost mandatory step for businesses that want to gain more space in the market.

Many technological projects are using RFID technology for purposes of warehouse control, location of materials and people, control of entry and exit of products, vehicles, people, identification of tools, among others. Its main advantages are: speed, precision, reliability in data transmission, high degree of control and inspection [16].

Another very urgent need today is related to sustainability. Conserving energy, improving air quality, making actions less polluting, encouraging recycling and using eco-friendly raw materials are examples of good sustainable practices. The construction industry can contribute to the adoption of sustainable processes and, consequently, the protection of the environment and the transmission of positive messages to the external public.

With this, the federal government instituted Law 12.305/2010, establishing the National Solid Waste Policy (PNRS), regulated through Decree-Law 7.404/2010, referring to CDW, including their economic, social and environmental dimensions [5].

In this sense and aiming to solve the problem previously elucidated, this study aims to present practices applied at the construction site for the reduction and final disposal of CDW through a field research of analyticaldescriptive and qualitative character conducted in three construction companies located in the city of Manaus-Amazonas.

II. THEORETICAL FRAMEWORK

2.1 LEGAL BASIS

By the Brazilian Association of Technical Norms (ABNT) NBR 10004:2004, solid residues are defined as residues in solid and semi-solid states, which result from activities of industrial, domestic, hospital, commercial, agricultural, service and sweeping origin. This definition includes sludge from water treatment systems, those generated in equipment and pollution control facilities, as well as certain liquids whose particularities make it unfeasible to release it into the public sewage network or water bodies, or require solutions for this technically and economically unfeasible in view of the best available technology.

CONAMA Resolution 307/2002 defines CDWs as discharges resulting from construction, renovation, repair and demolition of civil construction works and resulting from the preparation and excavation of land, such as: bricks, ceramic blocks, concrete in general, soil, rocks, metals, resins, adhesives, paints, wood and plywood, ceilings, mortar, plaster, tiles, asphalt pavement, glass, plastics, pipes, electrical wiring, etc.

By law 12.305, of August 2, 2010, solid residues are classified according to their origin and dangerousness.

Since the approval of Resolution 307 of CONAMA, there has been an advance in the search for reduction of environmental impacts caused by CDW. Allied to this resolution, a set of laws and public policies, in addition to technical standards form a package of measures aimed at the correct management of waste, aimed at reducing environmental, social and economic impacts.

2.2 WASTE GENERATION

Damage caused during transportation, receipt and storage, as well as loss of building materials on construction sites through waste during the execution process are decisive steps for the generation of CDW.

Among the many factors that contribute to the generation of CDW are the problems related to the project, such as the lack of definitions and/or satisfactory details, lack of precision in the descriptive memorials, low quality of the materials adopted, low qualification of the workforce, inadequate handling, transport or storage of materials, lack or inefficiency of control mechanisms during the execution of the work, the type of technique chosen for construction or demolition, the types of materials that exist in the construction area and finally the

lack of reuse and recycling processes at the construction site.

Figure 3 shows the CDW generation rates by activity. In addition to new construction, which is responsible for 21% of the amount of CDW, the main activities generating CDW are expansion, with 20% of the total, and renovation and demolition, with 59% and generally carried out in an informal manner.



Fig. 3 - Indexes of CDW Generation [22].

Reforms made with the hiring of small contractors are the responsibility of CDWs and, although they generate small volumes, the large number of reforms, often illegally, is responsible for the high CDW generation rate. In most cases, CDW are transported improperly and discarded in inappropriate places, bringing discomfort to the surrounding population, since along with CDW, various solid wastes are also discarded [22].

2.3 WASTE MANAGEMENT

Aiming at minimizing environmental impacts, CONAMA Resolution 307 establishes that municipalities should prepare an Integrated Management Plan, considering the capacity to generate waste. For small volume generators, the Municipal Management Program is applied. In the case of large generators, the Construction Management Project should be applied, emphasizing procedures for sorting, conditioning, transportation and destination (PINTO, 2005).

In order to these plans to be elaborated, it is essential to elaborate a diagnosis contemplating the waste generating source, the different generators and the quantification of CDW [2]. CONAMA establishes that the waste generators prioritize not generating, later, reuse, recycling and final disposal [5].

Also in this resolution, the main parameters for the correct management are the definitions of classes and destination of residual material, as well as guidelines for the preparation of the Management Plan for Civil Construction Waste (PGRCC).

2.4 REDUCTION, REUSE AND RECYCLING

As determined by CONAMA resolution 307, preference should be given to the non-generation of waste, then work is done on the reduction, reuse, recycling, treatment and proper final disposal [5].

Thus, reduce, reuse and recycle are the main concepts to be emphasized, forming what is known as 3 R's, also known as pillars of Resolution 307 of CONAMA [18].

• Reduction

In order to reduce waste, adequate planning is required for each stage of the work, from the acquisition of materials to internal distribution. Building efficiently implies directly in a lean production that, in turn, implies savings, both for the consumption of material and for the use of financial resources.

For the reduction to happen, some factors must be observed and avoided, such as: choice of technology, which will influence the higher or lower generation of losses; design failures; lack of standardization in the execution of services; inadequate storage and transport of materials at the construction site [4].

• Reuse

Careful use of reusable materials provides economic and environmental advantages. The absence of the practice of reuse and recycling of materials can be considered as the main cause of waste generation [17].

The possibility of reuse and the economic viability of waste recycling should receive special attention, since costs with acquisition of new materials, removal and disposal can be avoided if an appropriate waste treatment system is applied [22].

• Recycling

The practice of recycling is adopted in several countries of the European community and intensified in Germany after the Second World War. However, in Brazil this practice is little known, with few recycling plants installed in the states of the southeast region [18].

Based on the principle of sustainability, the practice of recycling implies a reduction in the consumption of natural resources and the maintenance of raw materials, avoiding unnecessary extraction and preserving the environment [4].

Many advantages can be obtained through the practice of recycling: preservation of natural resources with the replacement of these by transformed aggregates; reduction of landfill areas due to the decrease in the volume of waste to be deposited; reduction in energy expenditure and generation of employment and income [18].

2.5 WASTE STREAM

When waste generation occurs, specific conditions must be established, aiming at the initial and final conditioning, internal and external transport and final conditioning of the waste [22].

• Initial conditioning

The initial packaging must be performed near the internal transport site and equipped with devices with lids in order to avoid contamination with residues of different classes [17]. In specific cases, the collected waste should be taken directly to the final disposal site.

• Internal and external transportation

The transportation of CDW, when well executed, reduces waste management costs and the risks to which employees are exposed. Basically, there are two modes of transportation on a construction site: internal and external. Internally, it occurs at the limits of the construction site, while externally, it is characterized by the removal of waste from the construction site, and may also be performed by third parties [20].

Internal transportation is usually performed by the workers themselves, who collect the waste and send it to the temporary storage site. For each type of waste generated, there is an adequate form of internal transport.

As for external transport, this is usually performed by outsourced companies, specialized in this service and equipped with specific equipment for this transport, as shown in figure 4:



Fig. 4 - Poliguindaste Truck With Collector Boxes.

At this stage, the service of waste transportation is regulated by specific contracts, where the types of waste, the frequency of transportation and the values are provided. It is important that, in the service contracts, the construction company provides that the destination certificates and environmental licenses are transferred to the construction companies and that restrictions are provided in case of noncompliance by the service provider. It is up to the service provider to present documentation proving compliance with the legal requirements [20].

• Final Packaging

In order to facilitate the removal and final disposal, the final conditioning of the waste must ensure that the segregation and recycling conditions are maintained [18].

During the course of the work, changes may occur to the final conditioning conditions. However, the success of waste management, with regard to final conditioning, depends on respect for the set of factors mentioned [22].

For the final conditioning, table 1 provides conditioning options for the various types of waste.

Table 1 - Options for the final conditioning of waste

Source: Adapted from Pinto [21].

Final packaging of waste				
Type of waste	Final packaging			
Concrete blocks, ceramic blocks, mortar blocks	Preferably in stationary buckets.			
Wood	Preferably in marked bays, stationary buckets can be used.			
Plastics (packaging bags and piping chips)	In signposted bags.			
Cardboard and paper	In signposted bags or in bales, kept in covered places.			
Metal	In signposted stalls.			
Sawing	Bins for the accumulation of bags containing the waste.			
Plaster lining and carton boards	In stationary buckets, respecting the segregation condition in relation to the masonry and concrete waste.			
Soils	In stationary dumpsters, preferably separated from masonry and concrete waste.			
Facade and protection screens	Dispose of in a placeof easy access and request the removal to the recipient.			
EPS	Bins for the accumulation of bags containing the waste.			

	In duly marked bays and for		
Hazardous waste	the restricted use of workers		
	who, during their activities,		
	handle this waste.		
Remains of uniforms,			
boots and rags without	In here for other month		
contamination by	In bags for other waste.		
chemical products			

2.6 DISPOSAL OF WASTE

Civil construction companies face a serious problem when it comes to the destination of CDW. The lack of legislation addressing the issue drives generators to dispose of waste in an inappropriate or irregular manner [17].

Improper disposal is responsible for generating problems of degradation and contamination, as well as generating costs. It is worth mentioning that the responsibility for waste is the responsibility of the generator.

Some factors are essential for waste disposal solutions, and there must be a combination of environmental commitment and economic viability, in order to ensure sustainability.

2.7 ENVIRONMENTAL IMPACTS

Renovations and demolitions, usually carried out by small generators (owners) in an informal manner, are responsible for about 75% of CDW [22], as can be seen in figure 5:



Fig.5 - Renovations and demolitions generating CDW [15].

Of this amount, approximately 50% of the generated debris is being disposed of inadequately, causing problems such as depletion of landfills, siltation, contamination of streams, surface and ground water, proliferation of insects and rodents and obstruction of roads [4], as can be seen in figure 6:



Fig. 6 - Obstrução de via por deposição

Public authorities act performing services of collection and storage with costs of transportation and final disposal of waste. However, this practice does not solve the problem, since it is not possible to remove all waste generated.

On the other hand, the collection of waste encourages the continuity of irregular disposal in places served by the public authorities. Therefore, it is necessary to have an integration between public authorities, waste generators and transporters in order for waste management to be effective [22].

As for the consumption of natural resources, the civil construction industry is responsible for large negative environmental impact given the large consumption of resources such as extraction of deposits, which consume excessive amount of electricity, deforestation and alteration of landfills. This excessive consumption of resources results in a large amount of waste, making its management a highly complex activity [17].

III. MATERIALS AND METHODS

3.1 TYPE OF STUDY

The study is an analytical-descriptive field research, since the results were obtained through visits to the construction sites with photographic survey and application of questionnaires.

The field research aims to examine and collect information directly from the surveyed population, requiring from the researcher a direct meeting. In this case, the researcher needs to go to the space where the phenomenon occurs, or occurred and gather a set of information to be documented, in this case the use of photographs [14].

Referring to analytical research, the study involves the in-depth evaluation of available information in an attempt to explain the context of a phenomenon [13].

As for the descriptive researches, they are characterized as studies that seek to determine status, opinions or future projections in the responses obtained. The techniques used to obtain information are quite diverse, highlighting the questionnaires, interviews and observations. Their valuation is based on the premise that the problems can be solved and the practices can be improved through the description and analysis of objective and direct observations [13].

3.2 PLACE WHERE THE RESEARCH IS CARRIED OUT

This research was carried out in three construction companies, located in the southern zone of the city of Manaus, in the state of Amazonas, Brazil.

3.3 MATERIALS USED

The Power Shot SX280 HS camera was used for photographic recording, which records images with georeferencing.

The MS Excel software, the main spreadsheet editor, was used to prepare tables and graphs. For the generation and manipulation of images, AutoCAD®, from AUTODESK, and CorelDraw®, from Corel Corporation, were used. It is noteworthy that these softwares were used in student versions.

3.4 WORKING METHODS

In order to meet the proposed objectives, the research was developed through two stages: literature review and field research.

In addition to the literature review, carried out in that study, an analysis was carried out on the legislation on civil construction waste and on the possibilities of its correct management in the city of Manaus. Three construction companies, located in the city of Manaus, were willing to cooperate with this work. Construction sites were visited with special attention to the application of new construction technologies and waste management practices.

During the research, a photographic record of machinery and equipment was made, as well as the construction and waste management practices at the construction sites. The methodological process can be better observed according to the flowchart of Figure 7:



Fig. 7 – Flowchart of the Methodological Process.

IV. RESULTS

4.1 WASTE MANAGEMENT ON THE CONSTRUCTION SITE

CONAMA Resolution 307/2002 defines waste management as a management system that aims to reduce, reuse or recycle waste, including planning, responsibilities, practices, procedures and resources.

After literature review, a flowchart was conceived concerning the stages of the work planning, as can be seen in figure 8:



Fig. 8 – Flowchart of the stages of construction planning.

The first measure of waste reduction, without a doubt, is planning, with regard to purchase, storage and transportation. Then it is the application techniques that, during the construction process, determine the volume of CDW generated, as well as, at the end, the order and organization of the construction site and, especially, the areas of waste, which enable the reuse and recycling of CDW. The management of waste at the construction site is directly linked to the waste of materials and execution of construction elements. The choice of a constructive system and the correct storage of materials at the construction site are important tools in the prevention of waste generation.

• Construction Technologies

The use of pre-molded constructive elements allows a great reduction in the generation of waste, since other materials do not need to be used, such as wires, wood and nails. It is worth mentioning that for the option of premolding in places other than the construction site, the transportation of the elements deserves special care, because if transported improperly, the possibility of damage should be considered.

The molding of construction elements on site is another important factor regarding the generation of waste on construction sites. This practice enables the reduction of waste generation, since damage caused by external logistics can be avoided. For internal transport, the equipment must be specific to each operation.

Figure 9 shows the preparation of shapes for molding inspection boxes. It should be noted, however, that the molding sites are not far from the application sites of the molded elements on site. In figures 10 and 11, it is obtained molded parts in loco. Figure 12 shows the molding of paving blocks molded in situ.



Fig. 9 - Preparation of forms for molding inspection boxes.



Fig. 10 - Miscellaneous inspection boxes molded in situ.



Fig. 11 - Covers for inspection boxes molded in situ.



Fig. 12 - Paving blocks molded in situ.

• Storage of Materials

The correct storage of materials provides verification, stock control and facilitates their use, avoiding loss and, subsequently, the generation of waste. In order to determine the correct storage of materials, it is necessary to observe basic criteria. Among the criteria, the following can be highlighted: classification, in accordance with CONAMA resolution 307/2002; frequency of use; maximum stacking and distance between places where the material is applied.

Even though the storage spaces are smaller, it is possible to carry out the correct storage. For this, it is necessary to identify the intensity of use and maintain the preservation of operational spaces. As an example of material storage, figures 13 and 14 portray this activity.



Fig. 13 - Proper storage of tubes and steel bars.



Fig. 14 - Proper storage of building blocks.

4.2 WASTE CONDITIONING ON CONSTRUCTION SITES

The waste, when generated, should receive adequate treatment with respect to the flow at the construction site. Initially, they should be conditioned as close as possible to the generation points, as shown in figure 15:



Fig. 15 - Initial Conditioning of Waste.

The collection and transportation of waste on construction sites should be the responsibility of employees. For internal transport, employees should use trolleys, as shown in figure 16, for horizontal transport. An alternative for the vertical transport of waste is the installation of ducts along the floors.



Fig. 16 - Carriage of Waste.

The temporary disposal must be done as determined by CONAMA resolution 307/2002. The residues must be separated in bays and by class, as can be seen in figure 17:



Fig.17 - Waste Conditioning Bays.

Still thinking about the reduction of waste generation, it is recommended the use of equipment that allows the non-occurrence of rework. In addition to providing productive gains and well-being to employees, the use of equipment such as trenchers (figure 18) and mortar projectors (figure 19) allows precision in the execution of work avoiding the need to rework.



Fig. 18 – Trencher.



Fig. 19 - Mortar projection.

4.3 WASTE FOR REUSE ON CONSTRUCTION SITES

The correct handling of waste inside the construction site allows the identification of reusable materials, which generate savings both by dispensing with the purchase of new materials and by avoiding their identification as waste and generating removal costs.

Correct sorting enables the reuse of waste for the transformation of aggregates with the use, for example, for instance, concrete and ceramic waste crushers, as can be seen in figure 21. However, for the transformation of waste to be viable, the following aspects must be examined: possible applications for recycled aggregates on site; technological control over the aggregates produced; cost of natural aggregates and cost of waste removal.

Only after analyzing the economic feasibility of the aspects listed above, the decision to recycle waste at the construction site will be concluded.



Fig. 20 - Waste Shredder for Aggregate Transformation.

4.4 TRANSPORT DESTINATION OF CWD GENERATED AT THE CONSTRUCTION SITE

When the waste generated cannot be reused, it must be transported by collecting companies, through appropriate equipment. The residues generated are still of responsibility of the generators, however, the transporters are also responsible for the destination and management of the residues. The final destination chosen will depend on each type of waste.

The variables commonly evaluated in the definition of the final destination of waste are as follows: Type of waste; Classification of waste; Quantity of waste and Costs of treatment or disposal methods.

The waste shall be disposed of according to the classification and what determines the resolution 307/2002 of CONAMA. The carrier shall have a document that specifies the origin and destination of the waste to be presented to the inspection, if necessary. The company or the person responsible for the work must file a copy of the document.

The solutions for the disposal of the waste must combine environmental commitment and economic viability, ensuring sustainability and the conditions for the reproduction of the methodology by the builders.

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Reducing environmental impacts should be an objective to be achieved by engineering. For this, simple solutions must be studied and implemented. Among these solutions, the following stand out: alteration of the project aiming at reducing the consumption of resources in the use phase; replacement of disposable equipment by others of greater durability; recycling and reuse of generated waste; product design and planning of production systems aiming at avoiding losses [18].

A construction becomes sustainable, from the environmental point of view, when it is based on the prevention and reduction of waste generated through the application of clean production methodologies [3].

4.5 EVALUATION OF THE ANSWERS TO THE QUESTIONNAIRES

In the three companies evaluated (A, B and C), it was observed that only one company correctly practiced the disposal of waste, while the other two did not know the laws and obligations regarding the correct management.

Regarding the answers to the questionnaires applied, it was observed that, concerning waste management, Company A showed a constant concern of managers in properly disposing of waste, separating it, performing sorting and allocating it in bays for temporary storage, facilitating the possibility of transformation and reuse, as well as the disposal to companies specialized in waste treatment and recycling according to the classes defined by Resolution 307/2002, as can be seen in figure 22:



Fig. 21 – Management of Residues of Company A.

For the other two companies, a booklet was prepared and presented, with good practices for managing CDW on construction sites, as can be seen in figure 22:



Fig.22 – Booklet of Good Practices.

V. CONCLUSIONS

The impacts caused by inadequate management of CDW highlight the construction sector, often classifying it as the largest generator of waste. The correct management of construction and demolition waste is a constant effort in the application of the 3 (three) R's: Reduce, Reuse and Recycle. However, it is emphasized that the objective of the builder is not to generate waste, which, consequently, implies changes in the constructive culture adopted by most of the builders.

CONAMA Resolution 307/2002 is the main legal document related to the management of CDW, however, it is inefficient when it comes to adequate waste management, since it is not complied with by a large number of builders and the public administration.

During the preparation of this work, it was sought to identify practices adopted by construction companies in Manaus aiming at the correct management of CDWs with regard to the reduction of generation and adequate final disposal.

In the companies visited, it was observed that the application of construction techniques, different from conventional techniques, is a constant practice. The application of pre-molded or molded construction elements in the construction site and the use of equipment that allows the non generation of CDW are applied, resulting in the reduction of the CDW generation index.

Regarding management, there was a concern of managers to properly dispose of waste, separating it, performing sorting and allocating it in bays for temporary storage, facilitating the possibility of transformation and reuse, as well as the disposal to companies specialized in waste treatment and recycling according to the classes defined by Resolution 307/2002.

Finally, after verifying the practices adopted by the companies visited, a booklet was prepared, an attached

document, with good practices for managing CDW on construction sites.

As negative results obtained through this research, it can be mentioned: the lack of support from the public sector, mainly regarding the inspection of the destination of CDW and incentives regarding the use of transformed aggregates. The lack of options for the treatment of hazardous waste should also be highlighted.

In general, the objectives were achieved, considering that the companies show continuous interest in the application of new construction techniques and waste management practices. However, much remains to be done to ensure that CDW is managed correctly, especially Class D waste.

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REFERENCES

- [1] [1] Angulo, S. C. Variabilidade de agregados graúdos de resíduos de construção e demolição reciclados. 2000. 172 f. Dissertação (Mestrado) - Curso de Engenharia Civil, Escola Politécnica da Universidade de São Paulo, São Paulo, 2000.
- [2] Angulo, S. C. Resíduos de construção e demolição: avaliação de métodos de quantificação. Engenharia Sanitária e Ambiental, Rio de Janeiro, v. 16, n. 3, p.299-306, jul. 2011.
- [3] Azevedo, G. O. D.; KIPERSTOK, Asher; MORAES, Luiz Roberto Santos. Resíduos da construção civil em salvador: os caminhos para uma gestão sustentável. Engenharia Sanitária e Ambiental, Rio de Janeiro, v. 11, n. 1, p.65-72, jan. 2006.
- [4] Blumenschein, R. N. Gestão de resíduos sólidos em canteiros de obras. Brasília: SEBRAE/DF, 2007. 48 p.
- [5] Brasil, Ministério do Meio Ambiente, Conselho Nacional do Meio Ambiente – CONAMA. Resolução Nº 307, de 05 de julho de 2002. Estabelece diretrizes, critérios e procedimentos para a gestão dos resíduos da construção civil. Brasília, DF, 17 de julho de 2002.
- [6] Brasil, Ministério do Meio Ambiente, Conselho Nacional do Meio Ambiente – CONAMA. Resolução Nº 448, de 19 de janeiro de 2012. Altera os arts. 2º, 4º, 5º, 6º, 8º, 9º, 10º e 11º da Resolução nº 307, de 5 de julho de 2002, do Conselho Nacional do Meio Ambiente – CONAMA. Brasília, DF, 19 de janeiro de 2002.
- [7] Brasil, Ministério do Meio Ambiente, Conselho Nacional do Meio Ambiente – CONAMA. Resolução Nº 348, de 16 de agosto de 2004. Altera a Resolução CONAMA Nº 307, de 5 de julho de 2002, incluindo o amianto na classe de resíduos perigosos. Brasília, DF, 17 de agosto de 2004.
- [8] Brasil. Lei nº 12305, de 2 de agosto de 2010. Institui A Política Nacional de Resíduos Sólidos; Altera A Lei Nº 9.605, de 12 de Fevereiro de 1998, e Dá Outras Providências. Brasília, DF, 2 ago. 2010Perfect, T. J., &

Schwartz, B. L. (Eds.) (2002). Applied metacognition Retrieved from http://www.questia.com/read/107598848.

- [9] Brasil. Lei nº 12305, de 2 de agosto de 2010. Institui A Política Nacional de Resíduos Sólidos; Altera A Lei Nº 9.605, de 12 de Fevereiro de 1998, e Dá Outras Providências. Brasília, DF, 2 ago. 2010.
- [10] Brasil, Ministério do Meio Ambiente, Conselho Nacional do Meio Ambiente – CONAMA. Resolução Nº 431, de 25 de maio de 2011. Altera o art. 3º da Resolução nº 307, de 5 de julho de 2002, do Conselho Nacional do Meio Ambiente – CONAMA, estabelecendo nova classificação para o gesso. Brasília, DF, 25 de maio de 2011.
- [11] Exame. Mapa Estratégico dobrará ritmo de crescimento da renda per capita, 2018. Disponivel em: https://exame.abril.com.br/economia/mapa-estrategico-dob radobrara-ritmo-de-crescimento-da-renda-per-capita/. Aces sado em 24 Ago 2019.
- FGV. Sondagem da Construção, 2019. Disponível em: https://portalibre.fgv.br/data/files/5F/12/FE/84/BE8FA6107 8ADFDA68904CBA8/Sondagem%20da%20Constru__0% 20FGV_press%20release_Mai19.pdf. Acessado em 24 Ago 2019.
- [13] Gil, A. C. Como elaborar projetos de pesquisa. 3. ed. São Paulo:Editora Atlas S.A., 1996.
- [14] Gonçalves, E. P. Iniciação à pesquisa científica. Campinas, SP: Editora Alínea, 2001.
- [15] IMPLURB. Prefeitura faz demolição de guaritas em rua do Coroado que tinha fechamento irregular, 2016.
- [16] J. C. S. Oliveira, M. H. R. Nascimento, J. A. B. Junior, C. A. O. Freitas, "RFID System Applicability Model for Traceability of Luggage at Airports". IJAERS, vol. 05, 2018, pp.120-127
- [17] Karpinsk, L. A. et al. Gestão diferenciada de resíduos da construção civil: uma abordagem ambiental. Porto Alegre: Edipucrs, 2009. 164 p.
- [18] Lôrdelo, P. M.; Evangelista, P. P.; Ferraz, T. G. A. Gestão de resíduos na construção civil: redução, reutilização e reciclagem. Bahia: SENAI/BA, 2007. 86 p.
- [19] Nagalli, A. Gerenciamento de Resíduos Sólidos na Construção Civil. São Paulo: Oficina de Textos, 2014.
- [20] Pinto, T. Gestão Ambiental De Resíduos Da Construção Civil: A Experiência do SINDUSCON-SP. São Paulo: I & T, 2005. 48 p.
- [21] Pinto, T. Metodologia Para a Gestão Diferenciada de Resíduos Sólidos da Construção Urbana. 1999. 218 f. Tese (Doutorado) - Curso de Engenharia Civil, Escola Politécnica da Universidade de São Paulo, São Paulo, 1999.

Semi Preserved of Marine Fish, Physical-Chemical, Microbiological and Nutritional Characterization

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Abstract— Fish is a food rich in nutrients and highly perishable. In this sense, finding suitable forms for its processing and conservation is essential to maintain its quality. Thus, the objective of this work is the preparation of semi-preserves based on marine fish and to analyze their physicochemical, microbiological and nutritional composition, optimizing the time for sterilization of the glasses, so that the product is free of microorganisms. Sea fish preserves have been prepared, having as cover sauces: olive oil (extra virgin), sauce with tomatoes and water with salt (in the natural). These preserves, after their elaboration, were stored at room temperature for 40 days. The microbiological results obtained, for all the samples, were considered within the standard established in the RDC number 12 of January 2, 2001, for this type of product. Where the limit values for coagulase positive Staphylococcus, Salmonella sp. and Coliforms at 45 ° C, showing that the protocols used in the present study were adequate for the commercialization of the products. *Keywords*— Fish, preserves, processing, preservation, analysis, sterilization.

I. INTRODUCTION

Fish are natural resources that, if well used, may serve to improve the nutritional quality of human food [1].

Fish is a food rich in nutrients but highly perishable precisely because of its nutritional quality and pH close to neutrality, which gives it greater perishability and sensitivity to chemical and microbiological reactions, compromising its shelf life, if not adequately preserved [2].

From the nutritional point of view, the fish has specific characteristics that make it a beneficial food. Among these characteristics, the following stand out: fish is rich in high quality and fast digestible proteins rich in lysine and essential amino acids and an important source of vitamins A and D. If their fats are ingested, they contain thiamine and riboflavin B1 and B2) and is a source of minerals like iron, phosphorus and calcium. Marine fish still contain iodine [3].

Fish has a high nutritional value, proteins, lipids, vitamins and minerals, which are necessary for growth.

In the last decades, there has been a significant evolution in the state of the art of processing and preserving food and, consequently, fish. Technologies such as refrigeration (dry ice and cold air), freezing, salting (wet and dry), smoking (cold and hot), canning (canning, glass and other packaging) with sterilization were cited by Cantu (1997) [4] appropriate for fish processing. Also used to preserve fresh processed foods, including fish, preserved in modified atmosphere packaging, without sterilization, Santos & Oliveira (2012) [5] reports. The evolution of drying and dehydration techniques, including fish, has been described by Wilhelm, Suter & Brusewitz (2004) [6] and more recently Jeantet et al. (2016) [7] that presented the latest techniques of refrigeration, freezing and also dehydration and drying, such as roller drying, spray drying and freeze drying. The same authors also addressed the recent techniques of food stabilization by chemical inhibition, such as the use of condoms as antifungal and antibacterial substances. They also addressed advances in preservation techniques by fermentation.

There is a growing demand for fish products that are easier to prepare. With the hectic life, many people are increasingly preferring quality products with simplicity and speed in preparation [8].

In this sense, finding suitable forms for its processing and conservation is essential to maintain its quality. The forms of fish processing and preservation have evolved and today there is room for the implementation of modifications that can guarantee products to lower costs, longer shelves of supermarkets and stores, without losing quality [9].

Therefore, it is important that the fish processing industry is aware of the new technologies being developed in this area, as the quality of the fish products will be influenced by each action during its processing and preparation. Complementing that, if fish processing techniques are applied in an innovative way, quality products with high nutritional value will be achieved [9].

The industry of canning of marine fish, in Brazil and also in the world, goes through many difficulties due to the scarcity of its main inputs, such as tuna and sardine [10].

Therefore, there is a need to develop technological innovations in the area of fish processing and industrialization that result in the development and elaboration of new products with other species of fish that are attractive and healthy for consumers [11].

Arraial do Cabo RJ, is a region of great fishing potential. This is due to a local phenomenon called resurgence. The phenomenon known as resurgence refers to the outcropping of deep cold water bodies due to the movement of the sea currents and their interaction with winds and coastal structures [12].

he nutrients brought by the cold waters promote the growth of the phytoplankton and zooplankton, resulting in an increase in the population of the marine organisms and favoring the intense proliferation of the local fish fauna and, consequently, the increase of the fish catch [13],[14]. Fishing in the municipality of Arraial do Cabo, Rio de Janeiro, is located on a stretch of the coast of Rio de Janeiro that is characterized by the presence of restingas, lagoons and lowlands, extending from Arraial do Cabo to Itacuruçá Island in Mangaratiba, where the capture of species of great commercial value is practiced [13].

Due to the fact that it is located in a resurgence area near the city of Cabo Frio, fishing in Arraial do Cabo has a very interesting role in the feasibility studies of new fish products [13].

The preparation of semi-preserved fish uses techniques of elaboration and sterilization that make the shelf life can be extended, with a guarantee of quality of this product. When establishing an appropriate fish processing program or protocols, one can program the industrialization activities, making them more efficient. For each species of fish, a protocol can be developed for the elaboration of healthy products. In this way, the semi-preserves become a great alternative, because they generate conditions that increase the yield of the fish, through the development of protocols adapted to each type of species and their processing and conservation.

The objective of the present study was to study three species, *Carcarhinus spp, Sardinella brasiliensis* and anchovy, or shellfish *Pomatomus saltatrix* [13],[15],[16]. For the development and elaboration of semi preserved marine fish.

The values of moisture, proteins, fats and ashes were evaluated in the products developed and the total count of thermotolerant coliforms, total coagulase positive Staphylococcus counts and presumptive detection of Salmonella spp in the developed products.

The working hypothesis was that it is possible to keep the fish product sterile in hermetically sealed containers and retain their physical-chemical and nutritional qualities.

II. MATERIAL AND METHODS 2.1 Experimental Procedure

An important aspect in the development of a new product is the availability of raw material and, in case of scarcity, the possibility of establishing crops. In the case of this study, 3 species of fish were recorded, with the highest production volume in the catches, according to FIPERJ [13], of the last 10 (ten) years, dog fish (*Carcarhinus spp*), sardine (*Sardinella brasiliensis*) and anchovy (*Pomatomus saltatrix*).

The fish used were purchased in a store specialized in fish and crustaceans. Sardines were used in the sliced cut, fillets of anchovies and cation places.

The methodology was adapted from Silva (2011) [17]. The fish was thawed, washed in running water, diced and seasoned. For the seasoning, 1g of fish, 5g salt, 5g dehydrated herbs and 5g of dehydrated parsley were used for each seasoning (Tables 1, 2, 3). After seasoning, the fish were allowed to stand for 1 hour, then the fish were drained and pre-steamed for 10 minutes, for the exudation of water and fats.

The precooked fish was pre-sterilized in pre-sterilized hexagonal glasses, in the following proportion: half fish and half cover sauce (Figures 1, 2, 3). Both the fish and the cover dressing were at a temperature of 80°C, which was monitored with a laser thermometer.

The cover sauces used were: extra virgin olive oil industrialized brand La Violetera, sauce with traditional tomatoes industrialized Heinz traditional brand and water and salt (300 ml water for 12g salt). 5g of dehydrated garlic and two bay leaves were added to each glass, before the fish and cover dressing were added. 0,5 cm of ridge was left between the cover dressing and the lid. The metalcapped glasses were capped and then placed in a pan-type pan in a water bath where the panes were covered with up to 3 cm of water above the cap.

After sterilization, 30 minutes, the glasses remained in the container until they cooled. Afterwards, they were removed and placed inverted, with the lid down, on a white cotton cloth.



Fig.1: Semi Natural Cider Preserve.



Fig.2: Sardine Semi Preserved in Olive Oil.



Fig.3: Semi canned anchovy in sauce with tomatoes.

The glasses remain so for 24 hours to evaluate possible leaks in the lids. After 24 hours, the glasses were untapped and left on a shelf for 10 (ten) days, so that the cover dressing and seasonings were incorporated into the fish.

After that, they were taken to the laboratory for physical-chemical and microbiological analyzes. The table below summarizes the formulations (recipes) of the products developed.

Ingredients	Net Weight	
Quotation booths	1,0 kg	
Water	300 m1	
Fine herbs	8 g	
Bay leaves	2 in each glass	
Salt	12,0 g	
Crushed dehydrated parsley	8,0 g	
Crushed dehydrated onion	8,0 g	
Minced dehydrated garlic	8,0 g	
Water and salt at 10%	1,5 L	
Yield	5 glasses	
Source: Author	hovies	
Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients	hovies Net Weight	
Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients Anchovy fillets	hovies Net Weight 1,0 kg	
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Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients Anchovy fillets Water Fine herbs Bay leaves Salt Crushed dehydrated parsley	hovies Net Weight 1,0 kg 300 ml 8 g 2 in each glass 12,0 g 8,0 g	
Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients Anchovy fillets Water Fine herbs Bay leaves Salt Crushed dehydrated parsley Crushed dehydrated onion	hovies Net Weight 1,0 kg 300 ml 8 g 2 in each glass 12,0 g 8,0 g 8,0 g 8,0 g	
Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients Anchovy fillets Water Fine herbs Bay leaves Salt Crushed dehydrated parsley Crushed dehydrated garlic	Net Weight 1,0 kg 300 ml 8 g 2 in each glass 12,0 g 8,0 g 8,0 g 8,0 g 8,0 g 8,0 g 8,0 g	
Source: Author Table 2: Formulation of Semi Preserved Anc Ingredients Anchovy fillets Water Fine herbs Bay leaves Salt Crushed dehydrated parsley Crushed dehydrated onion Minced dehydrated garlic Sauce with tomatoes	Net Weight 1,0 kg 300 ml 8 g 2 in each glass 12,0 g 8,0 g 8,0 g 8,0 g 8,0 g 1,5 L	

Ingredients	Net Weight	
Steaks of sardines	1,0 kg	
Water	300 m1	
Fine herbs	8 g	
Bay leaves	2 in each glass	
Salt	12,0 g	
Crushed dehydrated parsley	8,0 g	
Crushed dehydrated onion	8,0 g	
Minced dehydrated garlic	8,0 g	
Olive oil (liquid cover)	1,5 L	
Yield	5 glasses	

For all formulations, the same experimental procedure was used, as described above.

2.2 Physical and Microbiological Physical Analyzes 2.2.1 Preparation of Samples

For each species of fish, 50g aliquots were separated, with 4 samples of each one, both fresh fish and developed (ready) products.

The physico-chemical and microbiological analyzes were performed in Food Analysis Laboratory, in triplicate, using the same standards used by Ribeiro et al. (2009) [18].

The physical and chemical analyzes for fresh fish and semi-preserved fish were carried out following the methodology of the Adolfo Lutz Institute. The moisture, ash, protein and lipid contents were determined [19].

Microbiological analyzes followed the following methodologies: M6-AFNOR-3M 01 / 2-09 / 89C, for Total Count of Thermotolerant Coliform at 45 ° C. M12A-ISO

6888-1: 1999, for Total Positive Coagulase Staphylococcus Count at 35 $^{\circ}$ C + -1 $^{\circ}$ C. M26- AOAC - 2011.03, for the presumptive detection of Salmonella spp, following what is recommended by the legislation of ANVISA and MAPA, according to DRC number 12 of January of 2001 [20].

III. RESULTS

The results of the centesimal composition for the in natura fish species (anchovy, dog fish and sardine) showed that the average of the results for the moisture content was around 77,95%, while the crude protein contents were on average 19,19%, for the lipid contents were on average 2,58% and for the ash content was 6,23%.

Table 4: Centesimal Characterization of Fish Type: Anchovy, Dog fish and Sardine in natura (wet weight or natural matter).

Variables (%)	Product		
variables (70)	Anchovy	Dog fish	Sardine
Humidity	75,89±25,34	80,09±21,55	77,89±23,20
Crude protein	18,56±2,17	20,67±1,06	18,35±2,70
Lipids	3,15±5,40	0,24±21,45	3,35±6,04
Ashes	6,68±4,83	4,45±7,68	7,57±4,77

* * Results of Mean (%) and Standard Deviation.

The results observed, for moisture content in the semipreserved anchovy and dog fish samples, were equivalent (Table 4). Although the pre-cooking exuded fat and water from the fish meat, after it was placed in the cover dressing and left on the shelf in quarantine, before the analysis was carried out, fish meat incorporated water from the cover dressing, reestablishing the content of moisture. For the sardine the same pre-baking processes were done for the exudation of fats and water, but during the quarantine in the olive oil it incorporated olive oil and not water, therefore the result of its moisture content was lower than the semi canned anchovies and cacao.

The results of the crude protein levels varied from 19,67% to 13,59%, not having a very significant distance between them.

As for lipid contents, the results were quite different: 9,11% for anchovy, 1,01% for dog fish and 65,02% for sardine samples.

For the results of the ash content, the anchovy obtained 27,82% and the dog fish 28,58%, while the results for the sardine were around 10,12% (Table 5).

Table 5: Centesin	al Characterization	of Semi-preserved Fisi	h Type: Anchovy	(in tomato	sauce), Dog Fish	ı (in salt and
water) and Sardin	e (in olive oil) (wet	weight or natural matter	r).			

Variables (%)	Product				
variables (70)	Anchovy	Dog fish	Sardine		
Humidity	83,68±17,50	85,52±15,64	36,06±12,88		
Crude Protein	19,67±5,08	13,59±7,35	16,90±5,91		
Lipids	9,11±2,54	1,01±2,77	46,97±6,20		
Ashes	4,87±1,67	4,47±14,68	7,29±26,57		

** Results of Mean (%) and Standard Deviation.

The results of the microbiological analyzes (Table 6) were satisfactory and within the standards recommended by ANVISA (National Agency of Sanitary Surveillance), confirming that it is possible to efficiently process and preserve these products based on the protocols of

processing and elaboration of the products, as they were elaborated in this study [20].

If the samples analyzed presented satisfactory results, the food being in compliance with ANVISA standards, the fish meets the national standards indicated for microbiological quality, maintaining the commercial sterility of the product [18].

Analyza	Samples		Legislation	(ANVISA,	
Allalyze	Dog fish	Sardine	Anchovy	— 2001)	
Salmonella (Ausência) *	Absent	Absent	Absent	Absence	
Staphylococcus	<1,0x10 ¹	<1,0x10 ¹	<1,0x10 ¹	Max 10 ³ g ⁻¹	
Positive				-	
Coagulase(UFC/g)**					
Coliforms at 45°C	$<1,0x10^{1}$	<1,0x10 ¹	<1,0x10 ¹	Max 10 ³ g ⁻¹	
(NMP/g)***	-	-		0	
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Results: * Absence; ** UFC - Colony Forming Unit; *** NMP - Most likely number.

The Port Authority Order No. 37, dated February 14, 2011, describes the quality and identification of canned fish, as well as the norms and requirements required for its processing [21].

In the results of the nutritional value table (Table 7), we can observe that the values of the protein contents remained very close. The results for carbohydrates were higher for dog fish and anchovy around 30% and 10% for sardines. For lipid contents, the results for the cacao were around 1%, due to the exudation of water and fats in their pre-baking and because their coating liquid was made with water and salt. The same occurred for the anchovy, which had as a cover liquid sauce with tomatoes.

As for the sardine samples, although the pre-cooking had exuded water and lipids, as its cover sauce was olive oil and the ready-made samples of the preserved half-lives awaited the 40 days of quarantine to be elaborated the analyzes, with that time the pre-cooked sardine meat incorporated well its sauce cover. Therefore, its result was around 65,02%, slightly higher than the other canned samples observed. This was due to the difference in the composition of the cover sauces for each type of fish evaluated.

Table 7: Nutritional value of semi-preserved fish type: Anchovy (in tomato sauce), Cação (in water and salt) and

Variables	Nutritional value	per serving (40g)	
	Dog fish	Sardine	Anchovy
Protein	13,59	16,90	15,32
Carbohydrate	30,90	10,22	32,11
Lipid	1,01	65,02	10,54
Minerals	28,58	10,12	32,54
Kcal	40,83	461,38	67,10
Humidity	84,36	27,75	77,60

Source: Author

IV. DISCUSSION

The present work obtained results for fresh fish samples, values of moisture contents, proteins, lipids and ashes, similar to those of the finished product, showing a good recovery of these parameters after the treatments. The results found in this study were equivalent to the results for the dog fish and sardines, according to the Table TACO (Brazilian Food Composition Table), which is 81,4% for the cacao and 76,6% for the sardine [22]. For anchovy, the value was higher than that found by Gonçalves & Prentice-Hernández (1998) [23], which was 69.38%.

In the study conducted by Cozer et al. (2014) [24], for canned jundiá, in tomato sauce it obtained values of 83,07% of humidity, 60,15% of crude protein. And in the results of microbiological analyzes, the results have remained within the standards required by current legislation. In this way, the results of Cozer et al. (2014)[24] were similar to those found in the present study. When we compare the fish in natura with the semipreserved (ready-to-eat) product, it is observed that the protein content decreases drastically, which can be explained by the decrease of the proteins in the elaborated preserves, due to the pre-baking, where a exudation of water and fats, thus losing part of the original proteins of the flesh in natura.

The fish musculature has about 60 to 85% moisture [25]. Showing that the results for moisture in this study are within that average observed by these authors above. The muscle of fish of low commercial value such as acari (*Liposarcus* pardalis) and tamuatá (Callichthys callichthys), possesses about 70% of proteins and has excellent acceptability [26]. The results of the centesimal composition of the work of Silva Junior et al. (2017) [27] for fish protein concentrate resulted in the following mean values, for moisture 13,61%, for proteins 66,7%, for lipids 9,58% and for 10,2% ashes. The results showed that the results were much lower than those described in the present study. As regards protein results, the lipid results were the same and the ash contents were close.

V. CONCLUSION

The results of the microbiological analyzes were satisfactory and within the standards recommended by ANVISA. The results for the analysis of centesimal composition were also equivalent to the results observed by other authors. Confirming that it is possible to process and preserve these products efficiently, based on the protocols of processing and elaboration of the products, as they were done in this study, which proved the initial hypothesis of work.

We can observe that the development of semipreserved marine fish can serve to increase the value added of fish to natural. Contribute to an increase in fishing, by using several species of fish, only making changes in seasoning, depending on the type of fish meat, due to the type of fibers and how that meat will absorb the seasoning. Therefore, future studies are recommended. In addition to this technological knowledge, it is necessary to improve fishing management, making it more sustainable, so that a constant supply of raw material (fish) is available at competitive prices. In this way, the diversification of a line of fish products can be made effective, without risk of lack of products due to overfishing.

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REFERENCES

- [1] [1] SARTORI, Alan Giovanini de Oliveira; AMANCIO, Rodrigo Dantas. Pescado: importância nutricional e consumo no Brasil. Segurança Alimentar e Nutricional, v. 19, n. 2, p. 83–93, 11 fev. 2012.
- [2] [2] SOARES, Karoline Mikaelle de Paiva; GONÇALVES, Alex Augusto. Qualidade e segurança do pescado. Revista do Instituto Adolfo Lutz (Impresso), v. 71, n. 1, p. 1–10, 2012.
- [3] [3] PEREIRA, Laís Aparecida Reis; FONSECA, Vanessa Vasconcelos. Controle de qualidade de pescados com verificação dos seus PCC's em um restaurante no Município de Volta Redonda. Interbio, v. 5, n. 1, p. 21–28, 2011.
- [4] [4] CANTU, Rafael. Tecnologia e Processamento do Pescado. 1997. 1–54 f. Monografia de Conclusão do Curso de Agronomia – Universidade Federal de Santa Catarina, 1997. Disponível em: <https://repositorio.ufsc.br/handle/123456789/117660>.
- [5] [5] SANTOS, Joana Silva; OLIVEIRA, Maria Beatriz Prior Pinto. Alimentos frescos minimamente processados embalados em atmosfera modificada. Braz. J. Food Technol., v. 15, n. 1, p. 1–14, 2012.
- [6] [6] WILHELM, Luther R.; SUTER, Dwayne A.; BRUSEWITZ, Gerald H. (Org.). Food & Process Engineering Technology. St. Joseph, MI: ASAE (American Society of Agricultural Engineers), 2004. p. 259–284. Disponível em: <https://www.asabe.org/media/184966/chapter_10_in_wilh elm_food_proc._eng._tech.pdf>.
- [7] [7] JEANTET, Romain; FLOURY, Juliane. Inhibition of Food Modifying Agents. In: JEANTET, Romain et al. (Org.). . Handbook of Food Science and Technology: Food Process Engineering and Packaging. Hoboken, NJ: John Wiley & Sons, Inc., 2016. v. 2. p. 33–99. Disponível em: http://www.wiley.com>.
- [8] [8] FAO, Food and Agriculture Organization of the United Nations. The State of World Fisheries and Aquaculture 2014. Rome, Italy: FAO, 2014. Disponível em: http://www.fao.org/3/a-i3720e.pdf. Acesso em: 12 jan. 2019.
- [9] [9] SAMPELS, Sabine. The effects of processing technologies and preparation on the final quality of fish products. Trends in Food Science & Technology, v. 44, n. 2, p. 131–146, 2015.
- [10] [10] IBAMA/CEPSUL. Relatório sobre a Reunião Técnica para o Ordenamento da Pesca da Anchova (Pomatomus saltarix) nas Regiões Sudeste e Sul do Brasil.Itajaí-SC: Centro de ICMBio - Instituto Chico Mendes de Conservação da Biodiversidade / Pesquisa e Gestão dos Recursos Pesqueiros do Litoral Sudeste e Sul -CEPSUL, 2009. Disponível em: <http://www.icmbio.gov.br/cepsul/images/stories/biblioteca /download/relatorio_de_ordenamento/enchova/rel_2009_pr el_anchova.pdf>.

- [11] SILVA, Amanda Thaís Ferreira et al. Alterações microbianas dos produtos de pescados curados: Revisão. Pubvet, v. 11, n. 7, p. 658–661, jul. 2017.
- [12] GUENTHER, Mariana et al. Plankton trophic structure and particulate organic carbon production during a coastal downwelling-upwelling cycle. Marine Ecology-progress Series - MAR ECOL-PROGR SER, v. 363, p. 109–119, 2008.
- [13] FIPERJ . Diagnóstico da Pesca do Estado do Rio de Janeiro Diagnóstico da Pesca no Estado do Rio de Janeiro. . Rio de Janeiro, RJ: FIPERG (Fundação Instituto de Pesca do Estado do Rio de Janeiro), 2013b. Disponível em: https://docplayer.com.br/7373350-Diagnostico-dapesca-do-estado-do-rio-de-janeiro.html>.
- [14] LELES, Suzana et al. A Lagrangian study of plankton trophodynamics over a diel cycle in a eutrophic estuary under upwelling influence. Journal of the Marine Biological Association of the United Kingdom, p. 1–12, 2017.
- [15] FIPERJ. Boletim Estatístico da Pesca do Estado do Rio de Janeiro – Anos 2011 e 2012. Fundação Instituto de Pesca do Estado do Rio de Janeiro. . Rio de Janeiro, RJ: FIPERG (Fundação Instituto de Pesca do Estado do Rio de Janeiro), 2013a. Disponível em: <http://www.icmbio.gov.br/cepsul/images/stories/biblioteca /download/estatistica/est_2011_bol__bra.pdf>.
- [16] FIPERJ. Dados de Produção Pesqueira Marinha Julho a Dezembro de 2017 - Região Norte Fluminense. . Rio de Janeiro, RJ: FIPERG (Fundação Instituto de Pesca do Estado do Rio de Janeiro), 2017. Disponível em: http://www.fiperj.rj.gov.br/index.php/arquivo/download/2 25>.
- [17] SILVA, Ana Maria da. Enlatamento de Peixes Cultivados em Água Doce. 2011. Trabalho de Conclusão de Curso de Engenharia de Pesca – Universidade Estadual do Oeste do Paraná, 2011.
- [18] RIBEIRO, Ana Lúcia Medeiros dos Santos et al. Avaliação microbiológica da qualidade do pescado processado, importado no estado do Rio de Janeiro. Revista Brasileira de Ciência Veterinária, v. 16, n. 3, p. 109–112, 2009.
- [19] ZENEBON, Odair; PASCUET, Neus Sadocco; TIGLEA, Paulo. Métodos físicos-químicos para análise de alimentos. 1a Edição ed. São Paulo, SP: Instituto Adolfo Lutz, 2008.
- [20] BRASIL. Resolução RDC n° 12, de 02 de Janeiro de 2001, que define o Regulamento Técnico Sobre Padrões Microbiológicos Para Alimentos. Resolução, n° 12. Brasília, DF: ANVISA (Agência Nacional de Vigilância Sanitária), 2001. Disponível em: http://portal.anvisa.gov.br/documents/33880/2568070/RD C_12_2001.pdf/15ffddf6-3767-4527-bfac-740a0400829b>. Acesso em: 12 fev. 2018.
- [21] BRASIL. Portaria n° 37, de 14 de fevereiro de 2011, que define o Regulamento Técnico de Identidade e Qualidade de Conservas de Peixes. Portaria, n° 37. Brasília, DF: MAPA, Ministério de Agricultura, Pecuária e Abastecimento, 14 fev. 2011. Disponível em:

<http://www.inmetro.gov.br/barreirastecnicas/pontofocal/te xtos/regulamentos/BRA_426.pdf>. Acesso em: 9 fev. 2018.

- [22] NEPA-UNICAMP. TACO Tabela Brasileira de Composição de Alimentos. 4. ed. Campinas, SP: UNICAMP - Universidade Estadual de Campinas, 2011. Disponível em: http://www.cfn.org.br/wpcontent/uploads/2017/03/taco_4_edicao_ampliada_e_revisa da.pdf>.
- [23] GONÇALVES, Alex Augusto; PRENTICE-HERNÁNDEZ, Carlos. Defumação Líquida de Anchova (Pomatomus saltatrix): Efeito do Processamento nas Propriedades Químicas e Microbiológicas. Rev. Ciência e Tecnologia de Alimentos, v. 18, n. 4, p. 438–443, 1998.
- [24] COZER, Nathieli et al. Enlatamento do jundiá: Caracterização centesimal, microbiológica e sensorial do produto final. Boletim do Instituto de Pesca, v. 40, n. 1, p. 61–68, 2014.
- [25] VISENTAINER, J. V. et al. Composição química e de ácidos graxos em tilápias (Oreochromis niloticus) submetidas à dieta prolongada. Revista Nacional da Carne, v. 319, p. 152–154, 2003.
- [26] CASTRO, F. C. P. Concentrado Proteico de Peixe como Suplemento Alimentar nas Forças Armadas: emprego, produção e estabilidade de concentrado proteico de Piracuí na ração operacional de combate de selva. 2003, Itajaí, SC. *Anais...* Itajaí, SC: Universidade do Vale do Itajaí, 2003. p. 1–4. Disponível em: http://www.cttmar.univali.br/ iwarp/>.
- [27] SILVA JUNIOR, Antonio Carlos Souza et al. Caracterização físico-química e avaliação microbiológica de concentrado proteico de peixe (Piracuí) comercializado em feiras livres da Cidade de Macapá-AP. Biota Amazônica, v. 7, n. 3, p. 33–36, 2017.

Breastfeeding: The Knowledge of the Partner within the Pre-Birth Program in Rondonia, North of Brazil

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Abstract— The process of breastfeeding is older than human existence, but still complex, involves several factors that contribute positively or negatively to the practice. The objective of this study was to describe the knowledge of the members of the male pre-birth program in a Family Health Unit in the city of Cacoal (Rondônia, North of Brazil) on the importance of breastfeeding. The research was conducted in the months of February, March, April, 2018, after signing the consent form. A qualitative, descriptive, cross-sectional study was obtained through interviews with the partners of the pregnant women enrolled in this Family Health Unit. The sample consisted of 20 partners, the results were: 09 (45%) of the partners were between 22 and 30 years of age, 13 (65%) are married, 4 (20%) work as a general helper, 10 (50%) of them did not complete the first degree, 10 (50%) interviewed attended a pre-birth visit, 16 (80%) partners never participated in the meetings promoted by the basic health unit, it was observed that 18 (90%) attended the examinations laboratory tests, and USG), 18 (90%) reported that their companion attended a course of preparation for childbirth. Regarding the partners' knowledge about the benefits of exclusive breastfeeding, it can be observed that 15 (75%) did not know the advantages of breastfeeding for the baby, 12 (60%) correlated the infant's development with breastfeeding, 11 (55%) did not (40%) answered that the economy is the biggest advantage for the couple, 7 (35%) claimed that breastfeeding should be performed up to 1 year of age. It is concluded that partners have no knowledge about breastfeeding, little participation was observed during pregnancy. The male pre-birth program is the way to contribute to the training of the partners' knowledge about the pregnancy cycle, making it necessary to implant them in the other health units of the family.

Keywords—Breastfeeding. Partner. Pre-birth of male.

I. INTRODUCTION

The process of breastfeeding is the oldest of human existence, but still very complex, involving several factors that may contribute positively or negatively to its practice. The act of breastfeeding is extremely important, providing an inseparable link through direct contact between mother and child, with a calming and analgesic effect for the infant. This maternal-infant interaction has the power to modulate the behavioral state of the child and the mother, with influences on affective psychological development and learning (CUNHA, 2016).

With regard to breastfeeding and family economic aspects, it is already clear that breastfeeding does not have financial implications and can burden a family substantially. The child who is not breastfed will generate a cost with infant formulas and bottles, in addition to having a higher risk of becoming ill, which may require more medication and even more hospital admissions (NUNES, 2015).

In addition to the recognized immunological factors of breast milk, it satisfies nutritional needs and is responsible for the best development of the child, especially in the first two years of life (PEREIRA, 2013).

It is evident that the father can be an important ally, true partner in the education of the children and in the breastfeeding, being indispensable the stimulus for their participation. The father should be remembered and included throughout the reproductive process, in nursing consultations, in hospital and home care, since breastfeeding is an inherent part of this singular phase in family life (RGO, 2016).

In 2010, the Ministry of Health launched the male prebirth clinic, recommending that men perform pre-birth examinations at the same time as their partners, encouraging them to attend the health service in a preventive way, and promoting the affective bond between him, the son and the pregnant woman (BRASIL, 2010).

In this context, this research aimed to know the profile of partners and their knowledge about breastfeeding, thus enabling health professionals to create strategies to opportune these partners to become co-responsible in the breastfeeding process, where they often do not assist their partners. for lack of education and knowledge. The health professional must be aware of this situation and thus has the role of encouraging participation, guide and clarify the doubts presented by the father, who are involved in the breastfeeding process.

II. MATERIALS AND METHODS

This is a qualitative, descriptive, cross-sectional study conducted through an interview. The research was conducted in a Family Health Unit (USF), in the municipality of Cacoal in Rondônia, North of Brazil, from which the data were obtained through interviews with the partners of the pregnant women enrolled in this Family Health Unit.

Data collection took place in the months of February, March, April, 2018, during the morning, afternoon and evening periods, during the six days of the week, participants were informed about the research and agreed to participate, signing the consent form.

Included in the study were the partners of pregnant women who perform pre-birth care at USF LMF, as the only health unit currently operating the male pre-birth program in the municipality of Cacoal.

The research was carried out after the approval of the CEP, where the researchers contacted the coordinator of basic care of the municipality, and the manager and nurse of the USF requesting authorization for data collection, soon after the partners were approached at the reception and taken to a room to answer the questionnaire separate from the wife, other meetings were scheduled on Saturdays to achieve covers the largest number of partners who perform and accompany the male pre-birth.

A questionnaire with 22 multiple choice questions was used, adapted from the work of Abrantes (2014). "Breastfeeding: The role of the father". The second phase included the questionnaire containing variables related to socio-demographic profile, such as: age group, marital status, occupational situation, school situation, age of partners. In the third phase, the interviewees were asked to answer questions related to pre-birth involvement (followed pre-birth consultations, laboratory and imaging exams, participated in a group of guidelines for pregnant women, if the companion attended a preparation for childbirth). In the 4th phase, knowledge about breastfeeding was investigated (what are the advantages of breastfeeding for the mother and the baby, the advantages of breastfeeding at economic level, the environment, knowledge of the legal rights of the mother and father during breastfeeding, problems that may arise in breastfeeding).

The initial sample consisted of 28 partners, but because the male patient was the same, he was very resistant in relation to the care with his health, therefore, only 20 were interviewed, in follow-up of pre-birth care.

As a strategy for the public approach to the research, calls were made to invite them to participate in the research, we established more flexible days due to the services, we scheduled a night meeting and on Saturday afternoon as a strategic point for a better comprehension, we followed weekly consultations to approach the partners. Approach data collection in the meetings happened as follows, when the partners arrived they were invited to participate in the research, were directed to another environment different from the pregnant women to answer the questionnaire, the pregnant women would be in another environment where was happening to the lectures and gestational orientations.

Research was carried out after approval of the project by the Ethics and Research Committee of the Faculty of Biomedical Sciences of Cacoal, Brazil - FACIMED; as well as the authorization of the primary care coordinator, manager, nurses working at the USF and researched partners, ensuring the ethical rigor of research involving human beings. The study did not pose any risk to the partners as it preserved any personal data from any of the samples. Initially, the project was evaluated by the Ethics and Research Committee (CEP) and approved according to 2.330.647 and was only executed with ethical authorization from the research ethics committee of the - FACIMED. For interpretation and analysis, the data were classified and organized from a descriptive and reflexive analysis, through the partners' answers, regarding the questions about breastfeeding. The data were inserted in the programs Word 2007 and Excel, were analyzed and tabulated, in which they are exposed in the work in the form of table by means of descriptive statistics.

III. RESULTS AND DISCUSSION

Twenty partners from pregnant women living in the municipality of Cacoal-RO, in a (01) family health unit, participated in the study.

 Table 1a - Socioeconomic characterization of partners of pregnant women enrolled in the Luiz Moreira de Freitas Health

 Unit of the municipality of Cacoal-RO (2018)

VARIABLES		No	%
	17 – 21	05	25%
Age	22 - 30	09	45%
	31 - 40	06	30%
Total		20	100%
	Not married	06	30%
Conjugal situation	Married	13	65%
	Stable union	01	05%
Total		20	100%
	Incomplete first degree	10	50%
Level of Schooling	First full grade	01	05%
	Incomplete high school	04	20%
	Second degree completed	05	25%
Total		20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

Table 1b - Socioeconomic characterization of partners of pregnant women enrolled in the Luiz Moreira de Freitas HealthUnit of the municipality of Cacoal - RO (2018)

VARIABLES		No	%
	Bricklayer	03	15%
	Public agent	01	05%
	Tapestry	01	05%
	mechanical	01	05%
	Unemployed	02	10%
	Box Operator	01	05%
Profossion	General helper		20%
11010551011	Potter	01	05%
	Civil firefighter	01	05%
	Electrician	01	05%
	Driver	01	05%
	Vigilant	01	05%
	Self Employed	01	05%
	Deliveryman	01	05%
Total		20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

It can be seen in table 1 that 9 (45%) of the partners are between 22 and 30 years old. Of the marital situation, 13 (65%) of the partners are married. When we analyzed the professional situation of the partners that constituted the sample we observed that 4 (20%) work as a general helper. Regarding the level of schooling, the highest concentration of the sample 10 (50%) of the partners did not complete the first grade incomplete.

Although there is a current trend for parents to identify themselves as a pregnant couple from the very beginning of pregnancy, seeking to play an active role in participating in pregnancy surveillance consultations or in childbirth classes, it is still not a reality in most of couples, especially those with low socioeconomic status and education (PESAMOSCA, 2008).

It is also observed that among the interviewed partners, the majority had a low level of education, and this may be an influential factor in not knowing the importance of breastfeeding, since the person does not have access to sources of information and does not understand basic are based on the belief that a child is more susceptible to the influence of culturally constructed myths and taboos and thus more vulnerable to weaning (JOCA et al., 2005).

 Table 2 - Characterization of the participation of the partners of the pregnant women enrolled in the Luiz Moreira de Freitas

 Health Unit of the municipality of Cacoal-RO (2018), in relation to the follow-up of the pregnancy process.

VARIABLES	YES	%	NO	%	TOTAL	%
Accompanied prenatal appointments	10	50%	10	50%	20	100%
She participated in the group meetings of pregnant women	04	20%	16	80%	20	100%
Accompanied the accomplishment of the exams (laboratory exams and USG)	18	90%	02	10%	20	100%
Has your partner attended any course of preparation for childbirth	02	10%	18	90%	20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

We can observe from the data presented in table 02, that 10 (50%) of the interviewees followed the pre-birth visit. Only 4 (20%) participated in the groups of pregnant women, observing that 18 (90%) followed the tests (laboratory tests and USG).

Paternity is directly linked to lactation, since the father can interfere in this process, positively or negatively, it all depends on the degree of information and its involvement. It is worth noting the affective value, since for man there is the involvement of several feelings, such as: wellbeing, frustration and exclusion, in the family context in which it is inserted (OLIVEIRA et al., 2009).

It is noticed that the presence of the partner in the act of the consultations of the pregnant women contributes in the strengthening and support in the gestational period, puerperium, and family context. (BRAZIL, 2012).

In the open-ended questions asking the advantages of breastfeeding for the mother?

15 (75%) total of 20 of the interviewed partners did not know how to respond, of the 5 partners who answered the answers were

(Answer 1 Partner) "a good food for the mother and the baby come very healthy"

(Answer 2 Partner) "healthy breast and health in force"

(Answer 3 Partner) "So that everything goes well with her and the baby"

(Answer 4 Partner) "You will have a healthy child" 6

(Answer 5 Partner) "Health for Mother"

Regarding the questioning about the composition of breast milk, 14 (70%) of 20 partners interviewed did not know how to define the composition of breast milk.

Only 05 (25%) answered that:

"Breast milk is composed of fats, nutrients and vitamins everything the baby needs, consequently it will have the immune system very strong."

Parental participation since pre-birth care breaks barriers in the adaptation and care of the child and the puerperium, contributing to the management of breastfeeding, thus avoiding early weaning, motivated by maternal discomfort and lack of incentive for mothers (PAULA, 2010).). Participation in pre-birth consultations is an opportunity for parents to feel closer, accompanying the baby's gestation, so that the child can materialize, because without this experience they present only a subjective perception through the information obtained by the child. mother (PESAMOSCA, 2008).

Among the open-ended questions that asked about the importance of the father in breastfeeding 11 (55%) did not know how to respond. Therefore, it is of great importance the participation of the partners in pre-birth educational activities, since this generates a greater involvement with the pregnancy, giving the partner the knowledge of the

conjugal benefits (REBERTE et al., 2010). According to FERREIRA (2016), most women reported that the presence of the companion during pre-birth consultations would provide feelings of security and confidence, experiences in which the parents actively participated in group work developed during pre-birth care, shared experiences and could perceive that other men also lived similar situations, there was promotion of the quality of the relationship between the couple and the involvement with pregnancy and the role of father.

 Table 3a: Characterization of the knowledge of the partners of the pregnant women enrolled in the Luiz Moreira de Freitas

 Health Unit of the municipality of Cacoal-RO (2018), on breastfeeding.

VARIABLES		No	%
A dreamte and of	I could not answer	15	75%
Auvantages of	So that everything goes well with her and with the baby	02	10%
the mother	Will have a healthy child	02	10%
the mother	Health for the mother	01	05%
Total		20	100%
Advantages of	I could not answer	04	20%
Advantages of breastfeeding for the baby	Breast milk helps development and empowerment	12	60%
	Milk contains all the vitamins	02	10%
	Breast milk is essential in the first year of the child	02	10%
Total		20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

 Table 3a: Characterization of the knowledge of the partners of the pregnant women enrolled in the Luiz Moreira de Freitas

 Health Unit of the municipality of Cacoal-RO (2018), on breastfeeding.

VARIABLES		No	%
Advantages of breastfeeding for	Did not know how to respond	11	55%
	With breastfeeding increases the immunity of the child avoiding infections and expenses with medicines	01	05%
the couple	Economy	08	40%
Total		20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

Regarding the characterization of the knowledge that partners of pregnant women consider to be about breastfeeding are presented in table 3, we can observe that 15 (75%) of the partners claimed not to know the advantages of breastfeeding for the mother, 12 (60%) answered however, 4 (20%) did not know how to respond and 3 (15%) stated that the advantages for the baby are related to the immunity that breastfeeding brings to the baby; 11 (55%) did not know about the advantages of breastfeeding for their socioeconomic cohabitation, 8 (40%) of the partners said that the advantage is related to the economy.

According to (REAL, 2010), breast milk is still able to prevent the future onset of diabetes, lymphomas, obesity, Crohn's disease, ulcerative colitis and celiac disease in children; reduces the likelihood of the appearance of dental caries, improves the development of the jaws, teeth and speech; facilitates the digestion and functioning of the intestine.

Second (BRAZIL, 2015) regarding the advantages of breastfeeding for the breastfeeding mother is much more than nurturing the child. It is a process that involves deep

interaction between mother and child, with repercussions on the nutritional status of the child, on his ability to defend himself against infections, his physiology and cognitive and emotional development, and his long-term health, besides have implications for the mother's physical and mental health.

In this respect (SILVA, 2007), the parents' understanding of the advantages that breastfeeding offers to the mother and the baby can increase the opportunity for parents to support their partners in this practice and also to participate in this practice, strengthening the ties between them. Parental support is an important ally of breastfeeding. The man, as father and companion, must participate in the integral health of the woman and the child.

In order to benefit the baby it is important to emphasize that breastfeeding is an age-old practice with recognized nutritional, immunological, cognitive, economic and social benefits. These benefits are fully utilized when breastfeeding is practiced for at least two years and is offered as an exclusive form of feeding to the infant until the sixth month of life as it says (NUNES, 2009). Confirming the advantages of breastfeeding for the couple, (ANTUNES, 2008) propose that breastfeeding should be stimulated, since each breastfeeding represents a vaccine for the baby, providing all nutrients, protection, bone, psychological and neurological structures, bringing beneficial effects for the infant who, in breastfeeding his child, makes the act of breastfeeding an important factor for Brazil from an economic point of view. By labeling the

benefits of breastfeeding to the mother / couple, (ABRANTES, 2014) says that, because it is safer, economical, easier and more practical because it does not require heating, preparation or sterilization, it promotes more time for the couple to enjoy the moment with their baby strengthening affective bonds and providing moments of pleasure between the triad.

 Table 4: Characterization of the knowledge of the partners of the pregnant women enrolled in the Luiz Moreira de Freitas

 Health Unit of the municipality of Cacoal-RO (2018), regarding the adequate time of breastfeeding.

Until what age baby must only breastfeed milk?	N°	%
Did not know how to respond	02	10%
Up to 4 months	01	05%
Up to 6 months	03	15%
Up to 8 months	01	05%
Up to 1 year	07	35%
Up to 1 year and 3 months	01	05%
Up to 1 year and 6 months	01	05%
From 1 year up to 2 years	01	05%
Up to 2 years	02	10%
Up to 3 years	01	05%
Total	20	100%

Source: Cassimiro, Luz, Nascimento, Viana (2018).

According to the survey conducted 7 (35%) partners claimed that breastfeeding should occur exclusively until 1 year of age; 3 (15%) partners said that up to 6 months; 2 (10%) partners could not answer; and 2 (10%) partners preferred 2 years of age.

Regarding the time of exclusive breastfeeding, the Ministry of Health recommends at least 6 months of age.

Breastfeeding should be exclusive up to six months and on demand, since it is common for the newborn to nurse frequently, with no regularity at times. The intervals between feedings should be observed by the parents, and if necessary, should encourage the newborn to suck correctly and more frequently (PAULA, 2010).

However, it may occur that parents become insecure when referring to the way the mother breastfeeds her baby, so it should be instructed and encouraged to participate more often at that time to decrease that distance and provide the experience needed to raise the child with more love and presence.

In agreement with (NUNES, 2015). The composition of breast milk ensures the necessary amounts of water, carbohydrates, lipids and proteins for the proper development of infants. Besides that it is practical, free of bacteria and contains lots of immunological factors that will protect the child for much of his childhood.

It is worth remembering that malnutrition accounts for one in three deaths among children under 5 years of age, with more than two thirds associated with inappropriate food in the first year of life of the child. The reduction of mortality is attributed to breastfeeding, which is a factor that in other instances is of great importance for the formation of the family in the relationships between father and son bringing with them the stigma of the family as a whole (OLIVEIRA, 2017).

The practice of breastfeeding brings proven benefits to all who are involved: mother-child. Human milk is speciesspecific and its substitution by artificial preparations does not bring the same benefits to the child. Thus, human milk is an irreplaceable nutritional source and it is also what makes breastfeeding the most efficient and economic way of uniting the family, benefiting not only the mother-child binomial but also adding the father to the formation of the family (SANTANA, 2015).

The superiority of breast milk over milk of other species is already well established by scientific studies. There are several arguments in favor of breastfeeding: reducing the number of infant deaths, avoiding diarrhea, avoiding respiratory infections, reducing the risk of allergies, hypertension, high cholesterol and diabetes, reducing the chance of obesity, better nutrition and a positive effect in intelligence, better development of the oral cavity, protection against breast cancer and avoids re-pregnancy, lower financial cost, increases the affective bond of mother-child and better quality of life (OLIVEIRA, 2017).

IV. CONCLUSION

The absence of partner partners in the pregnancy period is a factor that contributes negatively to support breastfeeding because it does not know the benefits of breastfeeding. It is important to be involved at this stage and it was observed that their attendance was more present at the time of the laboratory tests and ultrasonography, the USG being one of the expectations for revealing the sex of the baby, the gestational period involves several phases that the partner needs to be inserted to understand and contribute positively.

Breast milk is composed of all the nutrients needed to nourish this baby, the milk that the industries offer in the market besides not having all the necessary nutrients, has a high cost, bringing an extra expense to the couple, breastfeeding is something irreplaceable for the best health of the baby.

However, it was found that partners' knowledge about breastfeeding really did not want to present a plausible proposal to solve such a deficit that would implant the male pre-birth program in other units of the city so that more partners are covered in that system. Therefore, this work will contribute to a better understanding of the partners' knowledge about breastfeeding and will serve as a basis for the other units also to develop the pre-birth program of the man in order to address relevant issues in the pregnancy context.

V. REFERENCES

- [1] ABRANTES, G.M.T.M. (2014). Breastfeeding: The role of the father. Doctoral thesis.
- [2] ANTUNES D.S., Leonardo et al. (2008). Natural breastfeeding as a source of health prevention. Science & Collective Health, v. 13, n. 1.
- [3] BRAZIL (2015). Breastfeeding notebook
- [4] BRAZIL. Ministry of Health. (2010). Men's Health Policy encourages male prenatal care. Men's Health. [Internet].
 [cited 2011 Aug 23]. Availablefrom:http://portal.saude.gov.br/portal/aplicacoes/n oticias/default.cfm?pg=dspDetalheNoticia&id_area=1450& CO_NOTICIA=11705.
- [5] BRAZIL. Ministry of Health (2012). Attention to low-risk prenatal care. Brasília: Ministry of Health.
- [6] CUNHA, E. C .; DE SIQUEIRA, H.C.H. (2016). Breastfeeding: Nursing Contributions. Essays and Science: Biological, Agrarian and Health Sciences, v. 20, n. 2, 2016.
 12
- [7] FERREIRA, I. S.; FERNANDES, A.F.C., RICARTE LÔ, K. K., MELO, T. P. de, GOMES, A. M. F., ANDRADE, I. S .. (2016). Perceptions of pregnant women about the performance of partners in prenatal consultations. Northeast Network Nursing Journal, v. 17, n. 3.
- [8] JOCA, M. T; MONTEIRO, M.A.A; BARROS, S.K.S; PINHEIRO, A.K.B; OLIVEIRA, R. L. (2015). Factors

contributing to early weaning. Esc Anna Nery Nursing Journal. ten; 9 (3): 356-64.

- [9] NUNES DE SOUZA, Maria José et al. (2009). The importance of guidance to pregnant women about breastfeeding: a factor for the reduction of painful breast processes. ConScientiaeSaúde, v. 8, n. 2.
- [10] NUNES, L.M. (2015). Importance of breastfeeding nowadays. BolScientificPediatr, v. 4, n. 3, p. 55-8.
- [11] OLIVEIRA, Eteniger Marcela Fernandes de; DE BRITO, Rosineide Santana. (2009). Caregiving actions performed by the father in the puerperium. Anna Nery School Nursing Magazine, v. 13, n. 3, p. 595-601.
- [12] PAULA, A. O.; SARTORI, A. L.; MARTINS, C.A. (2010). Breastfeeding: guidance, knowledge and participation of the father in this process.
- [13] PEREIRA, C. R. V. R. et al. (2013). Assessment of factors that interfere with breastfeeding within the first hour of life. Revista Brasileira de Epidemiologia, v. 16, n. 2, p. 525-534.
- [14] PESAMOSCA, L. G.; FONSECA, A.D. da; GOMES, V. L. de O. (2008). Perception of pregnant women about the importance of parental involvement in consultations: a gender perspective. Revista Mineira de Enfermagem, v. 12, n. 2, p. 182-188.
- [15] Real, H. (2010). Breastfeeding: Promoting Health! (A. P. Nutritionists, Ed.) Porto: Alexandra Bento.
- [16] REBERTE, L. M; HOGA, L.A.K. (2010). The experience of parents participating in a prenatal health education group. Science and nursing, v. 16, n. 1, p. 105-114.
- [17] RÊGO Viana, Rita Maria et al. (2016). Paternity and breastfeeding: nurse's mediation. Acta Paulista de Enfermagem, v. 29, n. 4.
- [18] SANTANA, A. C. de. (2015). The knowledge of university students about breastfeeding and the role of the father in breastfeeding.
- [19] SILVA, M. B. de C .; MOURA, M.E. B .; SILVA, A. (2007). Early weaning: social representations and mothers. RevistaEletrônica de Enfermagem, v. 9, n. 1.

Canal as a Solution to Reduce a Puddle in the Drainage System of Passo - Ambon City

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Abstract— Due to the low infiltration capacity as the effect of land expansion into buildings / concretization in an area will have an impact on the surface flow rate which results in a drainage system that is not optimal. For this reason, routine flooding / inundation in Passo area is minimized by involving the canal of Passo as a water body that can manage flooding. The average rainfall data of 14 years is used to model the rainfall plan and land use data of 0.4-0.7 in the way tonihatu watershed is a variable of runoff coefficient. For the planned discharge with a 25-year return period of 14.84 m3 / sec with the Nakayasuyang synthetic hydrograph used to model the channel capacity of 46 nodes. From the simulation results of the existing condition, only 3 nodes are safe, after that the flow model and channel capacity are improved according to the channel characteristics requirements, the simulation results show the ability of the safe channel capacity to discharge the planned system.

Keywords-Nakayasu, Canal, Passo, land use.

I. INTRODUCTION

Excessive development in Ambon City has disrupted the balance of the water system which can be seen from the high number of surface runoffs, due to the low infiltration capacity as the result of the expansion of land into buildings / concretization in an area. The direct loss felt is a decrease in soil production capacity, high surface runoff, and sedimentation rates. Existing conditions in the city of Ambon, especially Passo, are experiencing a lot of problems with the urban drainage system that urgently needs to be addressed, including the problem of the malfunctioning of the network system, in this case the canal (long storage) which causes flooding.

In addition, an increase in demographic growth and urbanization has led to an irregular city morphology, slum, and squatter settlement, as the second developing city in Ambon city area, it is feared that in the next 10 years Passo will stagnate, so there is no more land that can be built. Based on the foregoing, a form of handling is needed by increasing / normalizing the urban drainage system so that rainwater flow is expected to be more optimal and shorter drying cycle times in the area.

II. REVIEW OF LITERATURE

The flood estimation equation that will be used for tertiary drainage is calculated based on the Rational formula while

for secondary and primary drainage the Nakayasu formula is used.

$$Qp = \frac{1}{3,6}CIA \tag{1}$$

$$\mathbf{I} = (\mathbf{R}_{24} / 24) * (24 / \mathbf{tc})^{2/3}$$
(2)

Tc = Concentration time (hour)

 $R_{24} =$ Maximum daily rainfall (in 24 hours)

And tc is the concentration time that can be calculated by the equation tc = L/V, dan

$$V = 72 \left(\frac{H}{L}\right)^{0,6},$$

Where :

L = River length in the flow area (km)

V = Flood creepage speed (km/hour)

H = the height of the furthest point upstream from the observation point (km)

$$Qp = \frac{A.R_0}{3,60 \,\mathrm{x} \,(0,3\mathrm{Tp} + \mathrm{T}_{0,3})} \tag{3}$$

where :

 $Qp = peak flood discharge (m^3/second)$

A = watershed area (km^2)

 $R_0 = unit rain (mm)$

Tp =the time period from the beginning of the rain until the peak of the flood (hour)

T_{0.3} = the time taken by the decline debit, from

the main discharge to the discharge, 30% of peak discharge (hour)



Fig.1: Unit of Hidrograf Nakayasu

$$CAll = \frac{C1.A1 + C2 + A2 + C3 + A3 + \dots Cn.An}{A1 + A2 + A3 + \dots An} C$$

flow coefficient from the flow area

A = area of flow (km^2)

III. METHODOLOGY



Fig.2: Passo canal situation



Fig.3: Research Site

Based on the Ambon city spatial plan (RTRW) in 2011-2031 against SWP (development area unit) Passo and surrounding

areas are service areas that are quite extensive to include Ambon Inner Bay (TAD)



Fig.4: Research Flow Chart

IV. RESULT AND DISCUSSION

Hidrology Analysis

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Table 1. Requirements for Distribution Selection Frequency

Type of distribution	Condition	Results	Information
Normal	Cs = 0	0.004 > 0	not accepted
Log Normal	$Cs = 3Cv + Cv^2$	1.226<0,167	not accepted
Log Pearson III	Cs ≠ 0	0,004 > 0	not accepted
Cumbol	Cs ≤ 1,1396	0,004 < 1,1396	not accepted
Gumber	Ck ≤ 5,4002	1.991 < 4,4002	be accepted

From the distribution test results for dk = 3 and $\alpha = 5\%$, then from the chi square test table obtained X2 = 7.815 From the above calculation obtained x2 = 4,571 this value is smaller when compared with the critical value of x2 with degrees of freedom (dk) = 3 the critical f2 value is 7,815. then the Gumbel distribution can be accepted.

• Land Use

In calculating the flood discharge the plan needs to be determined in advance the value of the drainage coefficient, the amount of which depends on the designation of the land

Regional rainfall has been calculated by the Arithmetic method and has produced a maximum annual daily rainfall as in Table

(land use). At the research location found a land use coefficient of 40-70

• Tidal Data

Tidal data used as modeling input used observations for 14 days. Taken on the upstream canal.

• Runoff discharge analysis

For the purposes of the analysis of the drainage system, the maximum rainfall data used for the planned return period of the drainage system is 5 years. To determine the dimensions of the drainage channel it is assumed that the condition of water flow is in a normal condition (steady uniform flow) where the flow has a constant velocity with respect to distance and time.

• Discharge flood plans

The amount of the planned flood discharge is determined by adding up the amount of surface runoff and dirty water discharge. In this study the surface runoff (rainwater) discharge used is a discharge with a return period of 25 years, as shown in table 2

	Table 2 Discharge system plan							
No	Channel	Channel segment	Qrain (m ³ /det)	Q accumulative (m ³ /det)	Qdesign (m ³ /det)			
1	Α	a0-a1	0.8663	0.0034	0.8697			
2	В	b0-b1	0.8663	0.0006	0.8669			
3	С	c0-c1	0.9531	0.0053	0.9584			
4	D	d0-d1	0.4754	0.0032	0.4786			
5	E	e0-e1	0.2640	0.0016	0.2656			
6	F	f0-f1	0.4998	0.0022	0.5020			
7	G	g0-g1	0.2416	0.0016	0.2431			
8	Н	h0-h1	1.5761	0.0026	1.5788			
9	Ι	i0-i1	0.9289	0.0022	0.9310			
10	J	j0-j1	0.7114	0.0015	0.7129			
11	К	k0-k1	1.1430	0.0017	1.1446			
12	L	10-11	0.4906	0.0012	0.4918			
13	М	m0-m1	0.2289	0.0009	0.2299			
		9.2734						

• Design Flood Hydrograph

For the purposes of the calculation of the flood hydrograph, it is necessary to have a base flow calculation.

Table 3. N	Vakayasu	Synthetic	Hydrograph	Unit
------------	----------	-----------	------------	------

	Curved up Curved Down					Debit
Time	0 < t < Tp	Tp < t < To 2	t < To 3 To 3 < t < 1.5To 3 1.5To 3 < t < 24			Hydrograph Unit
t	(t/Tn) ^{2.4}	(t-Tp)	(t-Tp+0.5T_a)	(t-Tp+1.5T)	Koef.	Qt
(Hr)	(01)	<u>т</u>	(1 5T)	(2T)		m ³ /dt
(11)	2	10,3 3	(1.51 _{0,3})	(210,3)	6-2+3+4+5	7
0.00	0.00	3	-	5	0.00	0.0000
0.00	1.00				1.00	0.0000
1.00	1.00	0.910			0.91	0.0331
2.00		2 354			2.35	0.0058
3.00		2.001	2.865		2.87	0.0031
4.00				3.37	3.37	0.0017
5.00				4.09	4.09	0.0007
6.00				4.81	4.81	0.0003
7.00				5.54	5.54	0.0001
8.00				6.26	6.26	0.0001
9.00				6.98	6.98	0.0000
10.00				7.70	7.70	0.0000
11.00				8.42	8.42	0.0000
12.00				9.15	9.15	0.0000
13.00				9.87	9.87	0.0000
14.00				10.59	10.59	0.0000
15.00				11.31	11.31	0.0000
16.00				12.03	12.03	0.0000
17.00				12.76	12.76	0.0000
10.00				13.40	13.40	0.0000
19.00				14.20	14.20	0.0000
20.00				15.64	15.64	0.0000
22.00				16.36	16.36	0.0000
23.00				17.09	17.09	0.0000
24.00				17.81	17.81	0.0000
	0.120	Λ				
	(m3/sec) 0.040					
	0.000	4	8 Dura	12 16 ation (Hour)	2	20 24

Fig.5: Nakayasu Hydrograph of the Passo Canal

• Hydraulics Analysis

For the cross-section analysis in this study the HEC - RAS 4.1 program was used



Fig.6: Geometry Data Input



Fig.7: Existing Qdesign 25 Year + Tidal







Fig.8: Simulation of Existing Channel

	Total Dabit Elevation (m) Doop oly Water level Velocity Top width							
Node	(m2/soc)	Lievau	Diaht	Doen eiv	(m)	(m/soc)	(m)	Informatinon
40	(113/300)	4.45	4.00	0.44	0.40	(11/300)	(11)	everflevve d
40	14.84	1.15	1.08	0.41	2.40	0.37	20	overnowed
45	14.84	1.85	1.00	0.83	2.45	0.41	20	overflowed
44	14.84	1.91	1.92	0.82	2.45	0.42	20	overnowed
43	14.84	1.23	1.43	0.72	2.44	0.52	20	overflowed
42	14.84	1.94	1.85	0.49	2.44	0.39	20	overflowed
41	14.84	1.56	1.57	0.47	2.43	0.52	20	overflowed
40	14.84	1.97	1.8	0.85	2.4	0.88	20	overflowed
39	14.84	1.42	1.36	0.92	2.39	0.6	20	overflowed
38 27	14.84	1.91	1.92	0.94	2.35	0.99	20	overflowed
3/	14.84	2.05	2.05	0.91	2.32	1.13	20	overflowed
36	14.84	2.09	2.03	0.64	2.23	1.54	20	overflowed
35	14.84	1.61	1.45	1.03	1.94	2.19	12.41	overflowed
34	14.84	1.51	1.43	1	1.73	1.76	20	overflowed
33	14.84	0.97	0.66	-0.28	1.63	0.63	20	overflowed
32	14.84	0.33	0.31	-0.22	1.63	0.45	20	overflowed
31	14.84	0.87	0.53	0.01	1.62	0.41	20	overflowed
30	14.84	0.79	0.78	0.04	1.62	0.53	20	overflowed
29	14.84	0.7	0.63	-0.31	1.62	0.47	20	overflowed
28	14.84	1.04	0.97	0.02	1.6	0.61	20	overflowed
27	14.84	1.03	1.01	0.02	1.58	0.8	20	overflowed
26	14.84	1.03	1.05	0.03	1.56	0.73	20	overflowed
25	14.84	0.99	0.92	0.01	1.55	0.72	20	overflowed
24	14.84	1.01	0.91	0.01	1.53	0.86	20	overflowed
23	14.84	1.32	1.3	-0.02	1.14	2.66	5.4	overflowed
22	14.84	0.87	1.17	-0.24	1.34	0.6	20	overflowed
21	14.84	0.7	0.85	-0.24	1.32	0.94	20	overflowed
20	14.84	0.86	0.57	-0.37	1.32	0.65	20	overflowed
19	14.84	1.02	1.06	-0.39	1.16	1.83	19.09	overflowed
18	14.84	0.41	0.5	-0.46	1.21	0.75	20	overflowed
17	14.84	0.55	0.54	-0.44	1.18	0.95	20	overflowed
16	14.84	0.51	0.61	-0.47	1.17	0.89	20	overflowed
15	14.84	0.35	0.19	-0.55	1.17	0.59	20	overflowed
14	14.84	0.33	0.29	-0.48	1.16	0.64	20	overflowed
13	14.84	0.78	0.84	-0.79	1.14	0.88	20	overflowed
12	14.84	1.07	1.51	-0.29	1.06	1.31	9.53	safe
11	14.84	2.07	2.14	-0.18	1.01	1.31	10.54	safe
10	14.84	2.03	2.05	-0.21	0.99	1.08	12.3	safe
9	14.84	-0.71	-0.25	-0.72	0.98	0.68	20	overflowed
8	14.84	-0.31	-0.19	-0.76	0.97	0.79	20	overflowed
7	14.84	-0.27	-0.11	-0.49	0.94	0.83	20	overflowed
6	14.84	-0.27	0.2	-0.89	0.91	0.88	16.79	overflowed
5	14.84	-0.56	-0.17	-0.91	0.89	0.77	20	overflowed
4	14.84	-0.36	-0.68	-0.92	0.86	0.85	20	overflowed
3	14.84	-0.36	-0.56	-0.93	0.85	0.72	20	overflowed
2	14.84	-0.62	-0.93	-1.37	0.84	0.66	20	overflowed
1	14.84	-0.98	-0.83	-1.39	0.84	0.47	20	overflowed
0	14.84	-0.93	-0.48	-1.35	0.83	0.58	20	overflowed

Table 4 Condition of existing channels

• Cross-section Planning

Normalization of the Passo channel with a single cross section is planned with the Manning formula. The type of cross section used follows the maximum cross section capacity because the channel dimension capacity that can be changed in maximum conditions is depth only.
Table 5 Improve Channels

Made	Total Debit	Elevati	ion (m)	Doen elv	Water level	Velocity	Top width	Informatioon
Node	(m3/s ec)	left	Right	(m)	(m)	(m/sec)	(m)	informatinon
46	14.84	2.52	2.52	0.65	2.02	1.09	10	safe
45	14.84	2.48	2.48	0.61	1.98	1.08	10	safe
44	14.84	2.45	2.45	0.59	1.95	1.09	10	safe
43	14.84	2.42	2.42	0.55	1.92	1.08	10	safe
42	14.84	2.39	2.39	0.51	1.89	1.08	10	safe
41	14.84	2.35	2.35	0.48	1.85	1.08	10	safe
40	14.84	2.32	2.32	0.43	1.82	1.06	10	safe
39	14.84	2.29	2.29	0.39	1.79	1.06	10	safe
38	14.84	2.27	2.27	0.34	1.77	1.04	10	safe
37	14.84	2.24	2.24	0.3	1.74	1.03	10	safe
36	14.84	2.21	2.21	0.26	1.71	1.02	10	safe
35	14.84	2.19	2.19	0.21	1.69	1.01	10	safe
34	14.84	2.17	2.17	0.1	1.67	0.95	10	safe
33	14.84	2.16	2.16	-0.23	1.66	0.78	10	safe
32	14.84	2.14	2.14	-0.13	1.64	0.84	10	safe
31	14.84	2.12	2.12	0.01	1.62	0.92	10	safe
30	14.84	2.09	2.09	0.04	1.59	0.96	10	safe
29	14.84	2.09	2.09	-0.31	1.59	0.78	10	safe
28	14.84	2.05	2.05	0.03	1.55	0.97	10	safe
27	14.84	2.03	2.03	0.02	1.53	0.98	10	safe
26	14.84	2	2	0.04	1.5	1.02	10	safe
25	14.84	1.97	1.97	0.01	1.47	1.02	10	safe
24	14.84	1.94	1.94	0.01	1.44	1.04	10	safe
23	14.84	1.91	1.91	-0.02	1.41	1.04	10	safe
22	14.84	1.9	1.9	-0.24	1.4	0.91	10	safe
21	14.84	1.87	1.87	-0.22	1.37	0.93	10	safe
20	14.84	1.82	1.82	0.02	1.32	1.14	10	safe
19	14.84	1.81	1.81	-0.32	1.31	0.91	10	safe
18	14.84	1.8	1.8	-0.41	1.3	0.87	10	safe
17	14.84	1.77	1.77	-0.26	1.27	0.97	10	safe
16	14.84	1.74	1.74	-0.21	1.24	1.02	10	safe
15	14.84	1.73	1.73	-0.55	1.23	0.84	10	safe
14	14.84	1.71	1.71	-0.47	1.21	0.88	10	safe
13	14.84	1.68	1.68	-0.32	1, 18	0.99	10	safe
12	14.84	1.65	1.65	-0.29	1.15	1.03	10	safe
11	14.84	1.6	1.6	-0.18	1.1	1.16	10	safe
10	14.84	1.55	1.55	-0.21	1.05	1.18	10	safe
9	14.84	1.53	1.53	-0.72	1.03	0.81	12	safe
8	14.84	1.52	1.52	-0.76	1.02	0.8	12	safe
7	14.84	1.46	1.46	-0.49	0.96	0.98	12	safe
6	14.84	1.44	1.44	-0.83	0.94	0.8	12	safe
5	14.84	1.42	1.42	-0.91	0.92	0.78	12	safe
4	14.84	1.39	1.39	-0.92	0.89	0.78	12	safe
3	14.84	1.37	1.37	-0.93	0.87	0.79	12	safe
2	14.84	1.36	1.36	-1.37	0.86	0.64	12	safe
1	14.84	1.35	1.35	-1.39	0.85	0.63	12	safe
0	14.84	1.33	1.33	-1.31	0.83	0.66	12	safe
25 20. 15.			Design	Canal Plan: Ru	in FlowKanal passo	12/22/2014		Legend E3 025 Vel 025 Ort 022 Ort 025 - ide - ide - ide
1.0-								



Fig.9: Improved Channel Lengthening



Fig: 10Simulation of Cross Section Improvement

Normalization of the Passo channel with a single cross section is planned with the Manning formula. The type of cross section used follows the maximum cross section capacity because the channel dimension capacity that can be changed in maximum conditions is only depth.

V. CONCLUSION

- 1) In Sub-watersheds that contribute to the flow in the Passo city drainage system that discharges the flow in the canal, the flow will be directed so that the Passo Canal system is no longer burdened with part of the discharge from the micro drainage system according to the Hydrological and Hydrolytic plan criteria.
- 2) For the channel dimensions in the existing condition the channel capacity is sufficient to accept the flood load of the planned 25-year return period, while the plan conditions for the channel dimensions that pass through the access road still follow the channel dimensions of the exciting conditions.

REFERENCES

- [1] Chow, Ven Te. 1997. *Hidrolika Saluran Terbuka*, Jakarta: Erlangga.
- [2] Istiarto, 2010, *Modul Pelatihan HEC-RAS*, Universitas Gajah Mada, Yogyakarta.
- Karnisah, Iin, 2010, Aliran Dalam Saluran Terbuka, KBK Sumber Daya Air JurusanTeknik Sipil, Politeknik Negeri Bandung.
- Kodoatie, J.R., 2009, *Hidrolika Terapan Aliran pada Saluran Terbuka dan Pipa*, Andi Publisher, Yogyakarta.
- [5] Linsley, R. K. Jr., 1996, *Hidrologi untuk Insinyur Edisi Ketiga*, Jakarta, Erlangga.
- [6] Sitepu, 2010, Simulasi Morfologi Dasar Sungai Way Sekampung Menggunakan Software HEC-RAS, Skripsi, Universitas Lampung. Harto, Sri, 1993, Analisa Hidrologi, Gramedia Pustaka, Jakarta.
- [7] Suripin, 2004, Sistem Drainase Perkotaan yang Berkelanjutan, Andi Offset, Yogyakarta.
- [8] Triatmodjo, Bambang, 2008a, *Hidrologi Terapan*, Beta Offset, Yogyakarta.
- [9] Triatmodjo, Bambang, 2008b, *Hidrolika I*, Beta Offset, Yogyakarta.
- [10] Triatmodjo, Bambang, 2008c, *Hidrolilka II*, Beta Offset, Yogyakarta.

Agropolitan Area Development Model as an Effort to Improve Local Economic Growth Enrekang District

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> Abstract— The development of the Belajen Agropolitan area, characterized by agricultural activities, can improve the local economy. This research aims to study and analyze the development model of Agropolitan area as well as its influence on local economy. This research uses quantitative and qualitative approaches, data obtained through observation, surveys, documentation and questionnaires, case studies in this writing were chosen to answer the question of how to conduct or implement the model development of local economic-based Agropolitan areas. While quantitative analysis to measure the influence between variables using multiple regression with the Eviews program, Samples of 30 farmers in the Agropolitan area. The results of the study gave the idea that the use of Agropolitan area development model in the form of upstream-aquaculture model in Agropolitan area running is not optimal especially on the downstream model that the agroindustry process has not been running with the economic constrition and labor absorption. Downstream does not go well, this can be seen from activities on the area of Agroplitan on the downstream activities only limited to conducting marketing activities products of cultivation, but there is no activity how to cultivate or process an agroindustry that is raw material into a final product ready for consumption. Until the future development of the model downstream in the area of Agropolitan Belajen can not be separated with upstream sub system and cultivation. The need for models that conform to the spatial structure of the area of Agropolitan Belajen is absolutely absolute, so that the productivity of horticultural crops can further provide a coherence to the regional economy. Keywords— region development Model, productivity, and the local economy.

I. INTRODUCTION

The gap between urban and rural areas resulted in poverty in the rural area, and uncontrolled urbanization process increasingly urged land productivity. Based on the fact, it has been affirmed in the national program that the main target of development is declining number of the poor and the creation of employment that is able to reduce open unemployment supported by Economic stability is maintained and the second target is reduced gaps between regions. One of the concept of rural development planning is development with the region model. With the development of this area is expected to be able to improve the community economy around the area. Formation of the region can benefit from economic agglomeration, namely increased productivity of business derived from spatial concentrations of economic activity (Krugman 1991, Newman and Page 2017)

The basic concept of Agropolitan development is an effort to create a balanced regional development, especially by increasing the linkage of rural city development that is integrated in urban system functionally and spatially. Economic development of local community/rural is very important, with the effort to optimize the utilization of local resources through the development of community economy, social capital investment and human capital, investment in the field of infrastructure and resources Natural.

Social capital in the local community is more important in developing the regional economy, (J. Rudnick et al. 2019 & Beugelsdijk, S., & Van Schaik, T. 2005), meaning the role of community groups in agricultural activities is decisive in the development of Economic. The development of Agropolitan areas is carried out by the efforts to increase capacity of building in the community and government level in order to ensure the main benefits can be enjoyed by the community (Charron, N., Dijkstra, L., & Lapuente, V. 2014). In law No. 26 of 2007 about spatial arrangement, that Agropolitan area is an area consisting of one or more centers of activities in rural areas as agricultural production system and the management of certain natural resources Demonstrated by the functional interconnectedness and hierarchy of system of residential units and agribusiness system. It is explained also that the spatial plan of rural areas is part of the district spatial plan that can be compiled as a space utilization instrument to optimize agricultural activities that can form Agropolitan areas. Enrekang District Regulation No. 14 Year 2008 (RPJPD year 2008-2028). Agropolitan areas are established and centered on the Agropolitan area of the district of Alla. Agropolitan Area Belajen District Enrekang, identified to have potential natural resources in the agricultural sector and has a superior commodity in horticultural crops, the condition is also supported by human resources potential Dominant work on agricultural sectors. Belajen Agropolitan area identified not optimal development in terms of achievement of production business based on economic business and regional based excellence. According to Budiningsih (2015), the development of Agropolitan area can not be done only by local government, but need to involvement of various stakeholders, especially existing farmers in Agropolitan area with farmers institutional strengthening pattern And revitalizing the farmer group as an important element in the development of Agropolitan areas. Meanwhile, according to Bahua, M.I., M. Arsyad, M.H. Jamil (2016),

To develop an Agropolitan area in Enrekang District, it is needed a model of upstream to downstream development so that the development process will not be hampered from production, post production, transportation, to processing. In order to implement this policy, a strategic linkage development strategy that includes regional economic governance, human resource quality/competence, infrastructure, public private partnership, and development facilities Local economic Area. It is necessary as a requirement to focus on the action for the development of mainstay, regional growth centers such as core competency based industrial area industry in the area of cluster shaped production center, new urban area. The area is expected to trigger the improvement of Community welfare and increase the regional genuine revenue through the development of superior products with market assurance.

II. RESEARCH METHODOLOGY

The selection of research locations is based on consideration; (a) that the district of Alla is the location of production centers and producers of horticultural commodities, (b) The main activity of the dominant population working in the agricultural sector or 29.44%, of the total population. This article is aimed at reviewing and analyzing the application model of the Belajen Agropolitan development area. Thus, the type of research chosen is the case study using a quantitative-qualitative approach. The reason for the protection of both approaches is; (i) The growing reality is not singular but plural, (ii) This paper is intended to describe the local economic potential related to the development of the Belajen Agropolitan region, and (iii) Belajen's agropolitan area is completely developed optimally through Agropolitan development model of upstream downstream. Qualitative research will be able to capture a variety of qualitative information with a description, which is more valuable than merely statement of number or frequency in the form of numbers, evaluate the potential based on certain criteria, among others, Issues of farmers on Agropolitan, climate, social economic, demographic and agroecological diversity and know the role of government and non-government (Forch et al, 2013). Subsequently Bog and Biklen (1982), asserted that case studies were research that sought to describe a particular setting, object or event. Thus the case study in this article was chosen to answer the question of how implementation or implementing a model of Agropolitan-based local economic development. Quantitative analysis to measure the influence between variables using multiple regression with the Eviews program, with samples of 30 farmers present in Agropolitan areas.

III. RESULTS AND DISCUSSION

Potential of Agropolitan areas of Belajen

City of Belajen located in the administration area of Alla District, Kota Belajen consists of 3 (three) environments, namely the North Belajen area of 3.05 km², the western Belajen environment covering an area of 3.38 km² and the East Belajen environment area of 1.63 km². Geographically The location of Kota Belajen is located north of the city of Enrekang within 38 Km and located in the north of Makassar City is about 265 Km on the regional road to Tana Toraja Regency. Division of Kota Belajen aims as strategic director of regional development of the city.



Figure 1. Location Map of Agropolitan Belajen District Enrekang

Agropolitan Area Belajen District of Alla, which set has an area of approximately 457.60 Ha. From the area's total physically spatial and geographic areas, the Belajen Agropolitan region is supported by the presence of Alla Mata's eyes as a contributing factor to increased agricultural sector productivity and particularly in the efforts to increase Production of vegetable and fruit horticultural commodities. Thus, the Belajen Agropolitan area has direct influence on the existence of surrounding villages as the location of agricultural production centers. Potential of hinterland of Belajen Agropolitan area which is dominant with rural agrarian and community business activities oriented to the development of commodity horticultural vegetables and fruits.

No.	Plant type	Harvest Area	Production (hundreds of Tons)
1	Rice	78	3.276
2	Corn	20	0.72
3	Cassava	11	1.87
4	Sweet potato	4	0.58
5	Cabbage	91	209.5
6	Tomato	38	6.49
7	Onion	81	90.65
8	Scallion	31	32.3
9	Red Chili	12	6.12
10	Beans	9	5.7
11	Rawit Cabet	30	19.16
12	Siamese Pumpkin	10	20.5
13	Peanut	14	0.182

 Table 1. Extensive and horticultural crops in the Agropolitan area of Belajen

 No.
 Plant type

 Plant type
 Production (hundred)

Source: Office of the Food plant Department of Enrekang District, 2019



Picture. 2. Development of Community Business field in Agropolitan area

From picture 2 above, some interpretation can be submitted, ie; (1), potential population of Agropolitan area of Belajen dominant as farmer or as many as 1,389 people (29%). That is, that the agriculture sector is the dominant activity of leading sectors of economic growth in the district Alla. (2). Horticultural commodities and fruits are the main commodities developed by the population. That is, that the orientation of the main activities of the population associations positive towards the development of agropolitan areas and local economic potential. (3). The dominant human resource potential engaged in the agriculture sector, become the basic capital in the development of Agropolitan-based areas of farmer empowerment. (4). Trading activities at the center of the Agropolitan area is sufficiently developed, characterized by the number of people engaged in trading efforts of 465 people or 10%. That is, that the mechanism of marketing of agricultural produce is not experiencing obstacles in the process of developing the Belajen Agropolitan area. Thereby, it can be concluded that the development of the Belajen Agropolitan area will require the integration of farmer activity patterns in terms of increasing agricultural production, processing agricultural products through rural agribusiness and marketing systems sustainable production through the optimization of economic potentials and transport transportation services.

Model of Agropolitan area development in Belajen

Agropolitan areas can be developed and sustainable when the development model is well executed consisting of:

a. Upstream efforts on Agropolitan areas

Including the procurement of agricultural production facilities, among others, consisting of seeds, seedlings, fertilizers, medicine pests and diseases, credit institutions, fuels, tools, machinery, and equipment agricultural production. Perpetrators of procurement and distribution of production facilities are individuals, private companies, governments, cooperatives. How important this subsystem remembers the need to be the alignment of various elements to realize the success of agribusiness. Industries that provide agricultural production facilities are also referred to as upstream agroindustry.

b. Farming

Farming produces agricultural products in the form of foodstuffs, plantation crops, fruits, flowers and ornamental plants. Perpetrators of the activities in this subsystem are producers consisting of farmers, etc.

c. Downstream ventures

In this subsystem there is a series of activities ranging from the collection of agricultural products, processing, storage and distribution. Some of the At this stage of the division of work in agriculture activities become increasingly clear, namely: farming activities as agricultural activities in a narrow sense, the production of farm supplies as an upstream industry and agricultural commodity processing activities AS Downstream industry. Produced from the farmer's business are distributed directly to consumers inside or outside the country. Some others undergo first processing process and then distributed to consumers. Perpetrators of the activities in this subsystem are collectors of products, processors, merchants, distributors to consumers, Canning and others. Industries that process farming products are called downstream Agro-industry. The role is very important when placed in the countryside because it can be the motor of driving economy wheels in the countryside, by absorbing/creating employment so as to increase the income and welfare of rural communities.

At this stage of the division of work in agriculture activities become increasingly clear, namely: farming activities as agricultural activities in a narrow sense, the production of farm supplies as an upstream industry and agricultural commodity processing activities as downstream industry. The research results in Agropolitan area by looking at the development model of Agropolitan area, has been implemented Upstream, cultivation and Downstream, statistic by using program of regression analysis of Eviews method obtained results:

Dependent Variable: Y Method: Least Squares Date: 04/19/19 Time: (Sample: 1 30 Included observations :	06:41 30				
Variable	Coefficient	Std. Error	t-Statis tic	Prob.	
c	10.98566	7.295704	1.505771	0,1442	
X1	0.556256	0.280044	1.986313	0.0576	
X2	0.711582	0.297121	2.394926	0.0241	
X3	0.102650	0.298582	0.343792	0.7338	
R-s quared	0.528151	Meandepend	ient var	49.53333	
Adjusted R-squared	0.473707	S.D. depende	ent var	5.462.937	
S.E. of regres s ion	3.963144	Akaike info cri	iterion	5.715518	
Sum squared resid	408.3692 0	Dependent Vari	able: Y		
Log likelihood	-81.732771	Method: Least S	jouares		
F-statistic	9.7008090	Date: 04/19/19	Time: 06:41		
Prob (F-s ta tis tic)	0.000180 5	Sample: 1 30			

Table 2. Multiple regression analysis results with Eviews

Source: Processed data, 2019

The statistic of the implementation of the development model of Belajen Agropolitan area in Enrekang district, can be explained that partially indicated by T-Statistic X₁ (the business of Upstream) with a value of 1.986 greater than the T-table 1.697, meaning variable X₁ partially influential to the Y (development of Agropolitan areas), as a system of economic activity, Agropolitan activities divided into three sub systems are intertwined with each other. Sub system is upstream sub system, downstream sub system and cultivation sub system (processing). The development of Belajen Agropolitan area that supports the increase of production of superior commodities, such as the provision of agricultural sector production facilities, Provision of infrastructure and supply of refrigeration machines and other means, has been provided by the Government so as to support the development of agropolitan areas in increasing productivity in the region. According to G. Rasul and Sharma (2014), the role of government, effective administration and major investment is the main thing in increasing economic growth, meaning that the Agropolitan region can develop when there is a government role and development of various Infrastructure on agricultural sectors. Meanwhile, according to B. Mueller, C. Mueller (2016), in Brazil the policy in agriculture works best with the network with various related markets, good institutional existence, and without intervention so that free farmers thrive, means the agricultural sector will

advance when there is an infrastructure required by farmers.

For variable X₂ (farming cultivation) the value of T-Statistic 2.394 is greater than the T-table 1.697, has a significant influence means farming business in the area of Agropolitan goes well. The cultivation development Model of the Belajen Agropolitan area plays an important role in the development of Agropolitan areas. Based on the diversity of agricultural products Enrekang, it takes the concept of developing agropolitan areas that are integrated horizontally. The biggest benefit of integrated and thorough agricultural production is not only through the processing technique of one branch of the business, which is derived on the branches of other farmers. Azas conformity and complement each other in the application of various excellent techniques in the processing of agricultural enterprises that produce positive and synergistic interaction is a major foundation in the development of integrated agricultural enterprises.

Diversification of agriculture sector efforts in the framework of the integrated agricultural sector business model should certainly be directed towards the sustainability of agricultural commodities. Therefore, attention should be centered on using the local resources efficiently. The development of Agropolitan areas is also aimed at the sustainability of the ecosystem in the ecoregion. Intensification of agricultural efforts with the productivity, stability and sustainability of income and community participation. The success of an integrated agricultural program is determined by the ability and accuracy in determining the commodity, cultivation and development techniques in accordance with the specific local conditions of each ecoregion, so that the Agropolitan models developed in addition Can meet the high productivity criteria also meet the socio-cultural criteria.

As for the activities downstream (X_3) the value of 0.343 is smaller than the T-table value of 1.697 thus insignificant, meaning that the downstream does not go well, this can be seen from the activities of Agropolitan areas on activities downstream is limited to doing marketing activities of cultivation products, but there is no activity how to cultivate or process the agroindustry that is the raw material into the final product ready to be consumed. Until the future development of the model downstream in the area of Agropolitan Belajen can not be separated with upstream sub system and cultivation. The

need for a model that corresponds to the structure of the spatial area of Agropolitan absolute Belajen.

Based on the theory and concept of Agropolitan area development, the Belajen Agropolitan area needs to do the development that is vertical. This concept means recommending that Agropolitan activities in Belajen be the main drivers. The Model is very suitable because it is able to accommodate economic activities and in accordance with the planned spatial structure of the Belajen Agropolitan area. Economic activities based on trading of agricultural sector commodity in the form of backward and forward team that are associated with upstream cultivation-downstream system. According to P. Dorosh, J. Thurlow (2018), the level of elasticity is higher for agricultural products than non-agricultural as a whole, meaning that agricultural products in terms of prices vary according to the season and consumer demand.



Picture. 3. Agropolitan Area Development Model

In the model of development of Agropolitan area of Belajen give social economic benefits, namely if the area of Agropolitan develop then the higher labor absorption, increase economic output as well as local economic growth and Community income, thereby giving effect to improving people's welfare.

Local Economic Development

Agricultural sectors play an important role in the economic development of an area, agricultural sector development is determined by the use of technology means how to utilize the results of research in developing agricultural sectors, according to Keith Fuglie (2016), technology has considerable importance and is increasingly important for developing countries in developing agricultural sectors. This indicates that an area with potential agriculture needs to utilize technology and develop agricultural areas professionally based on the excellence that has, the local economy is growing.

Local development economic based on agriculture is an orientation process, which puts the formation of new institutions, development of the alternative industry, increasing the capacity of actors to produce better products, identification New markets, the transfer of science, and stimulate the rise of new ventures and entrepreneurial spirit. According to Edmund Amann, Armando Barrientos, (2016), in overcoming challenges in economic development, can harness the strengths and abilities of the community by managing resources and natural resource-based products, So that economic growth will be sustainable, meaning that the management of agricultural sectors, especially in agropolitan areas, can provide a coherence to regional economic growth.

Expected in the development of local economies, agricultural activities in its development will be oriented to

the market (consumers) in case of the spread of resources and the production factor is evenly and the transportation is relatively cheap. This market orientation will show that each location can produce a superior agricultural commodity. According to Perez, C., Marin, A., & Navás-Aleman, L. (2014), the Economic development model can be sustainable when the products produced have comparative advantages in agriculture, increase productivity and increase the value added from Products produced, it is indicated that to increase the development of an area in line with the model of Agropolitan, namely downstream means that the resulting product must have economic added value.

With the proliferation of upstream, cultivation and downstream models of Agropolitan companions, agricultural activities will be more developed due to the convenience of consumers who come from inside or outside the location to come to Marketing location of the agricultural commodity, the development of Agropolitan areas can give constriction to the economic structure of the region. The economic structure of Enrekang District for 5 years has been reported to be less shifting, where the role of agriculture sector is still dominant with average still above 43.16%. The high contribution of the agricultural sector is supported by subsectors of the plant, the average contribution of food above 36% per year. Next table 3, the economic structure of Enrekang District:

No	Business field		PDRB D	evelopme	nt (%)	
		2013	2014	2015	2016	2017
1	Agriculture	41,96	42,76	42,65	42,45	43,16
2	Mining & Excavations	2,96	3,08	3,58	3,73	3,69
3	Industrial processing	9,83	12,35	12,65	12,34	12,15
4	Electricity, Gas, & drinking water	0,59	0,52	0,46	0,45	0,44
6	Building	4,69	4,48	5,78	5,80	5,31
7	Transportation & Communications	2,42	2,41	2,18	2,27	2,29
8	Bank & Financial Institutions	3,45	3,83	3,97	4,05	3,90
9	Services	20,35	24,60	29,89	28,32	28,66
PDF	RB	100	100	100	100	100

Fable 3. Economic structure of Enrekang District 2013-20	.7
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Source: Agency of the Statitic Center, 2019

The existence of Belajen Agropolitan area in Enrekang District, contributing to the development of local economic, agricultural production is the most coherence to economic growth, in the area of Agropolitan is expected to model the development of Agropolitan area is upstream-aquaculture downstream, so productivity and value added is greater.

IV. CONCLUSIONS

The areas of Agropolitan Belajen have the potential of natural resources and human resources that are engaged in the agricultural sector, in the implementation of the development of Agropolitan area has been running which is the process of upstream of the provision of infrastructure Agricultural that regenerate from the procurement of seedlings, fertilizer, medicines, warehousing, the provision of irrigation and the availability of the economic and cooperative banking. Similarly, in cultivation, farmers in the Agropolitan region have done the cultivation of horticultural farming as the flagship product of the region. For the model of downstream has been running in the area of Agropolitan but not optimal, meaning downstream activities are only limited to the marketing of agricultural products, have not conducted agro-industry activities that cultivate horticultural results into products that can be International market, such as products that are packaged in the form of cans that are managed by the industry.

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VI. DISCLOSURE STATEMENT

No potential conflict of interest was reported by the author.

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REFERENCES

- Bahua, M.I., M. Arsyad, M.H. Jamil (2016). Farmers Community Empowerment through Institutional Strengthening of Rural Food Barn. International Journal of Agriculture System, 4(2):161-167. DOI: http://dx.doi.org/10.20956/ijas.v4i2.689
- [2] Bernardo Mueller, & Charles Mueller (2016). The political economy of the Brazilian model of agricultural development: Institutions versus sectoral policy. The Quarterly Review of Economics and Finance 62 (2016) 12–20. https://doi.org/10.1016/j.qref.2016.07.012
- Beugelsdijk, S., & van Schaik, T. (2005). Social capital and growth in European regions: An empirical test. European Journal of Political Economy, 21, 301–324 <u>https://doi.org/10.1016/j.ejpoleco.2004.07.004</u>
- [4] Bog & Biklen, 1982. *Qualitative Research for Education*. United States of America: McGraw-Hill,Inc.
- [5] Budiningsih, W. (2015). Pemberdayaan Petani Melalui Penguatan Modal Kelembagaan Petani Di Kawasan Agropolitan Kecamatan Belik Kabupaten Pemalang (Farmer Empowerment Through Capital Reinforcement Of Farmers Institution At Agropolitan Area Of Belik Sub District, Pemalang Rege). Agriekonomika, 4(1), 50-58. http://journal.trunojoyo.ac.id/agriekonomika/article/vie w/673
- [6] Charron, N., Dijkstra, L., & Lapuente, V. (2014). *Regional governance matters: Quality of government within European Union member states.* Regional Studies, 48(1), 68–90. http://dx.doi.org/10.1080/00343404.2013.770141
- [7] Edmund Amann, Armando Barrientos, (2016). *Introduction – Is there a Brazilian development 'model*. The Quarterly Review of Economics and Finance 62 (2016) 7–11. DOI: 10.1016/j.qref.2016.07.013
- [8] Förch, W., Sijmons, K., Mutie, I., Kiplimo, J., Cramer, L., Kristjanson, P., Radeny, M. (2013). CCAFS Sites' Portfolio in the CCAFS Regions: East Africa, West Africa and South Asia. Version 3. http://dx.doi.org/10.1080/14735903.2017.1336411.
- [9] G. Rasul and E. Sharma, 2014. Understanding the poor economic performance of Bihar and Uttar Pradesh, India: a macroperspective Regional Studies, Regional Science,

Vol. 1, No. 1, 221–239, doi.org/10.1080/21681376.2014.943804

- [10] Harun, Uton Ruston (2004) Perencanaan Pengembangan Kawasan Agropolitan Dalam Sistem Perkotaan Regional Di Indonesia. Bogor. Crespent Press.
- [11] Jessica Rudnick, Meredith Niles, Mark Lubell & Laura Cramer (2019) . A comparative analysis of gover-nance and leadership in agricu-ltural development policy networks. World Development 117 (2019) 112–126. https://doi.org/10.1016/j.worlddev.2018.12.015
- [12] Keith Fuglie, (2016). The growing role of the private sector in agricultural research and development worldwide. Global Food Security. Volume 10, September 2016, Pages 29-38. https://doi.org/10.1016/j.gfs.2016.07.
- [13] Krugman, Paul. 1991. *Geography and Trade*. Cambridge, MA: MIT Press
- [14] Lightfoot, C., Noble, R. (2001). Tracking the ecological soundness of farming systems: instruments and indicators. Journal of Sustainable Agriculture 19(1): 9-29 <u>https://doi.org/10.1300/J064v19n01_03</u>
- [15] Mahi K.A., (2015), Agropolitan : Teori dan Aplikasi, Graha Ilmu, Yogyakarta.
- [16] Newman, Carol, and John Page. 2017. Industrial Clusters: The Case for Special Economic Zones. WIDER Working Paper 2017/15. https://www.wider.unu.edu/sites/default/files/wp2017-15.pdf
- [17] P. Dorosh, J. Thurlow (2018). Beyond Agriculture Versus Non-Agriculture: Decomposing Sectoral Growth–Poverty Linkages in Five African Countries. World Development 109 (2018) 440–451. https://doi.org/10.1016/j.worlddev.2016.08.014
- [18] Pawana Nur Indah, Zainal Abidin Sam, Effi Damaijati,
 (2017). *Identifying Potential Estate Commodity for Agropolitan*. International Journal of Agriculture System
 (IJAS) Development in Ponorogo, *Accepted: Jun 9, 2017* Volume 5 Issue 1 June 2017 (60-68).
 DOI: http://dx.doi.org/10.20956/ijas.v5i1.1171
- [19] Perez, C., Marin, A., & Navás-Aleman, L. (2014). The possible dynamic role of natural resource based networks in Latin American development strategies. In G.Dutrenit, & J. Sutz (Eds.), National innovation systems, social inclusion and development. Cheltenham: Edward Elgar. https://www.elgaronline.com/view/9781782548676.00018 .xml
- [20] Soenarno. (2003). Pengembangan Kawasan Agropolitan Dalam Rangka Pengembangan Wilayah. Jakarta

In vitro control of *Colletotrichum lindemuthianum* by *Trichoderma* spp. and *in vivo* with Alternative Products

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Abstract— Beans (Phaseolus vulgaris) are extremely important because it is included daily in the diet of themajority of the Brazilian population. Several factors negatively affect the productivity of this crop, especially diseases. One of the main ones is anthracnose (Colletotrichum lindemuthianum), which can cause total production damage and depreciation of the final product. The study and development of new strategies for integrated anthracnose management can reduce the cost of production and consequently reduce environmental impacts. The objective of this work was to evaluate the efficiency of Trichoderma fungi in in vitro tests (antagonism, production of volatile and non-volatile compounds) for control of C. lindemuthianum and to evaluate the efficiency of endophytic fungi, salicylic acid, copper phosphite, acibenzolar-S-methyl (ASM) and fungicide for anthracnose control in greenhouse bean plants. Anthracnose was controlled in bean plants with the use of alternative products. The endophytic fungi Trichoderma viride and Trichoderma tomentosum inhibited C. lindemuthianum mycelial growth in the three in vitro tests. In greenhouse, T. viride, T. tomentosum, salicylic acid, ASM and fungicide were effective, but copper phosphite was not efficient in controlling anthracnose.

Keywords— anthracnose, Phaseolus vulgaris, salicylic acid, copper phosphite, acibenzolar-S-methyl, azoxystrobin + diphenoconazole.

I. INTRODUCTION

The bean (*Phaseolus vulgaris* L.) is a plant originating from Latin America, grown mainly in tropical and subtropical regions of the globe. Beans are an important source of protein for populations of developing countries, especially for the lower income classes. [1].

This legume adapts to different edaphoclimatic conditions. However, this wide adaptability has favored the emergence of pests and especially diseases that compromise the productivity and quality of the final product[2].

Anthracnose caused by *Colletotrichum lindemuthianum* (Sacc. &Magn.) Lams. Scribis the main fungal disease of bean crop. It is a devastating disease in regions with moderate temperatures and high relative humidity, which can cause up to 100% damage to grain yield in highly susceptible cultivars and compromising seed quality[3].

The causative agent of anthracnose can cause symptoms in all organs of the plant shoot. In the stem and petiole, the lesions are depressed and dark and may deepen into the infected tissue if environmental conditions are favorable. The most characteristic leaf symptoms appear on the abaxial face with darkening along the ribs. Rounded lesions, initially light brown in color, evolving to depressed and dark lesions with a lighter center are observed in the pods. When conditions are favorable, a pink mass develops in the lesions center due to fungus spore production[4].

Among the main methods for controlling anthracnose in beans are chemical control and use of resistant cultivars. However, chemical control with fungicides can cause soil, environmental and human contamination, while plant resistance in cultivars can be broken by the pathogen.

New alternatives for disease control are replacing the use of fungicides and contributing to modern and more sustainable agriculture to protect plants and maintain a less pesticide-dependent disease defense system [6]. Therefore, one of the possibilities of alternative control is the biological control and induction of defense mechanisms in plants [7].

The objective of this work was to evaluate the efficacy of alternative products applied in bean plants to control

anthracnose in greenhouse and to analyze antagonistic characteristics of endophytic fungi*Trichoderma viride*(Pers.) and*Trichoderma tomentosum*(Pers.) for control of*Colletotrichum lindemuthianum in vitro*.

II. MATERIAL AND METHODS

The experiments were carried out at State University of Ponta Grossa(UEPG), located in Ponta Grossa - Paraná (Brazil), conducted in a laboratory and greenhouse.

In vitro experiments consisted of analyzes of the antagonistic effect and production of volatile and nonvolatile compounds of *T. viride* and *T. tomentosumonC. Lindemuthianum* growth.

For the antagonistic effectstudy, the paired culture technique was used in Petri dishes [8]. 5 mm diameter discs of endophytic and phytopathogenic fungi colonies previously grown in potato-dextrose-agar (PDA) medium were placed on opposite sides, equidistant, in plates containing PDA culture medium. Plates containing only the pathogen were the witness.

To evaluate the production of volatile metabolites, two Petri dishes containing PDA medium were used. In one was placed a culture disc of the pathogen and in another plate a culture disc of the antagonist. The plaque with the pathogen was superimposed on the plaque with the antagonist and these were wrapped in plastic wrap. The control consisted of a plate containing the pathogen overlaid with another plate containing only PDA medium[9].

The evaluation of nonvolatile metabolites production was performed by the cellophane paper method, which consists of transferring a colony disc from the antagonist to the center of Petri dishes containing PDA medium, overlaid with washed and sterilized transparent cellophane paper [9]. Seven days after of the antagonist transfer to cellophane paper surface, the adherent growth paper was removed from the plate and a pathogen colony disc was transferred to the plate'scenter. The control consisted of pathogen cultivation after cellophane removal, without previous antagonist overlap.

The three tests plates with colonies were kept in a BOD chamber at $25^{\circ}C\pm1$. The design used was completely randomized with 3 treatments (*T. viride, T. tomentosum* and control) and 10 replicates for each test, in each Petri dish containing the colonies a repetition was considered. For all tests, daily ray measurements were performed on two diametrically opposed axes, with the aid of a millimeter ruler.

At the end of each experiment, the percentage of mycelial growth inhibition was calculated [10].

The obtained data were submitted to analysis of variance and the means compared by Tukey test at 5% probability. Data were transformed into arc sen $\sqrt{(x + 0.5)} / 100$ and the analyzes were performed with the aid of SASM-Agri statistical software[11].

The experiments were conducted in greenhouse and repeated twice. The first experiment began on October 27, 2017 and the second on April 20, 2018.

The cultivar BRS Esteio was used, with two seeds sown in each pot with capacity of 3 liters of soil with black earth soil, using MAP (mono ammonium phosphate) fertilizer, with a dose of 21 mg per pot. The experimental design used was randomized blocks with 7 treatments and 5 replications, two pots with one plant considered a repetition.

The treatments used were: suspension of *T. viride* conidia; suspension of *T. tomentosum* conidia; salicylic acid ($C_7H_6O_3$; 10 mmol L^{-1}); acibenzolar-S-methyl - ASM (Bion[®]; 25 g ha⁻¹);azoxystrobin + diphenoconazole fungicide (Amistar Top[®]; 500 mL ha⁻¹); copper phosphite(N 11%; P₂O₅ 22%; S 1.76%; Cu 4%; 1000 mL ha⁻¹) and control (sterile distilled water).

The treatments were sprayed when bean plants were in vegetative stage V3 (first developed trifoliate). For all treatments, 20 mL of syrup was applied to each plant with the aid of a hand sprayer.

The inoculation of the pathogen *C. lindemuthianum* conidial suspension was performed three days after the treatments application. For inoculum production, pod-like culture medium was used [12]. The plants were inoculated by spraying the conidia suspension and after the pots were placed in moist plastic transparent bags for 48 hours and kept in a greenhouse. [13].

The assessment of anthracnose severity began with the onset of the first leaf symptoms and was performed according to diagrammatic scale [14] with a five-day interval in cotyledonary leaves up to the fourth trifolium, totaling 10 evaluations. With severity data the area under the disease progress curve (AUDPC) was calculated [15]. The AUDPC values were subjected to analysis of variance and means compared by the Scott-Knott test at 5% probability, with the aid of SASM-Agri software. [11].

III. RESULTS AND DISCUSSION

The evaluation period for mycelial growth of the fungus *Colletotrichum lindemuthianum* was seven days for the three tests, with colony size measured daily. Endophytic fungi (*T. viride* and *T. tomentosum*) affected the pathogenic fungus *C. lindemuthianum* in all tests.

For the test of antagonistic effect of endophytic fungi on the pathogenic fungus, it was found that there was significant difference between the treatments used (Table 1). The fungus *T. tomentosum* provided higher percentage of mycelial growth inhibition of the pathogenic fungus, differing from *T. viride* and both differed from the control when evaluated daily. On average, endophytic fungi differed only from the control, with no differences between them.

It was observed that the highest inhibition percentage occurred on the third day of evaluation, with 83.25% for *T. viride* fungus and 80.0% for *T. tomentosum* fungus. However, on average there was no statistically significant difference between endophytic fungi.

After the third day, the percentage of inhibition of endophytic fungi on the pathogen decreases for both treatments by the seventh day evaluationsend. This can be explained by the fact that fungi of the genus *Trichoderma* have very accelerated mycelial growth rate (IVCM), whereas those of the genus *Colletotrichum* have lower IVCM. With accelerated IVCM, endophytic fungi had already occupied most of the Petri dish by the experimented.

In a study by Sharma et al. [16] also observed a reduction in growth of *Colletotrichum capsici*(Syd. & P. Syd.) and *Colletotrichum truncatum* (Schwein) by *T. harzianum* when the plating pairing test was performed, with no growth of endophytic fungus on pathogens.

In tests conducted by Sundaramoorthy and Balabaskar [17], the percentage of mycelial growth inhibition of *Fusarium oxysporum*f. sp. *lycopersici*((Sacc.) Snyder & Hansen) by the antagonism of different *Trichoderma* species by the paired cultivation method was only 39.12% when using *T. viride*, contrary to the results of this work.

In the susceptibility evaluation of *C. lindemuthianum* to volatile compounds produced by endophytic fungi, it was found that there were significant differences only between endophytic and control in both daily and final average evaluations (Table 2).

The highest percentage of mycelial inhibition of both endophytic fungi was observed on the second day of evaluation, in which *T. tomentosum* resulted in 78.57% and *T. viride* in 72.36% of pathogen inhibition.

In this test there was also a decrease in the percentage of inhibition over the days, as verified in the test for the antagonistic effect. These data confirm the greater antagonistic interaction for *C. lindemuthianum* inhibition found in pairing studies previously discussed.

Isaias et al. [18] evaluated the susceptibility of *Sclerotium rolfsii*(Sacc) and *Verticillium dahliae*(Kleb) to volatile and nonvolatile metabolites secreted by *Trichoderma* isolates and found that there was variation in the percentage of mycelial growth inhibition of these pathogens. The results

show that there was a reduction of growth around 60% of the fungus *S. rolfsii*when submitted to some isolates only. For *V. dahlie*, all *Trichoderma* isolates showed approximately 80% inhibitory action.

No inhibition of mycelial growth of *Sclerotiniasclerotiorum*((Lib.) DeBary) was observed when *T. tomentosum*was used [19] suggesting that the volatile metabolites produced by this species have no effect on mycelial growth of the pathogenic fungus.

When analyzing the secretion of nonvolatile compounds by *Trichoderma* species, it was concluded that there was a high inhibition of apical pathogenic fungus on the second day of evaluation (Table 3), in which *T. tomentosum* and *T. viride* were similar (89.40 and 83.87% inhibition respectively).

From the third day there was a decrease in inhibition for both fungi tested. However, there were statistical differences between the fungi tested in daily evaluations, being the fungus *T. tomentosum* with higher inhibition percentages. Overall, no statistically significant differences were observed between the two endophytic fungi.

The results obtained by Isaias et al. [18] demonstrated that there is production of volatile and nonvolatile compounds by *Trichoderma* species that inhibited mycelial growth of pathogenic microorganisms, but such microorganisms may or may not be susceptible to the compounds. In the present work, it is evident that the fungus *C. lindemuthianum* is sensitive to volatile (Table 2) and non-volatile (Table 3) compounds produced by the *Trichoderma* species tested.

Raza et al. [20] found that nonvolatile compounds produced by *T. harzianum* SQR-T037 significantly inhibited mycelial growth of *Fusarium oxysporum* f. sp. niveum (Smith).

In another experiment, Joshi et al. [21] found that nonvolatile compounds produced by 33 different *Trichoderma* species inhibited around 40 - 55% mycelial growth of the fungus *Colletotrichum falcatum* (Went), the causal agent of sugarcane red rot.

Assessments of anthracnose severity in greenhouse began with the onset of the first symptoms at three days after pathogen inoculation in the first experiment and five days after inoculation in the second experiment, where severity was lower than in the first experiment.

In both experiments, symptoms were first observed in cotyledonary leaves, progressing to trifolium as the plant developed.

It was observed that in the first experiment (Table 4) all treatments were statistically equal and differed only from copper phosphite treatment, which presented higher AUDPC compared to the others even higher than the control. These results contradict those obtained by Gadaga et al. [5], where the authors applied different phosphite formulations and evaluated the severity of anthracnose in greenhouse, resulting in all applied products causing disease reduction and lower AUDPC than the control.

For the second experiment, the plants that received the *T*. *viride* and *T*. *tomentosum* treatment presented the lowest severity (Table 4), being statistically different from other treatments. The treatments salicylic acid, acibenzolar-S-methyl and fungicide did not differ from each other but were statistically superior to the control and copper phosphite. Copper phosphite treatment presented higher AUDPC compared to others, as observed in the first experiment.

The ability of biocontrol agents to recognize and mediate molecular events in the presence of a potential host is of paramount importance for the deployment of their weapons against their predatory host. At the molecular level, *Trichoderma* spp. is known to exhibit different transcriptomic responses at different stages of interaction against its hosts[22].

In a greenhouse experiment to control anthracnose in beans, Dildey [23] using 21 *Trichoderma* isolates, observed that all isolates controlled the disease differing from the control. *Trichoderma strigosum*(IB 28/07) provided systemic protection of bean plants to *C. lindemuthianum* as a function of inoculum concentration used in a greenhouse. [24].

De Meyer et al. [25] applied *T. harzianum* T30 seven days before the inoculation of *Botrytis cinerea* (De Bary) Whetzel on beans and observed significant reductions in disease. The authors reported a 35% reduction in disease severity, and since they did not find the fungus on the leaves, they attributed the decrease in disease symptoms to antagonist-activated resistance induction.

The application of *T. viride* can elicit a series of defense responses in plants such as phenol accumulation, enzyme induction, lignin deposition, among others. The use of this endophytic fungus can be a promising alternative to chemical fungicides, minimizing environmental impact and ensuring plant disease control[26].

Plants have elaborate mechanisms of protection against pathogens, but when there is exogenous application of salicylic acid, these defense compounds tend to increase in order to restrict the spread of fungal, bacterial or viral infections through the hypersensitivity reaction [27]. This mechanism in turn can lead to acquired resistance, especially when provided in the early stages of culture[28]. In a study by Pittner [29], with two wheat cultivars in greenhouse, the application of *T. tomentosum*, salicylic acid and ASM resulted in a decrease in the severity of

brown spot (*Bipolarissorokiniana* (Sacc.) Shoemaker) in relation to the witness, the best result was achieved with the application of the fungicide (azoxystrobin + tebuconazole).

The ASM-based product has no fungistatic action like fungicides and develops a salicylic acid-like role in the signal transduction pathway that leads to plant-acquired systemic resistance against pathogens [30]. The decrease in disease severity due to use of this product is related to increased activity of enzymes that exert antimicrobial action and antioxidant protection[31].

In an experiment conducted in a greenhouse, Gontijo Neto et al. [32] observed that bean plants treated with ASM had only 10.30% lower severity than treatment where there was no control of anthracnose. Plants that were sprayed with fungicide (methyl thiophanate + epoxiconazole + piraclostrobin) achieved a 54.60% reduction in disease progress.

Control of common bacterial growth (*Xanthomonas axonopodis*pv. *phaseoli* (Xap.)) in beans using ASM and*Bacillus cereus* (Frank & Frank.) It was effective. The use of the chemical caused a reduction of 79% of the disease, whereas the bacteria used as biological control reduced the severity of the disease by only 37% [33].

Results achieved by Moraes; Maringoni and Lima [34] demonstrate that the application of ASM to bean plants in a greenhouse was inefficient both to induce resistance to curtobacterium wilt (*Curtobacteriumflaccumfaciens*pv. *Flaccumfaciens* (Hedges)) on susceptible cultivar (IAC Carioca), as to increase resistance levels in resistant cultivars (IAC Akytã and IAC Carioca Piatã). These results contradict those of this work, since the product applications resulted in median control of anthracnose, which was statistically equal to the best treatment (*T. viride*).

IV. CONCLUSION

Alternative products controlled anthracnose in bean plants.

The endophytic fungi *T. viride* and *T. tomentosum* inhibited mycelial growth of *C. lindemuthianum* in the three *in vitro* tests.

In a greenhouse, *T. viride, T. tomentosum*, salicylic acid, acibenzolar-S-methyl and fungicide treatments were effective, but copper phosphite was not efficient in controlling anthracnose.

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REFERENCES

- Barbosa, F.R.; Gonzaga, A. C. O. Informações técnicas para cultivo do feijoeiro comum na Região Central-Brasileira: 2012-2014. Santo Antônio de Goiás: Embrapa Arroz e Feijão, 2012. 247 p. (ISSN: 1678-9644).
- [2] Bonett, L. P., Hurmann, E. M. de. S., Pozza Júnior, M.C., Rosa, T.B., Soares, J.L. (2013). Biocontrolein vitro de *Colletotrichummusae*por isolados de *Trichodermas*pp. Uniciências, Cuiabá, 17(1), pp. 5-10. (DOI: http://dx.doi.org/10.17921/1415-5141.2013v17n1p%25p).
- Padder, B.A., Sharma, P.N., Awale, H.E., Kelly, J.D. (2017). *Colletotrichum lindemuthianum*, the causal agent of bean anthracnose. Journal of Plant Pathology, Dordrecht, 99(2), pp. 317-330. (DOI: http://dx.doi.org/10.4454/jpp.v99i2.3867).
- [4] Paula Júnior, T.J. de., Vieira, R.F., Teixeira, H., Lobo Júnior, M., Wendland, A. Doenças do feijoeiro: estratégias integradas de manejo. In: Carneiro, J.E.; Paula Júnior, T.J.de; Borém, A. Feijão - do plantio à colheita. Editora UFV: Viçosa, p.270-299. 2015.
- [5] Gadaga, S. J. C., Abreu, M. S. de., Resende, M. L. V. de. & Ribeiro Júnior, P. M. (2017). Phosphites for the control of anthracnose in common bean. PesquisaAgropecuáriaBrasileira,52(1), 36-44. (http://dx.doi.org/10.1590/s0100204x2017000100005).
- [6] Ballaré, C.L. (2014). Light regulation of plant defense. Annual Review of Plant Biology, Palo Alto, 65(1), pp. 335-363. (DOI: 10.1146/annurev-arplant-050213-040145).
- [7] Moraes, W.B.C. (1992). Controle alternativo de fitopatógenos. Pesquisa Agropecuária Brasileira, Brasília, 27(13), pp. 175-190.
- [8] Dennis, C.; Webster, J. (1971). Antagonistic properties of species groups of *Trichoderma*: hyphal interactions. Transactions of the British Mycological Society, Londres, 57(3), pp. 363-369. (https://doi.org/10.1016/S00071536(71)80050-5).
- [9] Mariano, R.L.R. (1993). Métodos de seleção *in vitro* para o controle microbiológico de patógenos de plantas. Revisão Anual de Patologia de Plantas, Passo Fundo, 1(1), pp. 369-409.
- [10] Campanile, G.; Ruscelli, A.; Luisi, N. (2007). Antagonistic activity of endophytic fungi towards *Diplodiacorticola*assessed by *in vitro* and in planta tests. European Journal Plant Pathology, Dordrecht, 117(1), pp. 237-246. (DOI: 10.1007/s10658-006-9089-1).
- [11] Canteri, M. G., Althaus, R. A., Filho, J. S. das V., Giglioti, E. A., Godoy, C. V. (2001). SASM-Agri: sistema para análise e separação de médias em experimentos agrícolas pelos métodos Scott-Knott, Tukey e Duncan. Revista Brasileira de Agrocomputação, 1(2), 18-24. (http://www.agrocomputacao.deinfo.uepg.br/dezembro_200 1/Arquivos/RBAC_Artigo_03.pdf).
- [12] Dalla Pria, M.; Canteri, M.G.; Bergamin Filho, A.; Amorim, L. (1997). Avaliação de diferentes meios de cultura na esporulação de *Colletotrichumlindemuthianum*, *Phaeoisariopsisgriseolae Alternarias*p. Summa

Phytopathologica, Botucatu, 23(2), pp. 181-183. (ISSN:0100-5405).

- [13] Stangarlin, J.R.; Pascholati, S.F.; Labate, C.A. (2000).
 Efeito de *Phaeoisariopsisgriseola*na atividade de ribulose-1,5-bifosfato carboxilase-oxigenase (rubisco), clorofilase, β-1,3-glucanase e quitinase em cultivares de *Phaseolusvulgaris*. Fitopatologia Brasileira, Brasíla, 25(1), pp. 59-66.
- [14] Godoy, C.V.; Carneiro, S.M.T.P.G.; Iamauti, M.T.; Dalla Pria, M.; Amorim, L.R.D.; Bergamin, A.; Godoy, C.V. (1996). Diagrammatic scales for bean diseases: Diagrammatic scales for bean diseases: development and validation. Journal of Plant Diseases and Protection, Heidelberg, 104(4), pp. 336-345. (https://www.jstor.org/stable/43215167).
- [15] Shaner, G.; Finney, R.E. (1977). The effect of nitrogen fertilization on the expression of slow-mildewing resistance in knox wheat. Phytopathology, Saint Paul, 67(8), pp. 1051-1056. (DOI: 10.1094/Phyto-67-1051).
- [16] Sharma, V. Salwan, R., Sharma, P.N., Kanwar, S.S. (2017). Elucidation of biocontrol mechanisms of *Trichoderma harzianum*against different plant fungal pathogens: universal yet host specific response. International Journal of Biological Macromolecules, 95(1), pp. 72-79. (DOI: 10.1016/j.ijbiomac.2016.11.042).
- [17] Sundaramoorthy, S.; Balabaskar, P. (2013). Biocontrol efficacy of *Trichoderma* spp. against wilt of tomato caused by *Fusarium oxysporum*f. sp. lycopersici. Journal of Applied Biology & Biotechnology, 1(3), pp. 36-40. (DOI: 10.7324/JABB.2013.1306).
- [18] Isaias, C.O., Martins, I., Silva, J.B.T.da., Silva, J.P.da., De Mello, S.C.M. (2014). Ação antagônica e de metabólitos bioativos de *Trichodermas*pp. contra os patógenos *Sclerotiumrolfsiie Verticilliumdahliae*. Summa Phytopathologica, Botucatu, 40(1), p. 34-41. (http://dx.doi.org/10.1590/S0100-54052014000100005).
- [19] Qualhato, T.F., Lopes, F.A., Steindorff, A.S., Brandão, R.S., Jesuino, R.S., Ulhoa, C.J.(2013). Mycoparasitism studies of *Trichoderma* species against three phytopathogenic fungi: evaluation of antagonism and hydrolytic enzyme production. Biotechnology Letters, Heidelberg, 35(9), pp. 1461-1468. (doi: 10.1007/s10529-013-1225-3.).
- [20] Raza, W. Faheem, M., Yousaf, S., Rajer, F.U., Yameen, M. 2 (2013). Volatile and non-volatile antifungal compounds produced by *Trichoderma harzianum*SQR-T037 suppressed the growth of *Fusarium oxysporumf*. sp. *niveum*. Science Letters, 1(1), pp. 21-24. (http://thesciencepublishers.com/science_letters/files/v1i1-6-2013006.pdf).
- [21] Joshi, D., Singh, P., Singh, A.K., Lal, R.J., Tripathi, N. (2016). Antifungal potential of metabolites from *Trichoderma* sp. against *Colletotrichum falcatum*went causing red rot of sugarcane. Sugar Tech, Nova Deli, 18(5), pp. 529-536. (DOI: 10.1007/s12355-015-0421-y).
- [22] Atanasova, L., Le Crom, S., Gruber, S., Coulpier, F., Seidl-Seiboth, V., Kubicek, C. P., Druzhinina, I.S. (2013).

Comparative transcriptomics reveals different strategies of *Trichoderma* mycoparasitism. BMC Genomics, Londres, 121(14), pp. 1-15. (https://doi.org/10.1186/1471-2164-14-121).

- [23] Dildey, O.D.F. Interação *Trichoderma*-feijoeiro e seus efeitos na fisiologia e indução de resistência contra antracnose (*Colletotrichumlindemuthianum*). 2014, 74 f. Dissertação (Mestrado em Agronomia) – Universidade Estadual do Oeste do Paraná. Marechal CândidoRondon, 2014.
- [24] Pedro, E.A.de S. HARAKAVA, R., LUCON, C.M.M.,GUZZO, S.D. (2012). Promoção do crescimento do feijoeiro e controle da antracnose por *Trichodermas*pp. Pesquisa Agropecuária Brasileira, Brasília, 47(11), pp. 1589-1595. (http://dx.doi.org/10.1590/S0100-204X2012001100005.).
- [25] De Meyer, G., Bigirimana, J., Elad, Y., Höfte, M. Induced systemic resistance in *Trichoderma harzianum*T39 biocontrol of *Botrytis cinerea*. European Journal of Plant Pathology, Dordrecht, v. 104, n. 5, p. 279-286. 1998. (DOI: 10.1023/A:1008628806616).
- [26] Surekha, C. H., Neelapu, N., Prasad, B.S., Ganesh, P.(2014). Induction of defense enzymes and phenolic content by *Trichoderma viride*in *Vigna mungo* infested with *Fusarium oxysporum*and *Alternaria alternata*. International Journal of Agricultural Science and Research, Chhattisgarh, 4(4), pp.31-40.
- [27] Taiz, L., Zeiger, E., Moller, I.M., Murphy, A. Fisiologia e Desenvolvimento Vegetal. 6. ed. Porto Alegre: Artmed, 2017. 888 p.
- [28] Walters, D. R.; Ratsep, J.; Havis, N. D. (2013). Controlling crop diseases using induced resistance: challenges for the

future. Journal of Experimental Botany, Londres, 64(5), pp. 1263-1280. (doi: 10.1093/jxb/ert026).

- [29] Pittner, E. Fungos endofíticos de plantas daninhas no controle da mancha marrom do trigo. 2016, 173 f. Tese (Doutorado em Agronomia) – Universidade Estadual do Centro Oeste, Guarapuava. 2016.
- [30] Yamaguchi, I. Activators for systemic acquired resistance. In: Hutson, D.; Myamamamoto, J. Fungicidal Activity. 1. ed. New York: Wiley. 1998.
- [31] Andrade, C. C. L., Resende, R.S., Rodrigues, F.A., Silveira, P.R., Rios, J.A., Oliveira; J.R., Mariano, R.L.R (2013). Indutores de resistência no controle da pinta bacteriana do tomateiro e na atividade de enzimas de defesa. Tropical Plant Pathology, Brasília, 38(1), pp. 28-34. (http://dx.doi.org/10.1590/S1982-56762013000100004).
- [32] Gontijo Neto, G.F.; Andrade, M.J.B. de.; Pozza, E.A.; Martins, F.A. D., Soares, B.L., Belan, L.L., Cardilho, B.E. da. S. (2016). Controle da antracnose e da mancha angular do feijoeiro comum com indutores de resistência. Nucleus, 13(2), pp. 199-218. (DOI: 10.3738/1982.2278.1635).
- [33] Kuhn, O.J.; Pascholati, S.F. (2010). Custo adaptativo da indução de resistência em feijoeiro mediada pela rizobacteria*Bacillus cereus*ou acibenzilar – S – metil atividade de enzimas, sintese de fenóis e lignina e biomassa. Summa Phytopathologica, Botucatu, 36(2), pp. 107-114. (http://dx.doi.org/10.1590/S0100-54052010000200001).
- [34] Moraes, R.M.; MaringonI, A.C.; Lima, G.P.P. (2004). Ineficiência de acibenzolar-s-methyl na indução de resistência de feijoeiro comum à murcha-de-curtobacterium. Fitopatologia Brasileira, Brasília, 29(4), pp. 373-377. (http://dx.doi.org/10.1590/S0100-41582004000400002).

Table 1 - Inhibition (%) of mycelial growth on the antagonism of fungi Trichoderma viride and Trichoderma tomentosum
exerted on the fungus Colletotrichum lindemuthianum.

Trastmanta	Evaluation Days						
Treatments	2 nd	3 rd	4 th	5 th	6 th	7^{th}	Mean
C. lindemuthianumx T. tomentosum	73,47 a ¹	80,00 a	78,71 a	75,61 a	67,42 a	61,94 a	72,86 a
C. lindemuthianumx T. viride	65,89 b	83,25 a	71,37 b	63,35 b	58,30 b	54,68 b	66,14 a
Control	0,00 c	0,00 b	0,00 c	0,00 c	0,00 c	0,00 c	0,00 b
$C.V. (\%)^2$	11,20	16,65	8,89	6,54	6,23	7,14	12,00

(1) Means with the same letter in the column do not differ significantly by Tukey (p>0.05).

(2) Coefficientofvariation.

 Table 2 - Inhibition (%) of mycelial growth on the production of volatile compounds by the fungi Trichoderma viride and

 Trichoderma tomentosum exerted on the fungus Collectorichum lindemuthianum.

Evaluation Dave								
Treatments		Evaluation Days						
Treatments	2^{nd}	3°	2^{nd}	5°	2^{nd}	7°	2^{nd}	
C. lindemuthianumx T. tomentosum	78,57 a ¹	70,14 a	54,18 a	47,91 a	40,71 a	39,71 a	55,20 a	
C. lindemuthianumx T. viride	72,36 a	65,11 a	52,55 a	47,40 a	39,95 a	39,00 a	52,73 a	
Control	0,00 b	0,00 b	0,00 b	0,00 b	0,00 b	0,00 b	0,00 b	
C.V. (%) ²	15,69	21,81	20,01	20,89	20,09	20,37	22,66	

(1) Means with the same letter in the column do not differ significantly by Tukey (p>0.05).

(2) Coefficientofvariation.

and Trichoderma tomentosum exerted on the jungus Contentichum tindemutitanum.								
Treatments	Evaluation Days							
Treatments	2 nd	3°	2^{nd}	5°	2^{nd}	7°	2 nd	
C. lindemuthianumx T. tomentosum	89,40 a ¹	89,42 a	87,20 a	79,13 a	72,31 a	67,70 a	80,86 a	
C. lindemuthianumx T. viride	83,87 a	81,42 b	81,30 b	74,27 b	69,50 b	65,29 b	75,94 a	
Control	0,00 b	0,00 c	0,00 c	0,00 c	0,00 c	0,00 c	0,00 b	
$C.V. (\%)^2$	20,33	12,23	4,15	2,85	2,36	2,60	11,64	

 Table 3 - Inhibition (%) of mycelial growth on the production of non-volatile compounds by the fungi Trichoderma viride

 and Trichoderma tomentosum exerted on the fungus Colletotrichum lindemuthianum.

(1) Means with the same letter in the column do not differ significantly by Scott-Knott (p>0.05).

(2) Coefficientofvariation.

 Table 4 – Area under the progression curve of Colletotrichum lindemuthianum in bean plants (Phaseolus vulgaris) under greenhouse conditions, first and second experiments.

Treatment	1 st Experiment	2 nd Experiment
Trichoderma viride	166,56 b ¹	23,63 d
Trichoderma tomentosum	193,53 b	30,25 d
Salicylic Acid	229,63 b	41,20 c
Acibenzolar-S-methyl (Bion®)	212,66 b	38,85 c
Azoxystrobin + difenoconazole (Amistar Top®)	267,01 b	40,23 c
Copper phosphite (Strong [®])	389,68 a	81,28 a
Control	200,89 b	53,13 b
$C.V.(\%)^2$	20,59	17,82

(1) Means with the same letter in the column do not differ significantly by Scott-Knott (p>0.05).

(2) Coefficientofvariation.

Awareness Analysis on the use of Personal Protective Equipment: A Case Study in Health Unit

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Abstract— Personal or collective protective equipment refers to tools that have the function of minimizing certain accidents in addition to the protection against certain diseases that can often be caused by the work environment. This research aims to analyze the perception of employees of a heath unit regarding the importance of the use of individual protection equipment. Therefore, a qualitative and exploratory research with field research was performed. During the field research a questionnaire was applied to 11 employees of a Health Unit in Natividade- RJ. Despite the imminent risks related to the labor environment, the inconsistency of the use of personal protective equipment is still one of the main aggravating factors the cause the most serious work accidents. Employees were aware of the need to use collective and individual protection equipment, however, during routine activities; professionals often do not use the equipment. It's hoped that research can support further studies and highlight the importance of safety and health in the workplace.

Keywords—health, safety, awareness, engineering.

I. INTRODUCTION

It is known that the work environment is not always a safe and suitable place for the activities involved in it. Thousands of people die every day in various fields of work. According to the International Labor Organization -ILO, annually, more than 2 million people are affected by accidents and occupational diseases.

According to data from the International Labor Organization, global costs reach 7 trillion reais per year. Given this, it is understood the need to make organizations aware that financial and mainly human losses cannot be treated as something ordinary and normal in the workplace, thus creating the perception that it is necessary to acquire the awareness that safety comes first place. Risks in the workplace affect the health and the welfare of workers in any work activity (LIMA et al., 2019).

The working conditions in the Basic Health Units have been unfavorable to the health of professionals working in this context (CARVALHO et al., 2013). Accidents at work show a health problem worldwide, as they can be extremely lethal or harmful, particularly involving young people and in productive times, which has social and economic consequences. Thus, it is important to discuss the importance of safety management.

Silva et al. (2018) relate the use of personal protective equipment and collective protective equipment to individual and collective safety, respectively. However, many professionals feel uncomfortable using the equipment, failing to follow occupational safety and health standards. Employees need to be aware of the need for appropriate use of protective equipment and that they significantly minimize unforeseen cases (ALMEIDA, 2015).

In this context, this research aims to analyze the perception of employees of a health unit about the importance of the use of individual protection equipment. Therefore, a qualitative and exploratory research with field research was performed.

II. THEORETICAL REFERENCE

2.1 OCCUPATIONAL HEALTH

It's estimated that about 125 million occupational accidents occur annually, where 220,000 die (ABREU, 2002). Given this scenario, occupational health issues are increasingly emphasized in scientific research. Since the time of Bernardino Ramazzini, 1700, considered the father of occupational medicine, health and the working environment are situations that permeate the most diverse analyzes and studies (SERRA NETO, 2015). In 1948, with the advent of the World Health Organization, the concept was established that "health is the complete physical, mental and social well-being, and not only the absence of diseases and illnesses" and "the enjoyment of maximum degree of health that can be achieved is one of the fundamental rights of every human being "(LIMA, 2009).

Among the various terms associated with health, occupational or occupational health is related to the physical and mental well-being of an individual in their work environment. This is exclusively dedicated to the promotion and prevention of workers' health. Occupational health guarantees not only workers' health, but also productivity, quality of products and services, employee motivation and satisfaction, that is, it is an important strategy for the quality of life of those involved with the work environment and society at work general (OLIVEIRA, 2017).

According to Santos and Freitas (2009), occupational health, also called occupational health, is a subarea of health that covers ergonomics, toxicology, epidemiology, industrial hygiene and other work-oriented sciences and individual or collective health.

According to Lima (2009, p. 29), "occupational health has an approach to prevention, screening and early diagnosis of work-related health problems, in addition to the existence of cases of occupational diseases or irreversible damage to worker". The integrity of the physical and mental health of an individual, regarding the work environment, can be affected when he is subject to acquire an occupational disease, either due to the situation that is the environment or the most diverse issues.

2.2 PROTECTIVE EQUIPMENT

Personal Protective Equipment is a personal use tool designed to neutralize certain accidents and to protect against possible diseases caused by working conditions (SOUZA, 2017). According to Cisz (2015), the use of protective equipment is related to behavioral safety, a term that refers to the application of scientific knowledge of Behavioral Psychology in occupational safety issues.

Protective equipment is developed according to the risk inherent to the function of an employee and its exposure period, being mandatory and appropriate to the characteristics of each work environment (GOZZI, 2016). Its purpose is to preserve the physical integrity of the worker (ZOCCHIO, 2012). Protective equipment is an effective tool for minimizing occupational injuries, accidents and other hazards present in the workplace (BALKHYOUR et al. 2019).

The worker will be more receptive to personal protective equipment if it is comfortable and pleases. To do this, equipment must be practical, well protected, easy to maintain, strong and durable (ARAUJO, 2013). Proper use of personal protective equipment provides a better quality of life at work. Due to the large amount of equipment and the different environments of use, it is necessary to evaluate the protective equipment used by workers, so that it can be protected without loss of productivity (OLIVEIRA, PILON, 2012).

The worker may use the equipment for its intended use, being responsible for the maintenance and use of the equipment, reporting to the manager of any malfunction or failure (OIT, 2015). It is noteworthy that companies are required to offer free personal protective equipment in perfect condition and operation. (PONTELO; CRUZ, 2011).

III. MATERIAL AND METHODS

A research is bibliographical, qualitative and exploratory. Initially, a bibliographic study was performed. That done, a field research was conducted at the Health Unit object of study. The data collection instrument used was an interview with the aid of a questionnaire. The questionnaire was designed to be answered by 11 employees of the organization.

At this stage, workers were interviewed to identify the main causes of the lack of use of protective equipment

and their knowledge about the importance of using such equipment.

IV. RESULTS AND DISCUSSIONS

Healthcare workers are exposed to multiple chemical, physical, biological, psychosocial and ergonomic hazards (TINOCO et al., 2019). The research had the following groups: 1 doctor; 1 nurse; 5 health agents; 1 cleaning aid; 1 administrative assistant; 2 nursing techniques, as shown in Graph 1.



Graph. 1: number of employees

Everyone involved in the workplace needs to know about work safety, from the general helper to the manager of the organization, because only through knowledge the environment will be free from work accidents, therefore understanding should happen through training, exposure, pamphlet, security competition, bulletin, announcement, conversation, communication and newsletters.

Of the respondents, 36.36% answered that they never conducted training on the importance of safety in the organizational environment and consequently the need to use protective equipment, Graph 2. According to Zonta et al. (2012) many collaborators continue to practice the same failures resulting from inability to practice due to lack of qualification or improvement.



Graph. 2: percentage of employees who never performed training

It is of utmost importance that the company guides its employees regarding aspects of health and safety at work. As result of the lack of information about accidents and occupational diseases, the organization is injured, because when the employee gets sick, he or she leaves his / her job, causing delay in production and generation of expenses. Personal protective equipment helps to protect health professionals from pathogens (BALOH et al., 2019). However, the effectiveness of these equipment is often hampered by inadequate disposal methods (REDDY et al., 2019).

Regarding the opinion of workers about the need for the use of personal protective equipment, 27.27% said they use it due to obligation, 18.18% say they feel uncomfortable and 54.55% said they use the equipment for personal safety, Graph 3.



Graph. 3: Workers' opinion about the use of protective equipment

Due to concerns or lack of knowledge, many questions are asked by employees about the efficiency and need to use protective equipment. According to Araujo (2015), any company must offer safe working conditions when hiring an employee, being essential that the worker is made aware and encouraged to use the mandatory safety equipment correctly. It is noteworthy that educational measures need to focus on training and continuing education (SOUZA et al. 2016).

V. CONCLUSION

Based on the information studied, it can be analyzed that there is still some resistance to the use of personal protective equipment. However, employees are becoming aware of the need for prevention and adapting to safety methods so as not to suffer the consequences of accidents.

In general, it is noted that employees are aware of the need for the use of personal protective equipment and the risks of misuse or not of personal protective equipment. However, it is extremely necessary to reinforce the importance of the workers to carry out their activities as safely as possible.

REFERENCES

- ABREU, M. H. (2002). Accidents at work and occupational diseases in employees of the Municipal Health Secretariat of Bauru. 2002. 213 f. Dissertation (Master) - Postgraduate Course in Public Health, Paulista State University, São Paulo.
- [2] ARAÚJO, G. M. (2013) Commented Regulatory Standards - Occupational Health and Safety Legislation. Volume 2 - 4th edition. Green Consulting. Rio de Janeiro.
- [3] ARAÚJO, N. M. C. (2015). Proposed occupational health and safety management system based on OHSAS 18001 for vertical building companies. 204 f. Thesis (Doctorate in Production Engineering) - Department of Production Engineering. Federal University of Paraíba, João Pessoa.
- [4] BALKHYOUR, M. A. et al. (2019). Assessment of the use of personal protective equipment and occupational exposures in Jeddah small industries: implications for workers' health. Arabia Journal of Biological Sciences, v. 26, n. 4, p. 653-659.
- [5] BALOH, J.et al. (2019). Healthcare worker strategies for disposing of self-protective equipment. Clinical Infectious Diseases, v. 69, n. 13, p. 192-198.
- [6] OAK, M.; SANTOS, N. R., CAMPOS, G. W. S. (2013). The construction of the SUS and thehealth workforce planning in Brazil: a brief historical trajectory. Cheers in Debate, 37 (98).
- [7] CISZ, C.R. (2015). Awareness of the use of PPE, regarding individual and collective safety. Monograph (Graduation). Graduate Program in Occupational Safety Engineering, Federal Technological University of Paraná, Curitiba.
- [8] GOZZI, E. F. M. (2016). Collective protective equipment protects all individuals in the workplace. Dissertation (Master's Degree) - Professional Master's Program at the São Paulo Law School, Fundação Getúlio Vargas, São Paulo.
- [9] LIMA, E. M. (2009) 1 Respiratory diseases associated with mining activity in the municipality of Parelhas, Seridó Norte-RioGrandende region. 2009. 125 f. Dissertation (Master) - Regional Postgraduate Program in Development and Environment, Federal University of Rio Grande do Norte.
- [10] LIMA, A. F. S. et al. (2019). Recognizing the risks in the work of Street Medical Consultations: a participative process. Journal of Nursing School of USP, v. 53, n. 19.
- [11] ILO International Labor Organization. (2015). 18th World Congress on Safety and Health at Work.
- [12] OLIVEIRA, A. M. S.; PILON, V. A. (2012). Evaluation of the intervening factors in the use of PPE by construction workers. III SIBRAGEC - Brazilian Symposium on Construction Management and Economics. Sao Carlos, SP.
- [13] OLIVEIRA, M. A. (2017). The work environment and occupational diseases from the perspective of nursing professionals working in hemodialysis at HC / UFU. 2017. 104 f. Dissertation (Master) - Postgraduate Program Professional Master in Environmental Health and

Occupational Health, Federal University of Uberlândia, Uberlândia.

- [14] PONTELO, J.; CRUZ, L. (2011). People management: manual of labor routines. 5th ed. Brasilia: Senac / DF.
- [15] REDDY, S. C. et al. (2019). Improving the Use of Personal Protective Equipment: Applying Lessons Learned. Clinical Infectious Diseases, v. 69, n. 13, p. 165-170.
- [16] SANTO, E. E.; FREITAS, F. Q. B. (2011). Worker's health in times of precarious work. Intersaberes Magazine, Curitiba, v. 4, no. 8, p. 150-169.
- [17] SERRA NETO, A. (2015). Health and work environment of the federal public servant of Maranhão: medium expertise view. 2015. 68 f. Dissertation (Master) -Postgraduate Program in Health and Environment, Federal University of Maranhão, São Luís.
- [18] SILVA, F. S.; MARQUINI, L. L. SABADINI, O. S.; CARLETTI, E. Z. B. (2018). The importance of using personal and collective protective equipment in accident prevention. Rev. ACADEMIC ENVIRONMENT, v.4, n.1, jan./jun.
- [19] SOUZA, R. D. S. (2016). Occupational diseases of workers cleaning hospital service: educational proposal to minimize exposure. Global Nursing, v. 15, n. 3, p. 552-564.
- [20] SOUZA, C. S. P. M. (2017). Benefits of occupational safety management, equipment monitoring (PPE and EPC). Dissertation (Master) - Federal University of Pará. Institute of Technology. Graduate Program in Process Engineering, Belém.
- [21] TINOCO, H. C. et al. (2019). Risk perception when using personal protective equipment against noise-induced hearing loss. Management and Production, v. 2.1 n. 1.
- [22] ZOCCHIO, A. (2012). Accident prevention practice: ABC of occupational safety. 7. ed. Sao Paulo: Atlas.
- [23] ZONTA, T. et al. (2012). Scaffolding work: mechanical or electrical, equipment must ensure worker integrity. Protection Magazine, New Hamburg (RS), v.25, n.247, p. 68 - 76, July.

Constructive Process of using plates OSB (Oriented Strand Board) in sustainable structural systems in a Residential building in the city of Manaus - AM

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Abstract— The use of reforestation wood in civil construction plays an important role in the sustainable development of the world, as is the case with oriented wood strip panels. Coming from continuous technological advancement, which adds quality to the material and creates new constructive solutions, OSB (Oriented Strand Board) panels appear as an effective alternative for society. This work aims to broaden the knowledge about the use of OSB boards in the building system (CES), due to their function and application in wall, slab, roof and roof sealing, based on a case study of the construction process of a residence. in the city of Manaus. Advantages and disadvantages of this system were compared when compared to the conventional system, and its use (OSB / CES) has been shown to meet the sustainability criteria, as it is ecologically viable, being a clean, lean process; economically viable, fast, cheap and inclusive as it generates local employment. Further studies are needed to understand the importance of using clean technologies for construction, capable of reducing impacts on the environment, without compromising the development of the site.

Keywords— construction, oriented strand board, sustainability.

I. INTRODUCTION

Nowadays the ecological consequences of our actions have promoted, in the world architecture, the view that we must use the available raw materials carefully and economically. In industrialized countries, this concept has led the logging industry to rediscover the timber-built building, promoting quality material for construction companies.

With the growth of environmental awareness and, mainly, after the ISO 14.000 Standard was instituted, the logging activities became more controlled, with this, the wood from sustainable management gained some notoriety. Oriented Strand Board (OSB) is designed to meet an unmet demand for common plywood panels: mechanical strength for structural purposes (RAMPAZZO; SPONCHIADO, 2000)^[1].

In the Brazilian market, the OSB is still a little known panel, lacking greater disclosure of its characteristics and

possibilities of use, especially in civil construction. Although shy, its application already occurs in floors and partitions, roofs and temporary works such as siding and housing(FERREIRA, 2003)^[2].

The finitude of non-renewable natural resources and the development of the construction sector generated the need for adaptation to the problem of scarcity of some materials, such as native woods, natural aggregates, among others. And the use of alternative techniques and materials, as is the case with OSB, arise as a response to the problem..

This work aims to share scientific and practical knowledge, demonstrating the construction process of OSB plates in the CES (Sustainable Energy Building) system, employed in a single family residence in Manaus -AM. The case study in question highlights some technologies applied in the current market, their respective advantages and disadvantages.

II. THEORETICAL REFERENCE

2.1 The use of reforestation wood as a sustainable alternative in civil construction

Civil construction has always been linked to the economic and social development of societies, however, its construction methods converged to a continuous state of conservatism in which materials and labor were little changed and nature functioned as abundant stock for such Sector. Fortunately, this scenario has been changing. Research in the most diverse fields of science is looking for clean materials and technologies capable of meeting the needs generated by man.

Wood is a natural and renewable material with many positive aspects in various construction applications, such as wood panel which can present a functional, constructive and economical solution, competing with traditional sealing systems. The panels can be used both for external sealing and for partitions inside buildings, as wood can easily adapt to certain requirements and possibilities. It also has less weight, facilitating the transport and workability of the work (SUENAGA;BITTENCOURT;TERNI, 2002)^[3].

Wood panels arose from the need to decrease the anisotropy and dimensional instability of solid wood, lower its cost and improve the thermal and acoustic insulation properties. Additionally, they fulfill a recognized need in the use of lumber which is to extend its useful surface by expanding one of its dimensions (width), thereby increasing the field of application.

According to Stungo (2001) [4], the most common wood construction system in the world is the lightweight structure. Although it originates in the Scandinavian countries, the high production of the lightweight structural system is very popular in North America. On the other hand, in Brazil, the use of reforestation wood in civil construction faces greater prejudice than other types of wood. Largely used only for concrete forms and struts, we have the notion that this type of wood is fragile, not being considered "noble".

In this context, comparisons of the advantages and disadvantages of the analyzed systems support the choice of the system to be used in the intended construction project, being noticeable the implications and cost-benefit brought in the use of wood oriented boards, for example.

2.2 OSB - (Oriented Strand Board)

Brazil is very incipient in the production of OSB, began to produce panels only in the year 2002 compared to factories of other wood composites that are already quite consolidated, such as plywood that began in 1940, followed in 1966 with the chipboard, in 1995 with the fiber sheets and in 1997 with the MDF (MENDES, 2001; DEL MENEZZI, 2004)^{[5][6]}.

Oriented Strand Board (OSB) is designed to meet an unmet demand for common plywood panels: mechanical strength for structural purposes. Its structure is composed of three to five layers of particles or bundles of fibers (figure 1), united with phenolic resin, oriented at an angle of 90 degrees with each other and pressed for consolidation. This arrangement gives the panel mechanical strength and moisture resistance.



Fig. 1: Panel Oriented Cores OSB Source: MCTIGUE, (2011)^[7].

They are characterized by ISO 16894: 2009 "Wood Based Panels - Oriented Strand Board - OSB - Definitions, classification and Specifications". Brazilian Standard ABNT NBR 14810-2: 2006 describes wood particle boards as a panel-shaped product, ranging from 3 to 50 mm thick, consisting of wood particles agglomerated with natural or synthetic resins, fixed under pressure and heat action.

The properties and quality of OSB panels are influenced by several factors, including those inherent to wood, such as species, density, chemical factors; and those inherent in the process such as panel density, compaction ratio, panel composition, adhesive, paraffin, particle geometry and orientation, particle moisture content and press cycle(MOSLEMI, 1974; MALONEY, 1977; MENDES, 2001; SURDI, 2012)^{[8] [9][5] [10]}.

Particle geometry, homogeneity, types of adhesives, density and manufacturing processes may vary for the production of suitable products.

Because it is produced with wood from lower quality logs, OSB is lower in cost than structural plywood, and the fact that it uses less noble raw material does not diminish its quality, as its production technology determines its performance(RODRIGUES, 2006)^[11].

2.3 Application of OSB boards in building systems 2.3.1 Light Steel Frame building system

The construction system in Light Steel Framing is a strategy that focuses on the use of simple and stiffened

profiles, assembled and fixed, forming a structural skeleton and ensuring rapid construction elevation as well as weight reduction. This impacts the final budget of the work and also its sustainability(PENNA, 2009)^[12].

It is composed, according to Brazil (2012) [13], of frames formed by cold-formed light steel profiles, which receive metallic corrosion protection by the continuous hot-dip process, either with zinc or aluminum-zinc alloy.

According to Oliveira (2013) [14], the Light Steel Frame has about 50% less time on site, which is the reason for the increase in productivity, due to the speed of execution and the lower employment of existing labor. Thus, with the same labor that would be used in a masonry construction, it is possible to complete twice as many housing units in the same time frame and at similar costs.

2.3.2 SystemCES

The CES (Sustainable Energy Building) System comprises the Wood Frame and Steel Frame building systems. It is widely used in developed countries such as the United States and Canada, where most homes are built on "sustainable energy construction".

The main feature of this system is the use of a lightweight steel frame or wood frame structure, braced with LP OSB Home structural plates, which together work together, giving the building rigidity, shape and support.

2.3.3 Function LP OSB

In the CES System the main function of OSB Building Products (LP) is to brace and seal the structure of walls, floors and roofs. LP OSB plates and structural profiles work together, giving rigidity to the building, so that the structure as a whole acting monolithically. In addition, on the inner walls, LP OSB Home boards can be applied behind plasterboard as a reinforcement for drywall walls. It also allows the attachment of suspended loads such as planned furniture and frames anywhere in the wall, without the need to find the risers, as the OSB is a high strength structural plate.

III. METHODOLOGY

For the work were used the methods: case study, bibliographic research and documentary research - within the qualitative approach. In this one there is not a great concern with the numerical representation, but with the deepening of the comprehension of a social group, of an organization, etc. Regarding the bibliographic research, it was performed by collecting theoretical information already analyzed and published in written or electronic media (books, scientific articles, websites, among others). As for the case study, it took place in a single family residence, located in the residential condominium on Avenida Carlota Bomfim - Ponta Negra, Manaus - AM.

It is necessary to explain the steps of the construction process and the use of OSB boards used in the construction execution.

3.1 Construction Process Steps

3.1.1 Foundation

Freitas, Crasto and Santiago (2012) [15], emphasize that, due to the weight of the LSF system and the size of the structure, the foundation will consequently be smaller in relation to other structural systems. As the load is distributed linearly across the panels, the best option for the foundation is the radier system and the running shoe system.

To begin the construction, some basic preparations were made among them the clearing of the ground that was in the bush. After cleaning, the foundation began. Because it is a Light Steel Frame technology construction that allows any type of foundation and own weight lower than the conventional construction. By considerably reducing the loads on it, the most common Radier type foundation was chosen, made of reinforced concrete to receive loads through columns (in this case LSF structure), distributing them evenly to the ground.

3.1.2 Structure

The structures of the walls, slabs and roof are made of lightweight cold-formed galvanized steel profiles. It can be seen in Figure 2, that there are three types of profiles for use in Light Steel Frame, and in the present project we used the three.



Fig.2: Perfis Light Steel Frame Source: GOMES; UJIIE, 2015^[16]

Main structure

Formed by the structural frames of the walls, upstream type and guide. We can see in figure 3 that the structure of the first and second floor is erected, and the first floor is sealed in OSB structural plates.



Fig.3: Metallic Structure: first and second floor Source: Author (2019)

Roof Structure

They are made up of scissors consisting of uprights and guide profiles with dimensions of 90 mm, 140 mm. Figure 4 shows the roof structure already mounted on the metal walls.



Fig.4: Mounted Roof Structure Source: Author (2019)

In figure 5 we can see the external view of the roof in already installed top steel thermoacoustic tiles, which reflect up to 75% of the sun's rays and absorb up to 85% of the rain sound, offering greater thermal comfort to the building.



Fig.5: Outside view of the roof Source: Author (2019)

3.1.2 OSB structural wall sealing and cladding system The LSF system allows the application of various coatings, but in this residential project was used the structural OSB plates for sealing and structural reinforcement thereof. In addition to the structural function, the plates have the function of facilitating the roof support.

Outer Seal

It presents the closure of the external face of the first floor wall made with structural OSB plates. They were fixed directly to the mullions and guides with trumpet head screws, drill bit (ST 4.2 mm x 32 mm), following the same procedure for floor up. The plates used in the sealing design are 11.1 mm thick according to the technical specifications.

External Coating

On the outside the OSB plates were protected by a waterproof membrane that acts as a barrier against water, wind and dust, promoting the ventilation of the walls and at the same time allowing the internal humidity to escape from the panel (figure 6). It was then coated with cementitious plates ensuring high mechanical strength and weather resistance. Finally, the base coat was applied, providing greater surface resistance and unparalleled thermal insulation.



Fig.6: Hydrophobic Membrane Application Source: Author (2019)

Inner Fence

Assim, como a face externa o fechamento das faces internas foram feitas com placas OSB para maior reforço estrutural da edificação. Podemos observar na figura 7, as placas já instaladas sobre os perfis.



Fig.7: Inner face sealed with OSB boards Source: Author (2019)

Internal coating

After the application of the OSB plates on the profiles, the coating process was started, made with plasterboard screwed on them, which have adequate composition for each application of the residence. In dry areas was used gray / beige Stantard (ST) and for wet areas such as kitchen, bathroom and services the green was used -Moisture Resistant (UK).

In relation to the ceiling, they were constituted by plasterboard according to the respective areas, being fixed by bolts in steel structure. The dry areas were covered with plaster and treatment boards, such as: dry mass, joint tape and angle for leveling the small imperfections due to the joining of the boards, generating a smooth and seamless appearance.

For greater visibility and clarity of OSB inner seals on metal profile and coatings applied thereon; we can see figure 8, which shows the profile of the beams and columns in detail.



Fig.8: Profiling with Detailing Source: Author (2019)

3.1.3 Slab

For panels, slabs and roofs, basically the same principle is used, ie galvanized profiles whose function is to support the loads that are subjected.

To compose the residential structure, the slab chosen was of mixed type. Starting from the same principle of the

walls: the slab was made with the sealing of OSB plates applied over the metal framework, followed by the 5 cm reinforced subfloor lining.

3.1.4 Electrical, Hydraulic, Acoustic and Thermal Installations

Being an LSF system, the electrical and hydraulic installations were performed following the same principles and materials used in conventional construction. Due to the internal void of walls and ceilings and the presence of holes in the mullions, it was possible to perform quickly and without breaking.

We know that thermal and acoustic comfort is of paramount importance in a residence, providing great quality to the environment. The Steel Frame system, together with the use of OSB sealing plates, made it possible to use various types of insulation installed on the interior and exterior walls, ceiling and roof as required. We even witnessed some technologies during the presentation of the construction process. And one of the main products used for design is the glass wool blanket: which significantly reduces the transition of sound and heat between environments.

3.1.5 Finishes

At this stage of construction, it is the moment when the house loses its basic workmanship and begins to become clearer, giving the impression of being almost completed or nearing completion as seen in Figure 9.



Fig.9: Internal area in finishing phase Source: Author (2019)

It can be seen in figure 10, the residence with windows placed and all applied coatings, including vinyl paint that gives greater impermeability. Only need painting in some parts for finishing.



Fig.10: Residence facade Source: Author (2019)

IV. RESULTS AND DISCUSSION

Through the observations made through the present work, there was a perception of the lack of information, studies, research and Brazilian standard directed to the design and use of OSB plates application for sealing effect in structural system, in civil construction, leaving the professionals of the area depending on the product manufacturer's technical manual which are based on foreign standards.

The residence built within the CES System (Sustainable Energy Building), boasted a range of technologies, among which we can mention: TopSteel Thermoacoustic tiles, Water Membrane, Glass Wool, Cement plates, OSB and Steel Frame, which together work together, giving rigidity, shape, building support, unmatched temoacoustic comfort and environmental responsibility as the materials used emit low CO2.

In addition to the above results, it was observed that the use of OSB structural plates in the Light Steel Framing system results in buildings that look similar to traditional systems, but is a superior process in finishing, shortened lead time and so on. Table 1 shows a comparison between the systems described in the study.

Conventional system	LSF System - Use of OSB Cards
Benefits	
Uses products that degrade the environment: sand, brick, gravel tec.	Environmentally friendly system. One of the most recycled products in the world.
Durability over 300 years.	Durability over 300 years.
Placement of pipes and conduits with breakage of walls, waste of materials and work.	Laying pipes and conduits without waste and without work.
Dirty construction site.	Clean and organized construction site.
Thermal insulation is minimal. Allows heat to pass through.	Thermal insulation is maximum. It makes the passage of heat difficult.
Long and inaccurate lead time.	Up to 1/3 shorter and more accurate time.
Great use of water in the construction process.	Minimal water is used in the construction process.
Difficult maintenance requires time. It requires breaking and closing with mortar, as well as finishing.	Easy maintenance, coating removal, immediate location, repair, and coating retouching.
Fire resistance.	Fire safety - does not burn.
Paint made with undulating and imperfect surface.	Painting done on flat and smooth surface.
Structure partially subject to insects.	Insect resistant structure.
Low skilled labor.	Skilled labor.
Difficulties in locomotion of materials.	Ease of movement of materials for being light.
Lower long term profit.	Higher long term profit - about 30%.
Disadvantages	
Easy to find manpower.	Difficulty finding skilled labor.
Total cost of the work immediately lower.	Immediate total cost is increased by about 6%.

Tab.1: LSF Conventional System Comparison

Floor Limit: Up to 5 floors.

Limit set according to design

calculation.

V. CONCLUSION

Wood is a natural and renewable material with numerous positive aspects in various construction applications. Reforestation came to fill the gap left by hardwoods and has been applied in several segments, especially in construction. However, it was found through this study that there is low knowledge of the potentialities of this material, by the vast majority of professionals in the area, making it inappropriately used. In this context, the disclosure of the benefits brought by the use of this material enables a functional, constructive and economical solution for society, as it becomes competitive with traditional fencing systems.

In this study, the OSB were incorporated into the CES system, being used in the bracing and sealing of the walls, floors and roofs in the light steel profiles (Steel Frame), in which the union of this set resulted in the rigidity, shape and support to the building. In addition, the project used the slabs on both external and internal faces, ensuring greater structural reinforcement to the building. Not only as a structural reinforcement, the application of the plates behind the plasterboard in the internal areas of the residence allows the fixation of suspended loads such as planned furniture and frames anywhere in the wall,

Source: Author (2019)

without the need to find the mullions, since the OSB It is a high strength structural plate.

At the end of the presentation of the construction process, it was observed that the building results in an aspect similar to conventional masonry, but with superior final finishes. However, by joining the metal structure, sealing plate and its appropriate technologies applied within the CES system, several advantages were obtained; Among them, the following stand out: thermal / acoustic comfort, reduced execution time and the others. Finally, the system integrates technology, strength, sustainability, durability and agility, making it an excellent option for housing development.

REFERENCES

- RAMPAZZO, S.E.; SPONCHIADO, M. O uso da madeira de reflorestamento na construção civil com enfoque na habitação. Revista de Pesquisa e Pós-Graduação, Erechim, v.1, p. 131-148, 2000. Disponível em: <www.remade.com.br>. Acesso em: 20/09/2019.
- [2] FERREIRA, O.P. Madeira: uso sustentável na construção civil. São Paulo: Instituto de Pesquisas Tecnológicas, 2003.
- [3] SUENAGA, F.; BITTENCOURT, R.; TERNI, A. Vedações: estudo de duas soluções para habitação econômica em madeira.Encontro brasileiro em madeiras e em estruturas de madeira. Uberlândia. 2002.
- [4] STUNGO, N. Wood: new directions in design and architecture. San Francisco: Chronicle Books LLC, 2001.
- [5] MENDES, L. M. Pinus spp. na produção de painéis de partículas orientadas (OSB). Tese (Doutorado em Ciências Florestais) - Universidade Federal do Paraná, Curitiba, 2001.
- [6] DEL MENEZZI, C. H. S. Estabilização dimensional por meio do tratamento térmico e seus efeitos sobre as propriedades de painéis de partículas orientadas (OSB). Tese (Doutorado em Ciências Florestais) - Universidade Federal do Paraná, Curitiba, 2004.
- [7] MCTIGUE, A. A Unified Probabilistic Approach for Predicting the Structural Response of Oriented Strandboard. 365f. (A thesis submitted to the National University of Ireland, Galway in fulfilment of the requirements for the degree of Doctor of Philosophy) University of Ireland, Galway, 2011.
- [8] MOSLEMI, A. A. Particleboard: technology. London: Southern Illinois University, 1974.
- [9] MALONEY, T.M. Modern Particleboard & Dry Process Fiberboard manufacturing. San Francisco: Miller Freeman Publication, 1977.
- [10] SURDI, P. G. Produção de painéis de partículas orientadas (OSB) a partir da madeira de um híbrido de Pinus elliottii var. elliottii X Pinus caribaea var. hondurensis. Dissertação (Mestrado em Ciências) – ESALQ, Piracicaba, 2012.
- [11] RODRIGUES, F. C. Steel Framing: Engenharia. Rio de Janeiro. Instituto Brasileiro de Siderurgia/CBCA, 2006.
- [12] PENNA, F.C.F. Análise da Viabilidade Econômica do Sistema Light Steel Framing na Execução de Habitações de

Interesse social: uma abordagem pragmática. Dissertação de Mestrado. Belo Horizonte: Universidade Federal de Minas Gerais (UFMG), 2009.

- [13] BRASIL. Ministério das Cidades. Secretaria da Habitação. Programa Brasileiro da Qualidade e Produtividade do Habitat. Sistema Nacional de Avaliações Técnicas. Sistemas construtivos estruturados em perfis leves de aço conformados a frio, com fechamentos em chapas delgadas (sistemas leves tipo "Light Steel Framing"). Brasília: 2012.
- [14] OLIVEIRA, J.P. Otimização de processos construtivos através da inserção de novas tecnologias na indústria da construção civil: vantagens da aplicação do Sistema Light Lteel Framing em residências. Paraná, 2013.
- [15] FREITAS, A. M. S. CRASTO, R. C. M. de; SANTIAGO, A. K. Manual de Construção em Aço – Steel Framing: Arquitetura. Belo Horizonte: CBCA, 2012.
- [16] GOMES, A. P. B.; UJIIE, I. K. Análise comparativa de sistemas: (Alvenaria Convencional x Light Steel Frame), Trabalho de Conclusão de Curso, 2015. Disponívelem:<htps://www.tonsdaarquitetura.com.br/analis ecomparativasistemaconstrutivo>.Acesso em: 20/09/2019.

Status of the family Farming Economic and knowledge Potential from a Sustainable Rural Development Perspective

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Abstract— Technological innovations in agriculture have contributed to the increased production of food in order to meet an ever-increasing demand for agricultural products. On the other hand, agricultural modernization ended up being discriminatory because socio-cultural factors and the knowledge repertoires of rural populations have been neglected, this being caused by the homogenization of agricultural activities. With the recognition of the social-environmental problems caused by the technical paradigm of the Green Revolution, family farming is increasingly taking a prominent place in food production as well as its cultural heritage and knowledge of sustainable practices, necessary to restore the harmonious relationship between man and nature. The following question was raised as a research issue: What is the status of family farming in the literature and empirical research in relation to economic and knowledge potential in the context of sustainable rural development? In this sense, the objective was to identify the economic and knowledge potential of family farmers with a view to sustainable rural development. This is a case study involving 30 properties of family farmers, where interviews and observation on site were conducted. As a result, it was identified that in the socioeconomic factors the predominant status is negative, placing family farming in a critical situation in relation to its continuity, and the category of economic potential and knowledge has a predominant positive status. The maintenance of traditional knowledge transmitted from generation to generation contributes to this situation, however, it requires a greater interaction with technical-scientific knowledge in order to add value to economic activities.

Keywords— Family farming. Traditional knowledge. Rural development. Agricultural modernization. Nature.

I. INTRODUCTION

With agricultural modernization, food production has intensified to meet an ever-increasing demand. The production system adopted was based on the premise of 'Fordism,' which sought to standardize agricultural activities, focused on large-scale production.

The paradigm of industrialization extrapolated the boundaries between the rural and urban field, significantly changing the mode of production in rural areas. According to Oliveira, Almeida & Santos Silva (2011, p. 66), 'these technological changes have definitely brought the industry into agriculture, drastically reducing its dependence on natural resources and processes.'

According to Carneiro da Cunha (2012), the Green Revolution, which began in Mexico, and was spread worldwide since 1960, brought benefits to the increase in world food production, but, on the other hand, with the homogenization of production resulted in enormous environmental liabilities, given the need for intensive use of fertilizers and pesticides.

This development perspective, based only on economic aspects, caused enormous socio-environmental problems, interfering indiscriminately in the environment, neglecting the social-cultural values of family farmers, who consider their properties not only as a place for the development of productive activities, but also representing a 'space of life,' involving socio-cultural values transmitted from generation to generation.

The way in which technology is transferred to agriculture has neglected family farmer the knowledge, which is why it has been the subject of several studies and questions. In the current context, there is a consensus among scholars that when developing a sustainable rural development project there is a need to create conditions for the interaction between technical-scientific and traditional knowledge to occur, since both are important for the development of new practices that are compatible with the local reality of each territory.

This study aimed at analyzing in the literature the scope of the discussions on the status of the agricultural practices of rural populations, more specifically in family farming, with the objective of identifying the existing economic and knowledge potential for sustainable rural development.

This study is restricted to this publication and it is divided into the chapters: Introduction, Family Farming, Traditional Knowledge, Material is Method, Results, Discussions and Conclusions.

II. FAMILY FARMING

From the perspective of modern agriculture, the peasant was considered as a category that, due to the difficulty in adapting to 'modernity,' represented a social group devoid of knowledge, considered backward, in need of an educational process to insert them in the new paradigm of conventional agriculture production, for this purpose, they should give up their traditional form of production, and at the same time dispose of their cultural heritage, considering that for peasants the material and immaterial are part of their way of life in a systemic perspective.

The peasant concept emerged in Europe during the middle ages. In Brazil, the economic and social structure resulting from the colonization process, where the lands were concentrated by the latifundium and the rest of the workers were on the margin of the system, in the condition of a slave or subordinate to the work of the latifundium, meant that, unlike the European peasants, who had roots with their territories, they showed great mobility to seek better working conditions, due to instability and the precarious situation they lived in their residences and work, without any kind of guarantee for the possession of land (Marques, 2008).

Also, according to the author, it was in the 1950s that the peasant concept, in Brazil, acquires a certain systematization receiving denominations according to the regions of the country, such as, '*caipira* in São Paulo, Minas Gerais and Goiás; *caiçara* on the São Paulo coast; *colono* or *caboclo* in the south - depending on its origin, whether immigrant or not' (Marques, 2009, p. 60). Still, according to the author, although the peasant did not have an identification with certain territories, the cultural heritage remained, regardless of its spatial position.

There is a consensus among scholars on two aspects that are inherent to family farming, its diversity and heterogeneity. It also maintains the characteristics of peasant agriculture and in the performance of its activities incorporates traces of capitalism, since in the family economy regime production is not restricted to selfconsumption, with the commercialization of part of the production. In addition, family members carry out other non-agricultural activities, considering the small amount of land (Schneider & Cassol, 2017).

According to Navarro (2010), the denomination family farming in Brazil emerged in the 1990s, previously, the farmers belonging to this group received various denominations such as: subsistence farmers, small producers and smallholders, in the 1970s they were called low-income farmers. In general, according to the author, in the academic literature or not, the reference to this grouping was related to small production. In documents and newspapers, they were called peasants, having a pejorative meaning to highlight, in the perception of the urban society, a class with a low level of knowledge. The name peasant was also given in social research by sociologists following the Marxist tradition. Among producers, the term peasant was rarely used. Regionally, there were also different denominations, in the southern region they were known as settlers, and in the northeast as farmers.

According to Abramovay (1998), there is no unanimity on the definition of family farming. However, regardless of their representations for practical use by the different social sectors, three particularities are part of the core of family farming: family management, property and work, i.e. family farming activities are carried out on small farms, they are carried out by family members and management is carried out by the family itself, without external intervention.

According to Ploeng (2014), the complexity of family farming generates numerous controversies. Its characteristics are not in line with industrial standards and do not respond to bureaucratic and formalized rules in industrial society. And in this sense, due to the difficulty of inserting into economic patterns, family farming is seen by society as a social group resistant to change, thus acquiring a connotative meaning associated with backwardness. In the author's view, it is facing these difficulties to standardize the activities developed by it that makes it attractive, in this sense, it has much more qualities than the two aspects usually mentioned in its definitions.

As stated by Mattei (2014), the structure of the Brazilian agriculture is a reflection of the colonization process, where from the hereditary captaincies and the various economic cycles to the present day, the land issue and agricultural systems have always been present in political issues related to rural areas. The type of production, based on monoculture, favored large productive areas, considered fertile, for the cultivation of products aimed at serving a market formed by a small group belonging to the crown of Portugal. At the same time, in less fertile areas, such as the northeastern hinterland, subsistence agriculture was developed. This type of social structure is repeated in other cycles, becoming the standard for rural development in Brazil. The successive failure of the economic cycles has established small-scale agriculture, unprotected from any kind of support, generating poverty and social exclusion in rural areas.

III. TRADITIONAL KNOWLEDGE

The protocol of the 10th conference on Biological Biodiversity, held on October 30, 2010 in Nagoya, Japan, highlights the importance of traditional knowledge for the preservation of biodiversity resources. This knowledge, in general, are important sources for the adoption of preservationist practices, because they are the result of interactions and a way of adaptation of man with nature, characterized by a harmonious and balanced relationship. These populations have a vast knowledge of biological diversity. According to the author, the association of these two components, biodiversity and traditional knowledge, represent elements that the various countries should follow in the pursuit of biodiversity preservation (Carneiro da Cunha, 2012).

According to Pereira and Diegues (2010), the United Nations Conference on Environment and Development (Rio 92) emphasized the importance of traditional populations, with their knowledge, for the implementation of nature preservation practices. In this sense, [...] 'traditional populations began to be considered important as actors responsible for the protection of the natural environment in which they are inserted' (Pereira & Diegues, 2010, p. 36). According to Arruda (1999), the colonization of Brazil, which began in the 16th century, shaped the type of sociocultural organization of rural populations that follows the model practiced by the indigenous population who already inhabited the territory. Facing an unknown nature, the colonizers adopted indigenous techniques to suppress their needs. They used to plant various products for subsistence, make tools for work and process the products.

As stated by Pereira and Diegues (2010), the discussion around traditional populations is in great evidence not only at a theoretical level, but it is present when addressing the issues related to the development of environmental policies, the issue of technological insertion and territorial analyses that converge to the association of various economic, cultural, social and geographical factors.

According to Carneiro da Cunha (2007), the denomination of traditional knowledge is a form of homogenization to better confront with scientific knowledge, given that each society shows its traditional knowledge that was developed in a given historical context and that has been perpetuating itself from generation to generation. On the contrary, scientific knowledge shows its uniqueness, having as a basic premise the possibility of being replicated in various societies, regardless of cultural habits and values.

In order to value the range of knowledge existing in traditional populations, there is a need to find some way to allow traditional and scientific knowledge to coexist. This does not mean a fusion process between both, on the contrary, it is in this difference that there is the possibility of adding value, in the perspective that traditional knowledge has much contribution to scientific development (Carneiro da Cunha, 2007).

According to Fleury and Almeida (2007), the use of the term 'traditional populations' has been used in the pejorative sense for a long time, referring to societies or people considered backward groups of and underdeveloped. But, in recent decades, with the emergence of the new paradigm focused on sustainability and the concept of transdisciplinarity, more and more traditional knowledge has been addressed by academics and scholars, as the values and practices that need to be rescued in view of 'the close and recent association between traditional knowledge and conservation of natural elements' (Fleury & Almeida, 2007, p. 4).

According to Guivant (1997), technological diffusion in the period after World War II significantly affected rural areas. With the so-called 'technological package' disseminated by the Green Revolution, agriculture was made massive by a pattern of development that disregarded the heterogeneity of production in rural areas. Family farming, with its traditional knowledge, was considered a sector that adopted practices based on outdated knowledge and that needed to be 'educated' for its insertion in new market trends. However, behind the new practices, there were interests of large corporations and the agribusiness sector that intended to insert the new technologies developed in laboratories into the market, without any contextual analysis. This type of 'linear and vertical' approach began to be questioned by the area of agricultural sciences, NGOs and by government agencies, as the idea of sustainability began to be inserted.

As stated by Santilli (2012), the industrial, agricultural model defined boundaries in the relationship between the activities developed by scientific research and the knowledge of farmers in relation to the various management practices and interaction with the environment. On the one hand, researchers carried out studies on genetic improvement of seeds in their laboratories, aiming at making them more resistant and adaptable to regional heterogeneity, mischaracterizing the local culture and neglecting [...] 'the role of farmers as innovators and holders of knowledge and practices fundamental to agricultural systems and to the maintenance of agrobiodiversity in the field' (Santilli, 2012, p. 461). In this perspective, farmers became mere consumers of inputs and seeds produced by technicians attached to industries.

According to Guivant (1997), the erosion of farmers' knowledge was a consequence of the agricultural modernization model adopted worldwide. The new technologies were developed in restricted environments, developing innovations that were applied vertically and horizontally, without the participation of farmers and aiming at homogenizing agricultural activities.

In this sense, according to Fleury & Almeida (2007, p. 3), 'if we intend to use the traditional way of life as a conservation strategy, offering the democratic bases so that the balance with the natural environment persists, is necessary.' Also, according to the author, when seeking rural development, one must specifically analyze how these populations are inserted in the environment and their dependence on natural resources and the form of intervention in the environment, that is, whether there is a relationship of balance or exploitation of the environment.

In order to highlight the importance of traditional knowledge for the preservation of natural resources, Diegues (2010) makes a comparison between the focus of science and traditional populations on the concept of Biodiversity. According to the author, biodiversity in the conception of traditional populations has a broad meaning and cannot be segmented according to the perspective of science. Traditional populations see nature as a necessary resource for the maintenance of the social group, at the same time that they withdraw it, these transform and recreate landscapes, and on the other hand, there is the symbolic sense, where the natural and the supernatural are part of a whole in the cosmological sense. On the other hand, the science analyzes biodiversity in a segmented manner, in the laboratory, seeks to create an environment free of interference from factors, said non-scientific, in order to analyze the properties of each species. Still, according to the author, the scientist, when carrying out his/her studies of the places where living beings maintain their interaction, often remove the traditional populations, which was part of the transformation and creation of scenarios, and thus, open space for national and transnational companies conduct research focused on economic interests.

Still, according to Diegues (2010) on traditional knowledge, biodiversity is defined within a place or territory, where one cannot exclude anyone, either independent animals, plants, human beings, because everything is part of the construction of knowledge of these populations, and can classify them, assigning names, make relationships, nothing can be fragmented, in the sense of science, where the systemic reality is removed and parts of nature are analyzed in a segmented way in order to identify certain functioning, parts of reality mechanically, and then reconnect, without considering the cultural factors.

IV. MATERIAL AND METHOD

This research is characterized as a case study that, according to Yen (2001), uses many techniques of historical research such as 'direct observation and systematic series of interviews,' differentiating from other research with the ability to work with various evidence such as documents, artifacts, interviews and observation.

The data collection technique was performed through unstructured and unsystematic observation and a structured interview. According to Marconi and Lakatos (2003), observation is a data collection technique that aims to obtain information and uses the senses to obtain certain aspects of reality. It consists not only in seeing and hearing, but also in examining facts or phenomena that one wishes to study. Unstructured and unsystematic observation consist of collecting and recording the facts of reality with no special technical means or direct questions to be asked by the researcher. Regarding the interview, according to the authors, it can be defined as a meeting between two people, so that one of them obtains information about a certain subject through a conversation of a professional nature. It is a procedure used in social investigation for data collection or to help in the diagnosis or treatment of a social problem.

The research population is composed of family farmers belonging to the municipality of Cascavel. The districts that were part of the research are: Barreiro, Bom Retiro, Colônia Esperança, Gramadinho, Rio 47, Sapucaia and São Salvador.

The family farmers interviewed were selected for convenience based on their registration with the Emater from Cascavel. Thirty families were interviewed.

The interviews were exclusively directed to landowners, and who was not found in his/her residence, another date was scheduled for the application of the interview. From the list with the names of the landowners, information on the next residences was obtained.

Figure 1 shows the location of the districts from the municipality of Cascavel - PR that were part of the research.



Fig.1: Districts of Cascavel Source: Geoportal Cascavel, 2019

With the type of research previously defined and the research instruments developed, the search for data in the field of study was divided into two stages: socioeconomic data and identification of the economic and knowledge potential of family farmers from the perspective of sustainable rural development.

V. RESULTS AND DISCUSSIONS

This chapter seeks to analyze the results obtained in the visits to the family farmers' properties where the interviews with the landowners were conducted. For analysis, the data collected were divided into socioeconomic data and economic and knowledge potentialities.

In the presentation through the tables, in order to highlight the results, three colors were determined: red for the factors that according to the proposed objectives show negative status, yellow for an intermediate situation and green to highlight that the factor analyzed shows positive status.

5.1 Socioeconomic Data

Knowing the profile of the research population is of fundamental importance to identify certain types of behavior in social groups, considering that people do not adopt isolated behaviors, on the contrary, it is possible to identify common characteristics within the various spheres of society in each period. The ties that are established between individuals and the environment where they are inserted, the way people interact with nature and the culture that each social group holds regarding the family tradition, show specific characteristics within certain territories.

Changes in the external environment have a strong influence on whether or not certain behaviors and practices of a given social group remain. With technological evolution and increasing demand for food, more and more, in order to stay in the market, farmers have been subject to rules established by large corporations, becoming part of integrated production systems, serving the interests of organizations. In these production systems, farmers are dependent on all types of resources necessary for production, losing their autonomy in all phases of the production process.

Despite productivity gains and improved income, it does not represent stability, considering that in the globalized market, several factors interfere with production costs and the final price of products. On the other hand, family farmers lose a lot of traditional knowledge that has been passed on from generation to generation, which used to represent a guarantee for the maintenance of families.

According to Batalha, Buainain and Souza Filho (2005), when family farmers are part of the integrated production system, they are submitted to a list of determinations that are part of the principles and values of the companies. In this sense, the agents who provide technical assistance to farmers use management tools that are part of the company's strategy, so that the attributes of the products are consistent with the brand and the interest of the market.

Also reported by the author, in most cases, all the information related to the strategies and technical aspects provided by the integrator is not understood by the farmers, in this sense, the farmers only follow the guidelines without having knowledge about the real purpose of using certain management tools. In addition, as the purchase of products is tied to the integrator, the farmer ends up losing his/her autonomy to negotiate his/her products in the various marketing channels.

On the other hand, according to the author, this type of experience with integrated production systems can provide farmers who dissociate from companies, by experimenting with organizational culture, with the development of a culture focused on the 'creation and operationalization of associative structures of production, industrialization, marketing and distribution.'

The following table shows the results of the interviews in relation to the socioeconomic situation of family farmers.

Table 1: Socioeconomic data

Socioeconomic data	Status
Age group of landowners participating in	
the survey	
Age structure of the residents in the	
surveyed properties	
Level of education of the residents in the	
property	
Descendants of spouses	
Property size in hectares	
Time of experiences with agricultural	
activities	
Cultivation for self-consumption	
Animal production for own consumption	
Production for income generation in the	
researched properties	

Source: prepared by the authors, 2019.

5.1.1 Negative Status

a) Age group of landowners - most of the landowners have advanced age and associated with it, the age structure of the residents in the properties demonstrate that the young population is low, thus, the family farmers are facing the problem of succession. Therefore, the continuity of many family farms is compromised.

b) Level of education of the residents in the properties predominance of low education of who are the administrators of the property and the young population that is seeking studies is not directed to professions or improvements to engage in activities at the property. Generally, young people who remain on the property are those who have not completed elementary or secondary education in regular education.

c) Property size - is a limiting factor within the predominant form of production practiced by farmers, i.e., production for the generation of predominant income is the cultivation of commodities. In this sense, the need to adapt

the way of production, according to the potentialities existing in the properties is highlighted.

d) Predominant production of income generation - as already highlighted, in most properties, the productive activities are concentrated in the production of commodities, which requires large areas to obtain satisfactory results, since this type of production depends on production in scale, given the high cost of production.

5.1.2 Positive Status

a) Production for self-consumption - family farmers still hold the traditional customs and still do not become totally dependent on the purchase of products from supermarkets.

b) Farmers' time of experience with agricultural activities - the majority of those surveyed reside on the farm for more than 20 years, in this sense, family farmers show much knowledge about the practices that are developed on the farm, representing knowledge that are perpetuated over several generations and that can add value to the development of intrinsic potentialities to their origins and report the memory of how the farm has been transformed over the decades, showing the successes and failures, and thus can help in the development of projects that fit the local reality, considering the economic and social-environmental aspects of communities.

No classification has been established within the scale created for the descendants of the spouses, since each culture has its own identity and cannot be classified in quantitative terms because the culture is inserted in the way of life of each social group, formed by the precepts and values that are solidified according to time.

Therefore, as already highlighted in this study, the family values and traditions should be preserved to the extent that it is intended to insert new knowledge aimed at adding value to the production of family farmers. In this sense, researchers have stimulated the so-called traditional products, which means adding value to the goods and services offered, from the highlight of the originating culture related to territorial characteristics.

5.2 Economic and Knowledge Potentialities

The inhabitants of rural areas develop their activities based on a routine pre-established by the family; their worldview is still linked to the knowledge acquired through the experiences transmitted from generation to generation.

A few decades ago, with technological insertion in rural areas, the traditional knowledge of farmers was considered delayed in comparison to the technicalscientific knowledge. This perception, based on a disciplinary perspective, restricting absolute knowledge to science, caused much of the farmers' knowledge to be neglected in family farming development projects. The rescue of this knowledge became a necessity in the face of the enormous social-environmental problems caused by the fragmentation of farmer's reality, from establishing a standard of agriculture focused exclusively on economic aspects.

The mechanized agriculture facilitated the development of activities in rural areas, thus enabling the increase of planting areas and large-scale production, at the same time, devastated huge green areas and, in certain regions, practically extinguished the vegetation to be used for livestock occupation and the practice of large-scale agriculture aimed at producing commodities. As a result, the imbalance of ecosystems has intensified.

Therefore, in this part of the interview, the existing knowledge in relation to the universe of the relationship between the family farmer and nature, which became practical with the development of productive activities, was analyzed, and also analyzing the existing economic potentialities aiming at the development of family agriculture from the local specificities arising from the physical and cultural aspects.

Table 2: Economic and knowledge potentialities

Categories of analysis	Status
a) knowledge sharing	
- among farmers	
- experiences and life stories.	
b) Knowledge domain	
- Soil preservation	
- Traditional culture	
- Weather forecast	
c) Interaction between technical-scientific and	
traditional knowledge	
- Participation in improvement meetings (lecture	
restricted)	
- Interaction of knowledge in improvement	
meetings	
d) Origin of knowledge used in farmers'	
practices	
- interaction level between technical-scientific	
and traditional knowledge	
Share capital	
- Community participation	
- Entities or associations that are linked	
f) Knowledge by Gender	
- Level of knowledge by gender	
g) knowledge about property resilience	
- Protection of residences	
- Place to shelter in case of accident or disaster	
due to natural causes	
h) Environment preservation	
- Perception of environmental legislation	
- Use of pesticides on the property	
i) Possibilities of business ventures on the	

properties

- Interest in investing in new business ventures
- Knowledge about agroecology
- Knowledge about organic production
- Types of existing potentialities
- Availability of water on the property

Source: prepared by the authors, 2019.

5.2.1 Positive Status

a) Knowledge Sharing - the habit of farmers to share their knowledge with each other stands out. The interaction among farmers is very important for the process of creating new knowledge, because in order to become useful this knowledge cannot be stored in databases or in people's minds, but instead needs to be expanded and socialized among other farmers in order to initiate new cycles of innovation.

The literature that was analyzed showed that the studies demonstrate that traditional knowledge is still present in the activities developed by farmers and other rural populations because it is shared by families and communities. The authors researched, who addressed the theme in several countries, are highlighted: (Silva, 2017; Glasenapp & Thornton, 2011; Tricaud; Pinton & Pereira, 2016; Oliveira Junior, 2011).

By crossing the empirical research with the data obtained in the national and international literature, a convergence in the results can be observed, i.e., both show that local knowledge is shared among farmers and from generation to generation.

The process of sharing this knowledge allows sustainable practices to be rescued in order to re-establish harmonious interaction between men and nature.

In the current context, sharing this knowledge is becoming increasingly important as recent research has put as a starting point for sustainable rural development the endogenous approach, i.e., the construction of development projects must be based on the interests and motivations of the affected populations.

b) Traditional knowledge domain - on agricultural practices, related to the factors: care with the soil preservation; knowledge about making artifacts; cooking related to family tradition and knowledge about the aspects related to weather changes, the results are positive. It is noticed that despite the strong influence of external interventions aimed at the insertion of new technologies, local knowledge is still present in the daily lives of farmers. This is positive to the extent that the movements focused on the pursuit of sustainable rural development highlight the importance of this knowledge for the development of local potentialities aimed at creating value for products and services and, in general, it is important for

the restoration of the harmonious relationship between man and nature.

With regard to the knowledge domain derived from practices inherited from family tradition, the literature shows that rural populations still preserve their knowledge according to the authors researched (Santos; Soares & Barros, 2015; Glasenapp; Thornton, 2011; Zuchiwschi et al, 2010; Schiavon et al, 2015; Pandey & Sharma, 2016; Tricaud; Pinton & Pereira, 2016; Oliveira Junior, 2011; Marques, 2009; Thé, 2003; Barrué-Pastor; Barrué, 2016).

Also, it was found in the literature as well as in the empirical research that much of this knowledge is being lost, and for being tacit, it can be totally extinguished, losing valuable assets that can no longer be recovered.

c) Interaction of Technical-Scientific and Traditional Knowledge in improvement meetings - this category refers to the establishment of a field of interaction where various types of perception about certain situations that are placed, or when different worldviews enter into 'percussion' generating questionings and contextualizing new learning to local reality.

According to the authors researched (Glasenapp and Thornton, 2011; Pogutz & Winn, 2016; Schiavon et al, 2015; Pandey & Sharma, 2016; Tricaud; Pinton & Pereira, 2016; Oliveira Junior, 2011; Marques, 2009; Thé, 2003; Feliciano, 2013; Viegas, 2009), the importance of knowledge dialogue is being greatly emphasized in the literature.

In the studies analyzed, it was found that in view of the discussions on new technologies, technical assistance services, and any kind of intervention in the practices of traditional populations, the need for different types of knowledge, whether scientific or not, to be considered in the processes of building new knowledge was emphasized. d) Share Capital – represents the links of farmers in the community of which they are part, where they maintain their traditional forms of interaction through the church, community hall and the bars, as defined by the small local commerce in rural communities. In these places the farmers relate, practice leisure and exchange information about their daily lives.

In spite of maintaining a good relationship with the communities, more and more the farmers' families are ceasing to participate in the community, this loss is very harmful for their families, because the bonds of friendships are being lost, and all the local culture related to ethnicity that were ritualized through the community celebrations and in the participation on Sunday meetings, which besides reinforcing the spirituality, is a form of interaction among people, where knowledge and experiences are shared. In the literature researched, the works of the authors (Pandey & Sharma, 2016; Tricaud; Pinton; Pereira, 2016) are highlighted, who in their researches demonstrated that farmers have a good social participation through a link with several formal institutions.

Confronted with the empirical research, it was found that farmers have little links with formal organizations such as cooperatives and trade unions.

d) Knowledge on Resilience - as a positive aspect, it was found that there is still a concern of farmers with the protection of their homes against windstorms. In this sense, their residences are protected by trees around them, especially in the direction in which there are wind corridors. This concern is part of the culture of the inhabitants of rural areas.

In the literature review regarding the knowledge on resilience in rural areas, the works of (Glasenapp & Thornton, 2011; Barrué-Pastor & Barrué, 2016) are highlighted, which show knowledge and practices developed by populations living in an environment of imminent risk, which serve as models for researchers to adopt these measures for other populations living in dangerous situations.

The cases cited in the literature reinforce the importance of valuing local knowledge as a way of building solutions that can meet the needs of each territory, creating viable and contextualized alternatives for specific situations contextualized with the local reality, involving the physical and cultural aspects of populations.

e) Concern of farmers regarding the Environment Preservation - it was found that farmers are involved in a conscious way with the preservation of natural resources because the actions for the preservation of natural resources are the result of attitudes directed from an environmental awareness, fruit of the coexistence with nature and the legacy of the family tradition, which had a holistic relationship with nature, in this sense, the environmental legislation is not an external factor that determines the actions of farmers for the care of the environment.

In the literature analyzed, it is verified that the researches demonstrate that the knowledge on sustainable practices are present in the activities of farmers and other rural populations, however, this occurs as a proper action, with no management on this knowledge, on the contrary, it is still preserved by the initiative of the populations, which are constantly invaded by the interests of corporations that aim to implement exogenous methods of interaction and development of activities (Zuchiwschi et al, 2010; Viegas, 2009).
In the comparative analysis of empirical data with those of the bibliographic research, this theme is inserted in the factors on knowledge domain, considering that the actions that farmers adopt are related to the knowledge derived from the experience linked to the culture of traditional populations that treat the environment in a systemic perspective. Between the bibliographic data and the empirical research, the results show a convergence.

f) Availability of water on most farms - most farms have a high availability of water, making it an available resource for possible investments such as fish production and irrigation in the cultivation of vegetables and other products that can generate income for the farmer.

However, as analyzed on site, this type of resource is not being maximized, because it was not identified in the use of this resource for the development of productive activities. Thus, it should be noted again that family farmers are being included in hegemonic development projects that end up being stimulated to develop productive activities that are not identified with their preferences; on the contrary, they are adhering to the type of production that meets the requirements of the companies that operate on the properties by providing technical assistance.

Meanwhile, family farmers are increasingly losing the capacity to generate income, given the type of production that predominates, in this case soy production, where the results depend on production in scale. Consequently, family farmers are becoming more and more economically and socially unstructured, affecting the entire social and family organization, where young people abandon their families in search of other activities and aging landowners are no longer motivated to undertake new activities.

5.2.2. Intermediate Status

a) Interaction of technical-scientific (explicit) and traditional (tacit) knowledge - this factor is related to the diversity of options for carrying out the interaction between farmers and external agents. In this sense, the ways of interaction were very restricted to lectures, not providing opportunities for other ways of interaction than the tacit knowledge of farmers with the technical-scientific knowledge in the practical reality of their properties.

b) Origin of knowledge - although the interaction of both knowledge prevails as the predominant result, it was noticed that there is still some resistance on the part of some farmers to recognize the importance of new knowledge to assist in the activities developed on the farm in order to improve productivity.

Confronting with the empirical research, it is noticed that this theme is analyzed when questioning the process of interaction of farmers' knowledge with that of technicians and extensionists, which is reflected in the discussion on the traditional method of knowledge transfer that advocated a total transformation in the perception of the world of farmers. Farmers develop their activities based on models that were built by living with nature and were reconstructed over several generations according to the reality of each time. Thus, the literature increasingly emphasizes the importance of valuing traditional knowledge, since it can contribute greatly to the development of actions aimed at sustainable rural development. This compatibility among the different types of knowledge cannot be restricted only to economic factors because, as already analyzed, the practices of rural populations are developed in a holistic way, where the material and the immaterial are congruent factors, contrary to the Cartesian or dualistic view of traditional science of the West.

Concluding the analysis of this factor, there is a need to adjust the posture of external agents when intervening in the reality of farmers. The basic assumption for establishing a positive relationship is to increase dialogue and practical activities that bring the farmer and extensionists closer together as a means of disseminating new knowledge.

c) Knowledge by gender - as analyzed, there is still a *macho* culture on the part of farmers that men have more knowledge on agricultural activities, restricting the field of action of women to domestic activities and the care of dairy cattle. Also, within this perspective, women's social participation is small, thus reinforcing the cultural aspect of the difference between genders in rural areas.

5.2.3 Negative Status

a) Property Resilience - the shelter factor in situations of eventual calamities on properties was negative because the farmers do not show any alternative of protection in case of any type of damage to their homes. Also, they do not have a previously defined strategy if they need to leave their homes or property quickly.

b) Possibilities of business ventures in the property - the factor 'interest' in investing in new business ventures is negative because there is a lack of interest of farmers in investing in view of advanced age and the lack of a successor in the property considering that in most cases their children do not reside in their properties because they are already becoming professional or working in other urban activities.

c) Knowledge on Agroecology and Organic Production - it was found that farmers have little information, in this sense, the new enterprises aimed at sustainable rural development are compromised and with this, an alternative to restore the self-confidence of farmers and stimulate the permanence of young people in the properties ends up being wasted. Also, the financial resources for investment in this type of activities are limited or unknown to farmers, another difficulty in this type of investment would be the need for greater action by Ater as a sponsor of projects aimed at this type of production.

d) Share Capital - the factor participation in entities or associations was negative, since there was little participation of farmers in formal organizations such as cooperatives and unions. Participation in these entities is a way for farmers to obtain support and it is a channel of aid for solving various economic and social problems. Also, the intermediation of entities such as cooperatives makes it easier for the farmer to obtain inputs, credits and delivery of products for storage.

VI. CONCLUSION

Family farming is increasingly filling space as an important segment of responsible production for supplying the food market. Also, due to the socio-environmental damage caused by the technical paradigm of the Green Revolution, farmers have become protagonists in teaching sustainable practices.

The literature has shown the interest of researchers in analyzing the way of interaction that human beings, living in rural areas, have established with nature. As a culture of these social groups, the knowledge that is transformed into practices for the development of economic activities and social organization of families are perpetuated from generation to generation.

The results indicate that the socioeconomic status is quite compromised, considering the higher age group of the residents in the properties and the absence of family members willing to take over the management of the properties. The lack of public incentives and technical guidance for the development of production alternatives that may arouse the interest of young people to remain in agricultural activities has contributed to the expulsion of young people from rural areas. The activities that are developed in the properties are not very attractive and profitable because the predominance of cultivation is related to the production of commodities that is not suitable for small-scale production.

With regard to the knowledge potential, there is a positive status related to farmers' knowledge on sustainable practices. However, in relation to the incorporation of this knowledge into productive activities, there is a gap between local and scientific knowledge because farmers are not developing activities to generate income in line with the knowledge they have on sustainable practices. Rural development projects should be built in a participatory manner together with the local population, especially young people, so that they are encouraged to stay on the farms and at the same time become multipliers of successful models for other farmers in the community.

In short, the generalist model of rural development that is developed outside the reality of farmers, most of the time does not meet the needs and interests of farmers who identify themselves in activities with local peculiarities, due to sociocultural factors.

Therefore, according to the results of the empirical research, family farming remains with its characteristics that are perpetuated from generation to generation; however, the activities developed in their properties are decontextualized because, as analyzed, the activities developed by the surveyed farmers are basically summarized in the cultivation of commodities, which is not suitable for small properties, since its profitability is associated with production in scale. Thus, many economic and knowledge potentialities are not being put into practice.

REFERENCES

- Abramovay, R. (1998) Agricultura familiar e serviço público: novos desafios para a extensão rural. Cadernos de Ciência & Tecnologia, Brasília, v.15, n.1, p.137-157.
- [2] Al Said, F.A., Al-Yahyai, R.A., Opara, U.L. (2013) Traditional cultivation of pomegranate in Oman. Acta Horticulturae, p. 549-556.
- [3] Arruda, R. (1999) Populações tradicionais e a proteção dos recursos naturais em unidades de conservação. Ambiente & Sociedade, São Paulo, v. 2, n.5, p. 79-92.
- [4] Barrué-Pastor, M.; Barrué, M. M. (1998) Mémoire des catastrophes, gestion des risques et architecture paysanne en montagne. L'exemple des vallées du Haut-Lavedan dans les Pyrénées centrales françaises. Revue de géographie alpine, 86(2), 25-36.
- [5] Batalha, M. O., Buainain, A.M. & Souza Filho, H. M. de. (2005) Tecnologia de gestão e agricultura familiar. Disponível em: < http://sober.org.br/palestra/12/02O122.pdf>. Acesso em: març. 2019.
- [6] Carneiro da Cunha, M. (2012) Questões suscitadas pelo conhecimento tradicional. Revista de Antropologia, São Paulo, v. 55, n. 1, p. 439-464.
- [7] Carneiro da Cunha, M. da. (2007) Relações e dissensões entre saberes tradicionais e saber científico. Revista Usp, São Paulo, n.75, p. 76-84.
- [8] Diegues, A. C. (2010) A construção da etno-conservação no brasil: o desafio de novos conhecimentos e novas práticas para a conservação. Disponível em: < http://nupaub.fflch.usp.br/sites/nupaub.fflch.usp.br/files/colo r/manausetnocon.pdf>. Acesso em: 07 de junho de 2019.
- [9] Fachin, O. (2003) Fundamentos de metodologia. 4. ed. São Paulo: Saraiva.

- [10] Feliciano, A. M. (2013) Extensão rural: criação, estratégias de uso e retenção do Conhecimento. Florianópolis, Tese (Doutorado em Engenharia e Gestão do Conhecimento) – UFSC.
- [11] Fleury, L. C. & Almeida, J. (2007) Populações tradicionais e conservação ambiental: uma contribuição da teoria social. Rev. Bras. de Agroecologia, Pelotas, v. 2, n. 3, p. 3-19.
- [12] Glasenapp, M. V., Thornton, T. F. (2001) Traditional Ecological Knowledge of Swiss Alpine Farmers and their Resilience to Socioecological Change. Hum Ecol, New Delhi, 39(6), 769-781.
- [13] Guivant, J. S. (1997) Heterogeneidade de conhecimentos no desenvolvimento rural sustentável. Cadernos de Ciência & Tecnologia, Brasília, v.14, n.3, p.411-446.
- [14] Kesavan, P.C. (2008) Swaminathan, M.S. Strategies and models for agricultural sustainability in developing Asian countries. Philosophical Transactions of the Royal Society B: Biological Sciences, 363 (1492), p. 877-891.
- [15] Marques, F. C. (2009) Velhos conhecimentos, novos desenvolvimentos: transições no regime sociotécnico da agricultura a produção de novidades entre agricultores produtores de plantas medicinais do sul do Brasil. Porto Alegre, Tese (Doutorado em Desenvolvimento rural) – UGRGS.
- [16] Marques, M. I. M. (2008) A atualidade do uso do conceito de camponês. Revista NERA, Presidente Prudente, ano 11, nº. 12 p. 57-67.
- [17] MARCONI, M. de A. LAKATOS, E. M. (2003) Fundamentos de metodologia científica. 5. ed. São Paulo: Atlas 2003.
- [18] Mattei, L. (2014) O papel e a importância da agricultura familiar no desenvolvimento rural brasileiro contemporâneo. REN Revista Econômica do Nordeste. Fortaleza, v. 45, suplemento especial, p. 83-92.
- [19] Navarro, Z. (2010) A agricultura familiar no Brasil: entre a política e as transformações da vida econômica In: Gasques, J. G., Vieira Filho, J. E. R. & Navarro, Z. (Orgs.). A agricultura brasileira: desempenho, desafios e perspectivas. Brasília: Ipea, p. 185-209.
- [20] Oliveira Júnior, S. B. de. (2011) Avifauna Pantaneira: diálogo de saberes científico e popular em áreas úmidas (São Pedro de Joselândia, Barão de Melgaço, MT). São Carlos, Tese (Doutorado em Ciências) – UFSCAR.
- [21] Oliveira, M. C. C. de, Almeida, J. & Santos Silva, L. M. (2011) Diversificação dos sistemas produtivos familiares: reflexões sobre as relações sociedade-natureza na Amazônia Oriental. Novos Cadernos NAEA, Belém, v. 14, n. 2, p. 61-88.
- [22] Pandey, A. & Sharma, M. L. (2016) Study on knowledge level of the tribal farmers regarding seed production and management in Surguja and Surajpur districts of Chhattisgarh, India. Plant Archives, 16(2), 829-833. Disponível em: http://www.plantarchives.org/PDF%20162/829-833.pdf. Acesso em: ago. 2018.
- [23] Pereira, B. E. & Diegues, A. C. (2010) Conhecimento de populações tradicionais como possibilidade de conservação

da natureza: uma reflexão sobre a perspectiva da etnoconservação. Desenvolvimento e Meio Ambiente, Curitiba, n. 22, p. 37-50.

- [24] Ploeg, J. D. V. D. (2014) Dez qualidades da agricultura familiar. Agriculturas: cadernos de debate, n. 1, Rio de Janeiro, p. 1-16.
- [25] Pogutz, S.; Winn, M. Cultivating Ecological Knowledge for Corporate Sustainability: Barilla's Innovative Approach to Sustainable Farming. (2016) Business Strategy and the Environment, 25(6), 435–448.
- [26] Pooncharoen, N. (2016) The Effects of Economic Factors and Knowledge Management Practices on the Productivity of Small Farmers in the North of Thailand. International Business Management, 10(4), 456-460.
- [27] Puttoo, B.L. (2008) Traditional Rice Culture in Kashmir. Asian Agri-History, 12 (4), p. 285-297.
- [28] Santilli, J. (2012) A Lei de Sementes brasileira e os seus impactos sobre a agrobiodiversidade e os sistemas agrícolas locais e tradicionais. Boletim Museu Paraense Emílio Goeldi, Belém, v. 7, n. 2, p. 457-475.
- [29] Schiavon, G. de A.; Lima, A. C. R. de; Schiedecki, G.; Schwengber, J. E.; Schubert, R. N.; Pereira, C. V. (2015) O conhecimento local sobre a fauna edáfica e suas relações com o solo em agroecossistema familiar de base ecológica: um estudo de caso. Ciência Rural, Santa Maria, 45(4), 658-660.
- [30] Schneider, S. & Cassol, A. (2017) Diversidade e heterogeneidade da agricultura familiar no brasil e implicações para políticas públicas. In: Delgado, G. C., Bergamasco, S. M. P. P.(Orgs.). Agricultura familiar brasileira: desafios e perspectivas de futuro. Brasília: Ministério do Desenvolvimento Agrário, p. 82 107
- [31] Thé, A. P. G. (2003) Conhecimento ecológico, regras de uso e manejo local dos recursos naturais na pesca do alto- médio São Francisco, MG". São Carlos Tese (doutorado em Ecologia e Recursos Naturais) – UFSCAR.
- [32] Tricaud, S. Pinton, F. & Pereira, H. S. (2016) Saberes e práticas locais dos produtores de guaraná. Bol. Mus. Para. Emílio Goeldi. Belém, v. 11, n. 1, p. 33-53.
- [33] Wanderley, M. de N. B. (2009) O agricultor familiar no Brasil: um ator social da construção da construção do futuro. In: Petersen, P. (org.). Agricultura familiar camponesa na construção do futuro. Rio de Janeiro: AS-PTA, p. 33-45.
- [34] Yen, R. K. (2001) Estudo de caso: Planejamento e métodos.2 ed. Porto Alegre: Bookman.
- [35] Viegas, C. V. (2009) Atividades de gestão do conhecimento na elaboração do estudo de impacto ambiental. Florianópolis Tese (Doutorado em Engenharia e Gestão do Conhecimento) – UFSC.
- [36] Zuchiwschi, E., Fantini, A. C., Alves, A. C.& Peroni, N. (2016) Limitações ao uso de espécies florestais nativas pode contribuir com a erosão do conhecimento ecológico tradicional e local de agricultores familiares. Acta bot. Bras, 24(1), 270-282.

Investigations on a micro-scale solar chimney Aravind James¹, A.P. Sam², R. M. Skaria² and K.J. Sreekanth²

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Abstract— Solar chimney is a promising technology to convert solar thermal energy to electricity. This system is a combination of solar air heater and a central updraft tube to generate a solar energy induced convective flow of air to drive a turbine. A micro-scale model of such a system was installed for studying its feasibility in Kerala conditions. As the mean temperature differential obtained was only about 3.3°C and the chimney height was only 3m, a low air velocity value of 1.9 m/s was observed. Even though the possibility of power production with solar chimney could be established in the study, the economic and technical feasibility of the technology was not appreciable due to the climatic and geographic conditions prevailing in Kerala.

Keywords—Solar chimney, solar updraft tower, solar air heater, solar thermal energy.

I. INTRODUCTION

Energy is considered as the key to human progress since the very dawn of civilization. There is an ever increasing demand for energy due to the increasing population and the steady improvement in living standards all over the world. Dependence on fossil fuels for energy needs has been the cause of multiple challenges in the modern era namely: depletion of fossil fuels reserves, global warming and other environmental concerns and continuing economic crisis in developing countries due to fuel price rise. Being the most abundant and well distributed form of renewable energy, solar energy constitutes a big asset for the world. Solar energy is a very large non-polluting primary source of energy, available in plenty in developing countries like India.

Out of various technologies to harvest solar thermal energy, solar chimney is a promising innovation. It is a solar thermal driven electrical power generation plant which converts the solar thermal energy into electrical power with the aid of convective heat transfer process. Solar towers had aroused the interest of many researchers around the world and as early as 1500, Leonardo Da Vinci illustrated a solar tower which he called "smoke jack" [1]. Scientists had described the conceptual possibility of using the large hyperbolic cooling towers of abandoned nuclear power plants as solar chimneys, if a transparent cover surrounding the tower base is provided to collect the solar energy along with a hot air turbine in the tower [2]. As early as 1992, an experimental solar chimney power plant was developed at Manzanares in Spain [3]. The results of the experiments conducted and the simulation could establish the feasibility of the system. There was a proposal for solar chimney power plants in Iran as the country had high direct solar radiation with large areas

under desert which encouraged the project [4]. A solar chimney PV/T power plant which was a combination of solar thermal and photovoltaic technologies was developed in China [5]. New designs of solar chimneys by integrating PV are also being developed [6]. Many mathematical models have been developed to simulate the performance of solar chimney systems [7]. Investigations were also done by on the improvement of ventilation in buildings with these systems [8]. Numerical approaches to improve the design in buildings are also relevant [9]. Power production with solar chimney has also been combined with water desalination [10]. Solar chimney power plant, even though a known concept, has much relevance in renewable energy production and hence its feasibility in Kerala state of India was studied.

II. MATERIALS AND METHODS 2.1 Theoretical considerations and design procedure for



Fig.1: Concept of solar chimney

The micro scale prototype solar chimney plant consisted of a solar tower placed at the centre of a transparent canopy spread at a height above a painted black surface. The conceptual configuration of the solar chimney is shown in Figure 1.

2.2 Design procedure for chimney:

The Mass flow rate of air was estimated considering the following basic principles:

The air entering the periphery of the collector continue to travel through the space under the canopy until it reaches the chimney. The air finally exits from the top of the chimney and the rate of mass flow is given by the following continuity equation:

$$m. = A_p U \rho_1 = A_c V \rho_2$$
(1)
Where:
$$m. = mass flow rate of air (kg/s)$$

mass flow rate of air (kg/s) Ap = $4LH_p$ (collector peripheral area, m²) length of the side of the collector (m) L = height of the canopy at the periphery (m) Hp = U = velocity of incoming air at collector periphery (m/s)V = velocity of the air at chimney inlet (m/s) density of ambient air (kg/m³) = ρ_1 = density of air at turbine temperature (kg/m³) ρ_2 = cross-sectional area (πr^2) of the chimney with A_c

radius, r (m) The pressure difference between the bottom and the top

of the chimney P (Pa) is given by:

$$P = (\rho_1 - \rho_2) gH_c$$
(2)

Where:
g = acceleration due to gravity
$$(m/s^2)$$

g = acceleration due to gravity (H_c = height of the chimney (m)

The rising air imparts kinetic energy to a rotor placed in the chimney, causing it to rotate. The power the air turbine extracts from the rising air, P_r (W) is given by:

$$P_r = 0.5\eta_r \rho V^3 A_c$$
(3)
Where:

 η_r is the power coefficient of the turbine and ρ is the air density.

The pressure head due to the buoyant force can be obtained from Toriselli's equation given below:

$$V = (2gh)^{\frac{1}{2}}$$
 (4)
If the specific gravity of the general mass of cooler air

surrounding the chimney is unity and that of hot air
$$s_h$$
, the
net buoyant head responsible for velocity, V (m/s) is:
 $h = (1-S_h) H_c$ (5)

Where,
$$H_c$$
 is the chimney height (m).

The value for S_h of hot air can be expressed in terms of the ratio of absolute temperatures,

$$S_h = T_c/T_h$$
 (6)

Where, subscripts c and h refer to the cooler and hotter air masses. Now the formula (4) becomes,

$$V = (2gHc (1-T_c/T_h)) \frac{1}{2}$$
(7)

The mass of gases, m flowing through any crosssection of the chimney (kg/s) is given by:

$$m = AV\rho \tag{8}$$

$$m = \pi/4 D^2 V \rho \tag{9}$$

Thus, diameter of chimney D (m) is given by:

$$\mathbf{D} = 1.128 \,\mathrm{V}(\mathrm{mg}/(\mathrm{V}\mathrm{\rho}\mathrm{g}) \tag{10}$$

Collector dimensions:

The collector dimensions were arrived as follows:

Base length was decided to be 4m making a 4mX4m base which was painted black.

Slope of the collector roof = 30 degrees

From trigonometric ratios, the collector dimensions obtained were as below:

Slant height	=	(0.5) X base length/ $\cos 30^{\circ}$
	=	2.165m
Altitude	=	(0.5) X base length X tan 30°

=`1.0819m

2.3 Test procedure

The test was performed in the prototype power plant when the solar insolation was observed to be steady and somewhat conducive to obtain reliable data. The effort was to get a condition for obtaining steady values of air velocity which gave a direct indication of the output power. Observations of air temperatures (ambient and inside the collector) and air velocities were noted from 10 am to 4 pm at hourly intervals for 5 consecutive days.

The power density, $P_d\ (W/m^2)$ of the air stream was calculated using the equation,

$$P_{d} = 0.5 \ \rho_2 \ V^3 \tag{11}$$

The air density was calculated by taking the Universal gas constant for air as 0.287 kJ/kg°K and atmospheric pressure as 101.325 kPa.

Actual power production, P_a from the micro scale unit was calculated by assuming a conversion efficiency of 0.4. $P_a=0.4 A_c P_d$ (12)

III. RESULTS AND DISCUSSION

3.1 Design and fabrication of the solar chimney



Fig.2: Solar air heater

The designed and fabricated prototype solar chimney included a triangular pyramid collector along with the solar tower. The framework for collector was fabricated using MS angle iron and MS rods to get a square base. The cladding material for thermal energy trapping material was UV stabilised polyethylene sheet of 50 micron thickness. The sheet was clad on the collector framework to create a greenhouse effect for increasing the temperature inside. The collector was set at a fixed maximum height at the centre and minimum height at periphery leaving a clearance above ground level to permit the entry of outside cool air. This collector configuration was adopted to actuate the convection current which could drive the hot air upwards due to density difference. This sheet canopy supported on the framework fabricated with MS angle 32 x 32 x 3 mm size, could be placed at varying heights above the collector surface. The floor of roof terrace with a concrete surface was chosen to get a higher surface temperature than that could be produced by natural earthen ground. The collector surface was given three coatings of ordinary black paint to increase the absorptive characteristics of the surface.

The updraft tower was fabricated with a poly vinyl chloride pipe of length 3m and inside diameter 25 cm. An MS flange was used for connecting the pipe at the centre of the solar air heater (solar collector) as shown in Fig. 2. A provision for inserting an anemometer at the junction of the collector and tower was given for measuring air velocity. The design details of the solar chimney are given in Table 1.

Table 1. Design s	specifications	of solar	[.] chimney
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Size of the collector (m)	4x4
Height of chimney (m)	3
Diameter of chimney (m)	0.25
Canopy clearance at periphery (m)	0.06

3.2 Performance of the updraft tower

The experiments were conducted during the month of March at Trivandrum in Kerala state of India (8.5241°N, 76.9366°E). The temperatures Ti and To, inside and outside the collector, respectively recorded on five consecutive days at an hourly interval from 10 to 16 hours is shown in Table 2. It could be observed from Table 2 that substantial increase in air temperature could not be achieved in the morning hours. It appeared that even when there was sufficient sunshine, it took some time for the surface to get heated up and thereafter there was a steady increase in the air temperature rise of air in the collector is depicted in Fig. 3. Maximum hike in temperature was

observed at 3 pm and there after the temperature gradient started declining.



Fig.3: Variation of temperature gradient with time

Table 2. Temperature variation in the solar air heater

Dave		Time, Hrs						
Days		10	11	12	13	14	15	16
Day	Ti	37.3	38	40	41	41.2	40.4	39
1	То	36	37	36.5	38	38	37.5	36
Day	Ti	37	37	38.8	40	41.7	41.8	40
2	То	36	37	36.5	38	38	37.5	36
Day	Ti	38	39	39.6	40.3	41.7	40	40.2
3	То	36	38	38.3	38	39	38	38.2
Day	Ti	36	38.1	40.2	40	42.1	42	41
4	То	37	37	38	39.3	39	40	38.4
Day	Ti	37.3	38	38	40.2	40.7	42.5	39.4
5	То	36	36.8	37.1	38	39	37.5	36.8

The power obtainable from the air stream per unit area is a function of the cube of the air velocity and the air density. The variations of density and temperature of the air stream are illustrated in Fig.4. The upward draft of air is induced by the rise in air temperature which is responsible for the increased air velocity. Air density decreases as the air temperature increases and this is likely to have an adverse effect on the power production as the kinetic energy of the air mass is influenced by the mass of air column passing through the turbine in unit time.

Fig. 5 illustrates the power parameters of the micro-scale system. As the power in the wind is proportional to the cube of air velocity even with a slight increase in air velocity there was a significant rise in the power density of air. The effect of slight decrease in air density due to heating was not seen influencing the power density significantly. Thus it could be inferred that the air velocity varies in the solar chimney with time of the day and the power obtained was substantially high in the afternoon hours reaching maximum at about 3 pm in the climatic conditions prevalent in the test site. After that the power production seemed to decline.



Fig.4: Variation of collector air parameters with time

The actual power produced from the micro-scale solar chimney was meager as the overall conversion efficiency was low with most plat plate collectors. In this system the solar energy was converted into thermal energy of air which was subsequently converted to kinetic energy of the air mass flowing through the chimney. The kinetic energy of the air should again be converted to mechanical energy by the turbine which in turn needs to be transformed to electrical energy. The overall efficiency of the system gets reduced due to these series of conversions. The effect of side winds may also act adversely on the air velocity inside the chimney but could not be assessed in the present study. It can be seen from Fig.5 that the actual power produced from the micro scale model is very meager mainly due to the small height of the chimney. Chimney height is the most crucial factor in getting sufficient upward draft of air. Even though the possibility of power production by solar updraft tower could be demonstrated, the system is not expected to have substantial scope in states like Kerala where large stretches of waste lands are not available. In addition, the cloudy conditions prevalent during the monsoon season are not favourable for such a power production system. Another handicap is the lack of large stretch of waste land required for the collector. The overall inference of the study is not in favour of solar updraft towers in the state of Kerala.



Fig.5: Variation of different parameters of power with time

The following were the salient findings and conclusions of the present feasibility study on electric power production using the concept of solar chimney:

- i. The possibility of power production by solar chimney effect was demonstrated.
- ii. The relevance of the dimensions of the system on the power output could be understood. The chimney height is the most important factor affecting the air velocity which has a tremendous effect on the power output from the plant. Large collectors spanning huge areas of land are essential to produce reasonable power output.
- iii. The clearance between ground and the periphery of the collector need to be optimized to reduce the adverse effect of side winds.
- iv. The ground surface (concrete roof in the present stud) acted as a storage medium storing part of heat energy from the radiations incident on the land surface during the day time. During cloudy conditions and possibly at night, this heat is released to the air in the collector which in turn can produce power, though at a reduced rate. Sensible heat storage techniques can improve the performance.
- v. Temperature differential attained during the testing period was small in the micro-scale design. A collector of more optimised design with selective coatings with high absorptivity can produce better temperature gradient.
- vi. There is not much feasibility for this technology in the state of Kerala in consideration of the climatic and geographical factors characteristic of the state.

REFERENCES

- [1] Dhahri, A. and Omri, A. (2013) A review of solar chimney power generation technology. International Journal of Engineering and Advanced Technology 2(3): 1-17.
- [2] Scesa, S. (1985). Cooling tower retrofit for solar power generation. Alternative Energy Sources VII Solar Energy 2, Hemisphere Publishing Corporation: 459-468.
- [3] Schlaich Jorg, Schiel Wolfgang and Friedrich Karl (1992). Solar chimneys. Encyclopaedia of Physical Science and Technology. 15: 335-343.
- [4] Asnaghi, A. and Ladgevardi, S.M. (2012). Solar chimney power plant performance in Iran. Renewable and Sustainable Energy Reviews 16(5): 3383-3390
- [5] Liu, Q., Cao, F., Liu, Y., Zhu, T. and Deyou Liu, D. 2018. Design and simulation of a solar chimney pv/t power plant in northwest China. International Journal of Photoenergy, Article ID 1478695, 12 pages.
- [6] Ahmed, O.K. and hussien, A.S. 2018. New design of solar chimney (Case study). Case Studies in Thermal Engineering 11:105-112

- [7] Duan, S. 2019. A predictive model for air flow in a typical solar chimney based on solar radiation. J. Building Engineering 26, article 100919.
- [8] Hou, Y., Li, H. and Li, A. 2019. Experimental and theoretical study of solar chimneys in buildings with uniform wall heat flux. Solar Energy 193: 244-252
- [9] Khosravi, M., Fazelpour, F. and Rosen M.A. 2019. Improved application of a solar chimney concept in a two storey building: an enhanced geometry through a numeric approach. Renewable Energy 143:569-585
- [10] Maia, C.B., Silva, F.V.M., Oliveria, V.L.L. and Kazmerski, L.L. 2019. An overview of the solar chimneys for desalination. Solar Energy 182:83-95

Gamification as a Process Class: The Dialetic of user Interaction

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Abstract— The study of gamification as a process has been growing in a multidisciplinary way in various areas of knowledge, being applied to the development of products, services and interaction with users in a search to make their experience more meaningful and promote the change of their behavior. This paper aims to present a dialectical view on the concept of gamification as a process of its relationship with changing user behavior. Descriptive research, which used as analysis the dialectical method divided into three moments, syncresis, analysis and synthesis. The revision of the texts concludes with an interdisciplinary view of gamification as a process, as well as its development is linked to the intrinsic, extrinsic motivations and the behavioral change of users, especially when they are inserted actions and activities, whether products or services. Gamification it is not just a set of methods or game mechanics, but a process that increases the likelihood of user experiences seeking their behavior change.

Keywords—Users, Processes, Gamication, dialectic.

Resumo— TO estudo da gamification como processo vem crescendo de forma multidisciplinar em diversas áreas do conhecimento, sendo aplicado ao desenvolvimento de produtos, serviços e interação com os usuários, na busca de tornar sua experiência mais significativa e promover a mudança de seu comportamento. Este artigo tem como objetivo apresentar uma visão dialética do conceito de gamification como um processo de sua relação com a mudança de comportamento do usuário. Pesquisa descritiva, que utilizou como análise o método dialético dividido em três momentos, sincrese, análise e síntese. A revisão dos textos termina com uma visão interdisciplinar da gamification como um processo, bem como seu desenvolvimento está atrelado às motivações intrínsecas, extrínsecas e à mudança de comportamento dos usuários, principalmente quando inseridas ações e atividades, sejam produtos ou serviços. Gamification não é apenas um conjunto de métodos ou mecânica de jogo, mas um processo que aumenta a probabilidade de experiências do usuário buscando uma mudança de comportamento.

Palavras-chave— Usuário, Processos, Gamification; dialética.

I. INTRODUCTION

Process understanding is becoming important to organizations in the current context. How transformations in the market, such as changes in consumer and user behavior, are constantly changing factors that are directly linked to process development. Considered as a set of activities performed in sequence defining a path to be followed, almost always resulting in a product or service, the study of processes has been gaining ground in both the academic and business environments.

Defining process is not a very easy task. According to etymology the word 'process' comes from the Latin procedure. The Portuguese language dictionary defines process as "Continuous and prolonged action, which expresses continuity in the accomplishment of a given activity", the word is also used in various contexts: in legal, physics, chemistry, zoology. However, it is in the industry that it has been used to define a set of procedures related to product and service, seeking to improve results (ASSUNÇÃO; MENDES, 2000; CONEJO; GASPARIN; SILVA HOUNSELL, 2019).

Management studies understand the process as a sequence of activities performed to generate and create value for customers (HUOTARI, K.; HAMARI, 2012; KORN; SCHMIDT, 2015). This value creation is always related to other processes: creation, co-creation, development as well as product delivery. In a more holistic view, the processes in administration are managing the inputs, activities, infrastructure, and references needed to add user value (BRASIL; SANTOS; DIETRICH, 2010).

The processes are present in the development of new products and with the market strategies. For organizations product development is therefore a potential source of developing competitive advantage and differentiation, considered two essential processes for the survival of organizations, especially those inserted in highly competitive markets (BROWN; EISENHARD, 1995; PIMENTEL, et al., 2018).

In service development the process is related to meeting human needs. The services differ from the products in possessing: intangibility, are ideas and concepts, perishability, can not be stocked, besides variability, simultaneity. The execution of a service may or may not be related to a specific product (KELLER; KOTLER, 2006).

Processes are important for work time and procedure optimization. Process engineering that seeks to understand and promote process improvement as: to form of working analyzing and improving the flow of information, storing, as well as performing organizational analyzes and indicators to support decision making regarding an organization's production system (GROVER; KETTINGER, 2000).

The processes are also present in the studies of psychology. Perception, attention, memory, thinking, language and learning are described as Basic Psychological Processes. Vygotsky, directed his studies to understand the Higher Psychological Functions, this is, processes constructed in the relationships that humans have with each other and with nature, for him these functions are developed through the mediation, that is, a process of teacher/student interaction during the teachinglearning process (STERNBERG, 2010; SABE; KASTRUP, 2011; LEE, 2019; LANDERS, 2019). The process is also present in information theory. When observing the understanding of the process applied to information architecture during software construction, some elements are necessary as: the presence of a goal, the functions to reach that goal, the people involved, responsible actors, chronologies for carrying out the activities, as well as requirements, constraints, intentions or aspirations (PEDRAZA-GARCIA; ASTUDILLO; CORREAL, 2014; ALHAMMAD; MORENO, 2018; HERRANZ, et al., 2019).

Considering the need to debate the concept of gamification and its definition as a process class, The aim of this research is to present a dialectical view on the concept of gamification as a process its relation to user behavior change. The research is considered as a descriptive exploratory research, developed from the dialectical method. This method is based on the search for the construction of knowledge from the understanding and abstraction of thought. The dialectic theory of knowledge occurs basically in three great moments: Syncresis, Analysis and Synthesis (VASCONCELOS, 1992).

II. PROCESS AS GAMIFICATION, CONCEPT DIALETICS

The definition of the concept of gamification is the subject of investigation by several authors from different fields of knowledge. Marketing, psychology, interactive technologies, the social sciences, healthcare and even public policy, all interested in how to use gamification as a way of modifying user behavior and engaging them in activities and processes in a pleasurable way.

For the authors, Robert Mitchell, Lisa Schuster and Judy Drennan (2017), The study of gamification applied to social marketing is understood as a process that has the ability to improve a particular service and thus support the creation of value for the user. Gamification is linked in the authors' view to the significant increase in intrinsic motivation of individuals, Thus, as a process gamification directly impacts the maintenance of behavior and can thus be measured according to the increase of this motivation, always supporting the change in human behavior.

This perspective corroborates the authors Huotari and Hamari (2012). For these authors, gamification is a process that enhances a service with gaming features and experiences, with the purpose of supporting user value creation. The authors argue that gamification cannot be understood solely as a set of methods or game mechanics, but, as a process that increases the likelihood of gaming experiences, thus becoming a co-creation process between developer and players. What can be highlighted in their study is the separation of service concepts and systems for gamification application as a process class.

Huotari and Hamari (2012), present that services are linked to game design elements, that is, corresponds to a set of specialized competences, knowledge and skills, thus relating the actions of. Thus, systems are understood as the use of resources, namely: people, technologies and information to improve one's own situation or others.

For Swacha and Ittermann (2017), start from the idea that everyday actions can be playful. These authors present that gamification is a thinking process and game mechanics that aims to engage users and solve problems. Within this context, game design elements seek to achieve different goals by supporting user engagement and experience. The importance of extrinsic and intrinsic motivations are also presented by the authors. DIn this way, games are human resources that change behavior and gamification is seen as a process improvement technique.

Gamification has been the subject of study in educational processes for some time in Brazil (ALVES; MINHO; DINIZ, 2014; DA SILVA, A. R. L., et al., 2014). The authors Oliveira and Cruz (2018), present the concept of gamification from the reflection on the structure of Octalysis, a framework created by Yu-kai Chou, which has as its center the human being composed of eight axes, each axis represents a dimension of different meanings, empowerment of creativity, social influence, unpredictability, restraint, scarcity, possession and achievement, with the positives at the top and bottom the negative aspects (Black Hat); on the right the extrinsic motivation factors, on the left the intrinsic motivation factors (SANCHEZ-GORDÓN: COLOMO-PALACIOS: HERRANZ, 2016; FERREIRA; MORGADO: MIRANDA, 2018).

Oliveira and Cruz (2018), present gamification as a technology that can be inserted into the teaching-learning process for better student interaction. As a result the authors proved that gamification can promote the development of skill transformations in primary English teaching.

Authors like Korn, Schmidt (2015), help understand gamification applied to business processes. These authors demonstrate that concept study is still beginning to settle in industry and service. Gamification is a social technology that seeks to improve human experiences, user engagement and satisfaction. When applied to business gamification helps in visualizing management by objectives, while in industry it helps in measurability and service improvement. As presented in the aforementioned studies, the authors also view gamification as a process that helps support the creation of user value.

Gamification should be viewed as a process. The teacher Werbach (2014), from the University of Pennsylvania in your article (Re)Defining Gamification: A Process Approach, stresses that gamification is the use of game design elements in non-game context. However, the author points out that not everything that includes a game element can be considered a gamification. For this author, gamification is defined as a process of making activities closer and more like games. This concept validates the ideas of the authors Huotari and Hamari (2012), where gamification is seen as a process that enhances services making it the most fun experiences ever seeking to create user value.

As a practical example of how gamification is a process that can be applied to various contexts, Inchamnan (2019), presents a gamification proposal used for behavior change for older people in Thailand. This author discusses gamification as a persuasive tool that can be used to change people's mentality and culture. Gamification engages people to change their behavior, which can only be done by providing information that encourages desired behavior. For this author, engagement can be characterized by the intensity of behavior and emotional quality, as well as the active involvement of a person during a task.

The concept of gamification is seen as a process that has the ability to improve the organizational environment. The authors Oprescu, Jones e Katsikitis (2014), reinforce that the work environment has stress levels, social capital, loyalty, rapid change and workforce demographics. These elements are important for gamification system implementation. For these authors gamification can be used to turn some of their work processes into a gaming experience.

Huotari and Hamari (2017), argue that the study of gamification has been the subject of research by both industry and academia. When applied to the service, gamification has the ability to promote behavior change and enable valuable experiences. The authors present that players in their action of interaction with service systems create value by becoming co-creators of the process. Figure 01 seeks to represent this view of the authors.



Fig. 1: User Interaction with Gamified System

The authors point out that systems are seen as a set of features that enable the user to accomplish their related goals. This way gamification lets you render new meanings to existing features. Service here is understood as any system that promotes interaction resulting in a value proposition. As such, (game) design elements can be described as services and games as service systems.

III. CONCLUSION

Dialectics as a methodological principle helps to understand the concept of gamification as a process. In general, the idea of gamified system development is related to the use of non-game game design. This principle is related to the change of user behavior in different categories of products or services seeking to promote engagement and involving the user in value building.

It is possible to realize that the word process evokes many meanings and can be applied to different scenarios, management, health, education, sports, among others. Process can have many meanings, however, what can be observed in the authors' view is a similarity in all contexts, There are always action stocks and input transformations (abstract quantities) that are processed from established objectives (gamified system), being dynamic and possible to apply them in different scenarios.

Understanding the concept of gamification as a process contributes to the understanding of how its application can be used to change human behavior. Defined by an interdisciplinary point of view, gamification seeks to promote an integrative view with systems (products or services), as well as user interaction in value creation.

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REFERENCES

- ALHAMMAD, M. M.; MORENO, A. M. Gamification in software engineering education: A systematic mapping. Journal of Systems and Software, v. 141, p. 131-150, 2018
- [2] ALVES, L. R. G.; MINHO, M. R. S.; DINIZ, M. V. C. Gamificação: diálogos com a educação. In: FADEL, Luciane Maria et al.(Org.). Gamificação na educação. São Paulo: Pimenta Cultural, 2014, p. 74-97.
- [3] ASSUNÇÃO, M. A.; MENDES, P. J. V. Mudança e Gestão de Processo em Organização Pública. Congresso Internacional del CLAD. Anais... Santo Domingo: CLAD, p. 14, 2000.
- [4] BRASIL, V. S.; SANTOS, C.; DIETRICH, J. F. Co-Criação de valor: proposição de uma estrutura de análise dos elementos influenciadores da criação compartilhada de valor nas empresas. Anais do EMA–IV Encontro de Marketing da ANPAD, Florianópolis, 2010.
- [5] BROWN, S. L.; EISENHARDT, K. M. Product development: Past research, present findings, and future directions. Academy of management review, v. 20, n. 2, p. 343-378, 1995.
- [6] CONEJO, G. G.; GASPARINI, I.; SILVA HOUNSELL, M. Detailing Motivation in a Gamification Process. In: 2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT). IEEE, 2019. p. 89-91
- [7] DA SILVA, A. R. L., et al. Gamificação na educação. Pimenta Cultural, 2014.
- [8] FERREIRA, M.; MORGADO, L.; MIRANDA, G. L. Análise das funcionalidades de gamificação nos ambientes de aprendizagem Classcraft e Moodle à luz da framework Octalysis. 4º Encontro sobre Jogos e Mobile Learning, p. 117-130, 2018.
- [9] HERRANZ, Eduardo et al. Gamification for software process improvement: a practical approach. ET Software, v. 13, n. 2, p. 112-121, 2018.
- [10] HUOTARI, K.; HAMARI, J. Defining gamification: a service marketing perspective. In: Proceeding of the 16th international academic MindTrek conference. ACM, 2012. p. 17-22.
- [11] _____. A definition for gamification: anchoring gamification in the service marketing literature. Electronic Markets, v. 27, n. 1, p. 21-31, 2017.
- [12] JOENK, I. K. Uma Introdução ao Pensamento de Vygotsky (An Introduction to the Thought of Vygotsky). Revista Linhas, v. 3, n. 1, 2002.
- [13] KOTLER, P., KELLER, K. Administração de Marketing. Pearson - Prentice Hall, 2006.
- [14] LANDERS, Richard N. Gamification misunderstood: how badly executed and rhetorical gamification obscures its transformative potential. Journal of Management inquiry, v. 28, n. 2, p. 137-140, 2019.
- [15] LEE, B. C. The Effect of Gamification on Psychological and Behavioral Outcomes: Implications for Cruise Tourism Destinations. Sustainability, v. 11, n. 11, p. 3002, 2019
- [16] MITCHELL, R.; SCHUSTER, L.; DRENNAN, J. Understanding how gamification influences behaviour in

social marketing. Australasian Marketing Journal (AMJ), v. 25, n. 1, p. 12-19, 2017.

- [17] OPRESCU, F. JONES, C.; KATSIKITIS, M. I PLAY AT WORK—ten principles for transforming work processes through gamification. Frontiers in psychology, v. 5, p. 14, 2014.
- [18] PEDRAZA-GARCIA, G.; ASTUDILLO, H.; CORREAL, D. Modeling Software Architecture Process with a Decision-Making Approach. In: 2014 33rd International Conference of the Chilean Computer Science Society (SCCC). IEEE, 2014. p. 1-6.
- [19] PIMENTEL, J. et al. A gamified requirements inspection process for goal models. In: Proceedings of the 33rd Annual ACM Symposium on Applied Computing. ACM, 2018. p. 1300-1307.
- [20] SANCHEZ-GORDÓN, M.; COLOMO-PALACIOS, R.; HERRANZ, E. Gamification and human factors in quality management systems: mapping from octalysis framework to ISO 10018. In: European Conference on Software Process Improvement. Springer, Cham, 2016. p. 234-241.
- [21] KORN, O.; SCHMIDT, A. Gamification of business processes: Re-designing work in production and service industry. Procedia Manufacturing, v. 3, p. 3424-3431, 2015.
- [22] SADE, C.; KASTRUP, V. Atenção a si: da autoobservação à autoprodução. Estudos de Psicologia, Rio de Janeiro, v. 16, n. 2, p.139-146, 01 maio 2011.
- [23] STERNBERG, R. J. Psicologia Cognitiva. 5^a ed. São Paulo: Cengage Learning, 2010.
- [24] SWACHA, J.; ITTERMANN, R. Enhancing the tourist attraction visiting process with gamification: key concepts. Engineering Management in Production and Services, v. 9, n. 4, p. 59-66, 2017.
- [25] WERBACH, K. (Re) defining gamification: A process approach. In: International conference on persuasive technology. Springer, Cham, 2014. p. 266-272.

Prevalence of Disease Resulting from Chronic Renal Failure in Patients Treated in Pró-Rim Foundation in the Municipality of Gurupi-To

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Abstract— A vital function of the kidneys is to extract the waste and excess water from the body. Chronic kidney disease is characterized by the slow decline of kidney function, it increases the risk of other diseases such as hypertension, diabetes mellitus, and anemia. The prevalence of diseases arising from chronic renal failure patients on hemodialysis was evaluated through analysis of medical Kidney Foundation Pro- Gurupi the municipality, state of Tocantins, Brazil. The data were extracted from medical records of 90 patients undergoing hemodialysis in Pro Rim. The diseases found in patients with chronic kidney disease were hypertension (52.22%), diabetes (68.89%) and anemia (78.89%), hypophosphatemia (62.22%). To solve the prevalence of these diseases in the city studied, actions are needed guidance on prevention and treatment showing the importance of the foundation pro- kidney as a therapeutic mechanism for each condition, so that prevented damage to the health of patients originated from the lack of information on these diseases by the health units. Keywords— Pro-Rim, Chronic Kidney Disease, Renal Insufficiency, Hypertension.

I. INTRODUCTION

Chronic kidney disease consists of renal injury (CKD) and progressive and irreversible loss of kidney function (glomerular, tubular and endocrine). In its most advanced phase (called the terminal phase of chronic renal insufficiency-CRF), the kidneys are unable to maintain the normality of the patient's internal environment (ROMÃO-JUNIOR, 2004).

The *National kidney Foundation*-K/Doqi (2002) reports that CKD can be diagnosed without the knowledge of its cause, and renal impairment can be confirmed by injury markers even before a renal biopsy.

Patients with chronic kidney disease, when compared to the general population, present a higher prevalence of cardiovascular diseases (CVD), including coronary, cerebral vascular, peripheral vascular disease and heart failure. The retention of sodium chloride (Na⁺Cl⁻) by the inappropriately elevated levels of renin for the expansion state of the extracellular fluid volume, by sympathetic stimulation through afferent renal reflexes, and by Impairment of renal endothelial function with nitric oxide deficiency and increase in endothelin production leads to complication of hypertension in CRF, which if not treated, corresponds to cardiovascular risk (GUIMARÃES; FERREIRA, 2010).

Hemodialysis is the first-choice treatment in CRF. Over time this therapy affects other physiological systems triggering cardiac and pulmonary damage, with pulmonary congestion being the most frequent, being related to the restrictive disturbance the reduction of airflow to the pulmonary function test (PIERSON, 2006).

Certain patients offer great predisposition to chronic kidney disease and thus are considered a risk group as in the case of diabetes mellitus, hypertension, and anemia.

Anemia is defined as a hemoglobin concentration below normal values for a given age group and gender. The most common causes of anemia are acute blood loss, hemolysis, increased plasma volume or lack of vitamins and minerals (WHO, 2004; REZENDE, 2005).

Diabetes mellitus and hypertension, which are commonly addressed in the Office, are the major contributors to CKD and, therefore, these risk factors should be rigidly controlled and these patients should be evaluated due to the renal damage that may arise (MURPHREE et al., 2010).

In view of this problem, research is needed through the bibliographical survey and analysis of medical records of patients attended at the Pró-Rim Foundation, in order to analyze the main pathologies affecting patients with chronic kidney disease in Municipality of Gurupi-TO, seeking also to seek ways of prevention and a possible delineation of methods that may minimize the symptoms and effects that these diseases cause.

Pró-Rim is a non-profit foundation specialized in nephrology, being one of the most respected in this area, which is headquartered in the city of Joinville, State of Santa Catarina. In the state of Tocantins, it is installed in the cities of Palmas, Araguaína, and Gurupi. In Gurupi it is located as an annex to the Regional Hospital where data collection will be made, bringing an important contribution to this research.

This work aims to analyze the prevalence of diseases caused by chronic renal insufficiency in patients attended at Foundation Pró-rim in the municipality of Gurupi – TO.

II. MATERIAL AND METHODS

Quantitative-Descriptive exploratory research was performed. The research was carried out at the Pró-RIM Foundation of the municipality of Gurupi – to, located at street 5 between the Avenues Pernambuco and Piauí. The sample consisted of the analysis of charts of 90 patients since this number represents the sample group in a more representative way and encompasses 100% of the patients undergoing treatment at the foundation.

The inclusion criteria were: Be regularly linked to the PRÓ-RIM Foundation undergoing hemodialysis

treatment; Medical records of patients older than 18 years of age of both sexes.

For the evaluation of the occurrence of diseases in patients with chronic kidney disease (CKD), the medical records of all patients undergoing hemodialysis were collected, where the data needed to better expose this subject were extracted, achieving the proposed objectives.

The collection of medical records was carried out between October and November 2013. After collection, we extracted. The necessary data to better expose this theme in order to achieve the proposed objectives as follows: An individual survey was made of the Patients medical records, where they were separated by disease. Ex. Of the 90 patients 30 found diabetes, 60 had high blood pressure, and so on. Thus, the control of the diseases was also verified, that is, the amount of normotensive, pre-and post-hemodialysis urea among other diseases.

It is known that the patients undergo periodic exams (monthly), and it is of these exams (Glycemia, hematocrit, calcium, potassium among others) that will be analyzed the prevalence of diseases resulting from CKD in these patients.

The data obtained were evaluated descriptively. Organization of data in charts and tables using MSOffice Excel® 7.0 for discussion and final analysis with a scientific basis.

The legal devices that regulate research activities involving public archives were observed, according to the National Health Council (CNS). The work passed by the Ethics and Research Committee, approved by the opinion no. 436719-2013, even though the research did not have an *in vivo* approach, it is worth remembering Again that the identification of the patients was confidential.

III. RESULTS AND DISCUSSION

The research was conducted with 90 patients of the Pró-Rim Foundation, being 60% male and 40% female as shown in Figure 1.



Fig.1: Gender of the pro-kidney Foundation patients

The results were the same as those found by Romagna (2010) In his research entitled "Prevalence of anemia, dyslipidemia and arterial hypertension in patients with chronic renal failure on hemodialysis in a hospital in the city of Criciúma-SC", where Data showed 40% of women and 60% of men.

In another study conducted by Marques, Pereira, and Ribeiro (2005), about 53.2% of the patients were male and, in the case series of the study by Antoniazzi et al., (2002), 56% of the patients were male and 44% female, results similar to the Present study.

Other studies also had similar results as that of Abreu et al. (2008), which found 58% of male patients and 42% of females. Bevilacqua et al. (1995) also describe results of 57.8% of male and 42.2% female individuals.

The tests of the calcium and phosphorus levels had their results out of the normality's, as shown in table 1.

Table 1: Calcium and phosphorus dosage of patients assisted at Fundação Pró-rim					
(n) (%)					
Ca	32	35,56			
Ca	58	64,44			
Total	90	100,00			
р	56	62,22			
1	34	37,78			
Total	90	100,00			

This research was similar to a study conducted in our country where it was also evaluated, the knowledge of 147 individuals on hemodialysis (45% were hyperphosphatemic) as regards the consequences and treatment of hyperphosphatemia, the mean score found, was 79.1%, similar also to the work Nerbass, et al., (2010) that detected 78.5% of this disease.

The inappropriate control of phosphorus is associated with the emergence of mineral and bone disturbance and hyperparathyroidism. Thus, the control of Hyper-phosphatemia, the most prevalent mind in people undergoing dialysis, is of great significance, establishes one of the fundamental goals of health professionals working with dialysis patients. The nutritional orientation of phosphorus consumption is very delicate since strict restrictions are contraindicated since most foods that are sources of phosphorus are sources of protein. Therefore, it is necessary to suggest the ingestion of protein foods with a small phosphorus/protein concentration, according to the need individual (Nerbass, et al., 2010).

Epidemiological evidence update evidenced the relationship between the high calcium-phosphorus product, increased levels of phosphorus and high mortality. These correlations have been evaluated secondary to the calcification of the coronary arteries with consequent ischemic heart disease, cardiac arrest, and myocardial infarction. Moreover, the increased calciumphosphorus product can cause changes in cardiac microcirculation, predisposing patients to sudden death and arrhythmias. These actors Assume greater relevance when it is verified that cardiac arrest by unknown origin, acute myocardial infarction and all other deaths due to cardiac reasons, represent almost the half of all causes of death in individuals who are in chronic dialysis (Brazil, 2002). The tests of the glutamic transaminase (TGP) and potassium had their normal results, as shown in table 2.

Table 2: Dosage of TGP and potassium of patients						
tr	treated at the Pró-Rim Foundation					
Х	x (n) (%)					
тср	2	2,22%				
101	88	97,78%				
Total	90	100,00				
	18	20.00%				
K	72	80,00%				
Total	90	100,00				

It is important to know that: 1 - the TGP is an examination that verifies the levels of the enzyme transaminase pygmy glutamic (TGP), also called ALT (alanine aminotransferase). It is found practically only in liver cells, so very specific. It serves to verify liver functions and cirrhosis, viral hepatitis, liver ischemia, heart failure, and liver cancer. Its level is also altered in case of excessive use of alcoholic beverages, drugs, and remedies (IG, 2013a); 2 – Potassium dosage is a blood test that measures potassium (K) levels in the bloodstream. It serves to evaluate renal function, neuromuscular function, acid/basic balance and blood pressure behavior (IG, 2013b).

All patients with CKD should be evaluated for the prevention of hypokalemia and hyperkalemia. The preservation of body potassium is subject to an integrated balance sheet. Where the absorption and ingestion of potassium through the intestine are on one side and their excretion by feces and urine are on the other side (HELOU, 2004).

In relation to hemoglobin, the values were altered in 78.89% of the patients and the hematocrit also changed in 93.33% of the individuals as shown in Figure 2.



Fig.2: Hemoglobin dosage of patients treated at Foundation Pró-Rim

Draczevski (2011), in his research "evaluation of the biochemical profile and hematological parameters in patients undergoing hemodialysis" had the results similar to that of the present study, because it found a hemoglobin rate Altered in 85% of the patients and in 80% of the sample verified changes in Hematocrit.

The results are in agreement with the literature consulted, because in Ramona's research (2010) 75% of patients with CKD had anemia. In another Canadian multicenter study with 446 patients with CRF on hemodialysis, the incidence of anemia was around 90% (MIDDLETON; PARFREY FOLEY, 2001).

Anemia is a complication frequently found in patients with CKD and is related to the intensity of renal insufficiency. The origin of Anemias is characterized by anomalous hemoglobin biosynthesis, as the developing red blood cells need iron, protoporphyrin, and globin in optimal amounts for the production of hemoglobin (CARVALHO; BARACAT SGARBIER, 2006).

The administration of recombinant human erythropoietin has positive effects for the patient with CRF anemia and expressive results such as the growth of hemoglobin and hematocrit rates, the Which implies the feeling of well-being and improvement in the physical, psychic and general condition of the patient. The maintenance of red blood cells is subject to several aspects, among the most important are an appropriate amount of erythropoietin and the presence of an iron stock in the body (Draczevski, 2011).

Anemia is a serious consequence in CKD, especially due to insufficient production of erythropoietin. Anemia stigmatizes individuals with chronic kidney disease, since it leaves the person with cutaneous pallor, expressing a patient aspect, and deeply damaging their recovery Social (ABENSUR, 2004; BRAZILIAN SOCIETY OF NEPHROLOGY, 2008)

Regarding Diabetes and hypertension, the results were worrying due to the high prevalence, as evidenced in Figure 3.



Fig.3: Degree of diabetic and hypertensive patients attended at the pro-Kidney foundation of the municipality of Gurupi-to

According to Martins (2005), arterial hypertension (SAH) can be both the cause and consequence of CRF and establishes a consecutive factor of renal injury, needing to be rigorously controlled.

In a study conducted by Barancelli and Paraboni (2008), with 45 patients undergoing hemodialysis, it was found that about 44.4% were hypertensive patients and 22.2% had diabetes-related hypertension. Data are similar to this work. Canziani et al., (2006) in his research "iron deficiency and anemia in chronic kidney disease" resulted in 35% of diabetes and 89% of hypertensive patients.

Sesso (2007) cites surveys conducted by the Brazilian Society of Nephrology (BSN) in 1996/97, where the main diseases cited as the origin of CKD in incident patients are arterial hypertension (24%), and diabetes mellitus (17%). The prevalence of hypertension in the adult population is higher than 25%. Countless of these people do not know to be hypertensive, and among those who have the knowledge, less than 30% are appropriately treated. Thus, there is ample potential for in the coming years the HA continues to be a significant cause of CRF. Diabetes and hypertension are analyzed as a major public health problem in Brazil and in the world since each year new cases are diagnosed throughout the country. According to Barros et al. (2006) and Riella (2003), these diseases lead their patients to an accelerated impairment of renal function.

In relation to pre-and post-hemodialysis urea dosage, the results were satisfactory, as shown in table 3.

Table 3: Statistical analysis of pre-and post-hemodialysis Urea dosage in patients treated at the Pró-RimFoundation					
	Average	Mode	Median	Standard deviation	
Urea Pre	172,4	206	178	58,9	
Urea Pós	52	35	49,5	25,1	

In a study that investigated the pre-and posthemodialysis urea of 30 patients, it had a considerable reduction in the urea values, because it observed the efficacy of hemodialysis and consequently to the reduction of the urea values in patients with CKD, favoring the similarity with the present study, since serum urea levels were significantly reduced (SILVA; BARBOSA SOUZA, 2008). More than 50% of the samples obtained their value in accordance with the reference value, and those who continued with altered values had their serum urea levels reduced, which motivates the significance and efficacy of the dialysis treatment.

The renal tests of urea and creatinine dosage are relevant parameters in the diagnosis of CKD, serving for treatment and control. Being one of the final products of protein metabolism, urea accumulates in the blood in chronic renal insufficiency and is in such a way responsible for the causes of uremia and all the symptoms and has its serum concentration enlarged so that the rate of renal filtration decreases (LEITE et al., 2002)

Romão Junior (2004) cites that, the two main causes/consequence of chronic renal failure are arterial hypertension and diabetes, which was also the result of this study, the need for judicious action of generalist physicians who work in the area of primary health care in order to trace these problems. In addition, the essential role of the entire health team in this sense is also demonstrated. Acting together with other professionals such as nurses, nutritionist, psychologist, and physical educator can be actions that should be encouraged since strengthen the educational approach.

It is necessary to encourage the presence of a member of the patient's family or caregiver when attending consultations, and the importance of using several medications and the occasional occurrence of cognitive deficit may cause iatrogenic with undesirable effects for Patient.

It is also important to emphasize the importance of the Pró-Rim foundation for the southern region of the Tocantins and its benefit for renal patients. The results of this study showed the efficiency of hemodialysis performed in the Gurupi-TO pole because almost half of the patients managed to control the urea powders. Other aspects that we cannot forget is also that it is moved by donations from both individuals, corporations, public and private bodies, which sometimes places the institution in conditions of economic and reduced service in order to reduce the costs. Thus, it is necessary to make a work of awareness and information about the foundation in our region, since many people do not know of the existence, the purpose and the importance of it for the regional population.

IV. FINAL CONSIDERATIONS

The present study evaluated the prevalence of diseases resulting from chronic renal insufficiency in patients treated at the pro-Kidney foundation in the municipality of Gurupi – TO, by means of statistical analyses presented in the form of graphs and tables.

Thus, it was verified that: 60% of the patients were males and 40% were females; In relation to age, the age group with the highest prevalence was "over 34 years" with 40%; 48.89% of the individuals are married; 46.67% perceived income of up to 3 minimum wages, followed by "3-4 salaries" with 32.22%; 44.44% of the patients have incomplete 1st grade and 26.67% are illiterate.

Regarding the exams: 64.44% of the calcium and 62.22% of the phosphorus were outside the reference values; 97.78% of the TGP and 80% of potassium were within the reference value; 85% of the hemoglobin rate and 80% of the hematocrit found values outside the standards of normality's; 31.11% of the patients are diabetic and 52.22% are hypertensive; pre-and posthemodialysis urea dosage results were positive in 44.44% of the patients.

Chronic kidney disease has a high rate of mortality and morbidity, its incidence and prevalence are increasing progressively each year. In the analyses performed, the biochemical markers that assist in the detection of chronic kidney disease and in the monitoring of it were evaluated. Through the values found and compared with the data as reference values, we obtained a representation that the numbers found in the chronic renal patients are, not always, in the majority of the Times high, and in some cases, are shown exorbitant.

REFERENCES

- ABENSUR, H. Deficiência de ferro na doença renal crônica. Rev. Bras. Hematol. Hemoter. 2010; 32(Supl.2):84-88.
- [2] ABREU, R.C.; PEREIRA, E.R.P.; GABRIEL, D.P.; CARAMOR, C.A.; BARRETTI, P. Jacqueline Costa Teixeira CARAMORI. Influência do treinamento na evolução da diálise peritoneal. Jornal brasileiro de Nefrologia, São Paulo, v. 30, n. 2, p. 126-131. 2008.
- [3] ANTONIAZZI, A.L. BIGAL, M.E.; BORDINI, C.A.; SPECIALI, J.G. Cefaléia relacionada à hemodiálise -Análise dos possíveis fatores desencadeantes e do tratamento empregado. Arquivos de Neuro Psiquiatria, São Paulo, v.60, n. 3, set. 2002.
- [4] BARANCELLI, G.; PARABONI, M.L.R. Associação entre marcadores inflamatórios e lipídicos como preditores

de risco cardiovascular em pacientes com insuficiência renal crônica que realizam hemodiálise. **Revista Perspectiva**, Erechim/ RS, p. 01-17, 2008.

- [5] BARROS, E.; MANFRO, R.C.; THOMÉ, F.S.; GONÇALVES, L.F.S. Nefrologia rotinas, diagnóstico e tratamento. 30 ed. Porto Alegre. Editora Artmed, 2006.
- [6] BEVILACQUA, J. L. MARABEZI, M.G.B.; CANIELLO, C.A.; CAMARGO, M.C.; EVES, A.V.; GOMES, J.G. Diálise peritoneal contínua (CAPD):- experiência de 10 anos em um centro brasileiro. Jornal Brasileiro de Nefrologia, São Paulo, v. 17, n. 4. p. 206-213. 1995.
- [7] BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Protocolo clínico e diretrizes terapêuticas.
 Hiperfosfatemia na Insuficiência Renal Crônica. Portaria SAS/MS nº 845, de 31 de outubro de 2002
- [8] CANZIANI, M.E.F.; BASTOS, M.G.; BREGMAN, R.; PECOITS-FILHO, R.; TOMIYAMA, C. DRAIBE, S.A., CARMO, W.B.; RIELLA, M.C., ROMÃO-JR, J.E.; ABENSUR, H. Deficiência de ferro e anemia na doença renal crônica. J Bras Nefrol. 2006; 28(2):86-90.
- [9] CARVALHO, M.C; BARACAT, E.C.E; SGARBIERI, V.C. Anemia Ferropriva e Anemia de Doença Crônica:Distúrbios do Metabolismo de Ferro. Segurança Alimentar e Nutricional, Campinas, v.13, n.2, p. 54-63, 2006.
- [10] DRACZEVSKI, L.; TEIXEIRA, M.L. Avaliação do Perfil Bioquímico e Parâmetros Hematológicos em Pacientes Submetidos à Hemodiálise. Revista Saúde e Pesquisa, v. 4, n. 1, p. 15-22, jan./abr. 2011
- [11] GUIMARÃES, L.R.M.; FERREIRA, A.A. Caracterização e tratamento de anemia em pacientes com insuficiência renal crônica. V Mostra Interna de Trabalhos de Iniciação Científica 26 a 29 de outubro de 2010.
- [12] HELOU, C.M.B. Potássio e Bicarbonato. In: Abensur, H. Jornal Brasileiro de Nefrologia. JBN Volume XXVI -Número 3 - Supl. 1 - Agosto de 2004.
- [13] IG. Sódio e Potássio. 2013b. Disponível em: http://saude.ig.com.br/minhasaude/ exames/sodio+e+potassio/ref1237835472381.html>. Acesso em: out., 2013.
- [14] K/DOQI. Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. American Journal of Kidney Diseases 39 (2): S1-S246. 2002.
- [15] LEITE, I.C.; SCHRAMM, J.M.A.; GADELHA, A.M.J.; VALENTE, J.G.; CAMPOS, M.R.; PORTELA, M.C.; HOKERBERG, Y.H.M.; OLIVEIRA, A.F.; FERREIRA, V.M.B.; CAVALINI, L.T.; BITTENCOURT, S.A. Comparação das informações sobre as prevalências de doenças crônicas obtidas pelo suplemento saúde da PNAD/98 e as estimadas pelo estudo Carga de Doença no Brasil. Ciência Saúde Coletiva, v. 7, n. 4, 2002, p. 733-41.
- [16] MARQUES, AB; PEREIRA, D; RIBEIRO, RCHM. Motivos e frequência de internação dos pacientes com IRC em tratamento hemodialítico. Arquivo Ciência da Saúde, São Paulo, v. 12, p.67-72, abr/jun. 2005.

- [17] MARTINS, C. Insuficiência renal crônica In: LAMEU, E. Clínica nutricional. Rio de Janeiro: Revinter, 2005, p. 869-888.
- [18] MIDDLETON, R.J.; PARFREY, P.S.; FOLEY, R.N. Left ventricular hypertrophy in the renal patient. J Am Soc Nephrol. 2001;12(5):1079-84.
- [19] MURPHREE, D.D.; THELEN, S.M. Chronic Kidney Disease in Primary Care. Journal of the American Board of Family Medicine 23(4):542-550.2010.
- [20] NERBASS, F.B.; MORAIS, J.G.; SANTOS, R.G.; KRÜGER, T.S.; KOENE, T.T.; LUZ-FILHO, H.A. Adesão e conhecimento sobre o tratamento da hiperfosfatemia de pacientes hiperfosfatêmicos em hemodiálise. J Bras Nefrol 2010;32(2):149-155.
- [21] PIERSON, D.J. Respiratory considerations in patients with renal failure. **Respiratory care**, Seattle, v. 51, n. 4, p. 413-422, Apr. 2006.
- [22] PRÓ-RIM. Fundação Pró-Rim. Disponível em: < http://www.prorim.org.br/site/>. Acesso em: abr., 2013.
- [23] REZENDE, J. Modificações sistêmicas. In: Rezende J. Obstetrícia.10. ed. Rio de Janeiro: Guanabara-Koogan; 2005. p.143-59.
- [24] RIELLA, M.C. Princípios de nefrologia e distúrbios hidroeletrolíticos. 4^a ed. Rio de Janeiro: Guanabara Koogan, 2003.
- [25] ROMAGNA, G. Prevalência de anemia, dislipidemia e hipertensão arterial em usuários com insuficiência renal crônica em hemodiálise de um hospital da cidade de Criciúma-SC. 65f. 2010. Trabalho de Conclusão de Curso (obtenção do grau de bacharel no Curso de Nutrição) Universidade do Extremo Sul Catarinense – UNESC.
- [26] ROMÃO-JR, J.E. Doença Renal Crônica: Definição, Epidemiologia e Classificação. J Bras Nefrol Volume XXVI - nº 3 - Supl. 1 - Agosto de 2004.
- [27] SESSO, R.C.C.; GORDAN, P. Dados disponíveis sobre a doença renal crônica no Brasil. Jornal Brasileiro de Nefrologia, v. 29, p. 9-12, 2007.
- [28] SILVA, J. L.; BARBOSA, P. S. S.; SOUZA, H. W. O. Avaliação da dosagem de uréia pré e pós-diálise em pacientes em terapia renal substitutiva. Revista Eletrônica de Farmácia, Belo Horinzonte, v. 5, n. 2, p. 43-47, 2008.
- [29] WHO. World Health Organization. Assessing the iron status of populations. Geneva; 2004.

The Effect of Local Revenue to Poverty Rate in Southeast Sulawesi Indonesia

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Abstract— Poverty is a fundamental problem and becomes an important international agenda as outlined in the Sustainable Development Goals (SDGs). Various poverty reduction programs have become the main concern of national and regional development in Indonesia. Local government is in the most ideal position to be able to identify people living in poverty more closely, and provide resources and services to help them free from poverty. This study intends to examine, analyze and describe the effect of the use of regional expenditure funds sourced from the Local Revenue to poverty rate in the Regency/City in Southeast Sulawesi. Using the least square panel method, the results show that the Local Revenue has a significant negative effect on poverty rate. Keywords— poverty, local revenue, fiscal decentralization, regional development.

I. INTRODUCTION

Poverty is a fundamental problem that is being faced by most nations in the world, both developed and developing countries. Conceptually, poverty is positioned as an economic and social issue because failure to overcome the problem of poverty can lead to various social, economic and political problems in society. Bellinger (2007) states that the concept of poverty involves multidimensional, multi-definition and multi-alternative measurements. So that the current issue of poverty is still an important agenda internationally and set forth in the Sustainable Development Goals (SDGs) with no poverty as the first agenda. Even an experimental study conducted by Banerhjee and Duflo on the subject of poverty has won them the Nobel Prize in economics in 2019.

Various poverty reduction programs have become the main concern of national and regional development in Indonesia. The program aims to improve community welfare, as stated by Aranson and Lofgren (2007) that a wise government is a government that is able to improve welfare.

The authority of the Regional Government in managing regional government and finance to run in accordance with the aspirations, needs and priorities of the regions has been guaranteed and regulated in the Law as the basis for implementing regional autonomy and fiscal decentralization in Indonesia. Decentralization in legislation is defined as the transfer of governmental authority by the government to autonomous regions to regulate and manage government affairs in the Unitary State of the Republic of Indonesia (NKRI) system. Local government is in the most ideal position to be able to identify people living in poverty more closely, and provide resources and services to help them free from poverty on target.

Fiscal decentralization as a way to promote economic growth has attracted much attention and produced ambiguous conclusions. Some economists believe that fiscal decentralization has a positive effect on promoting economic growth, improving equity, and improving the quality of public services and public welfare. This opinion is supported by Oates (1993), Bird (1993), Bird, Ebel, and Wallich (1995), Bahl and Linh (1992), Gramlinch (1993), Prud'homme (1995), Peterson (1996), Zhang and Zou (1998), Phillips and Woller (1997), Wibowo (2008), and Simanjuntak (2010). While some other economists argue instead that fiscal decentralization can encourage macroeconomic instability, tends to slow growth, increase inequality, and worsen the quality of public services and public welfare. This view is supported by the results of World Bank research (1997), Phillips and Woller (1997), Martinez and McNab (2001), and Zhang and Zou (2001).

Fiscal policy support with various infrastructure developments and technological advances is the most

important driving factor in changing the economic structure of society (Swiecki, 2017 and Samaniego and Sun, 2016). Investment in the industrial sector will bring increased productivity through technological innovation, even Vu, 2017 found The Effective Structural Change (ESC) Index to measure the effectiveness of structural changes that occur due to technological innovation (Vu, 2017 and Gala, et.al, 2018). Research Liow, et al (2016) states that the number of industries in an economy will affect the amount of employment. Gabardo et al (2017) in his study found that the process of structural change cannot be separated from economic growth.

In this study, fiscal decentralization is realized in the form of granting authority to the regions to collect taxes and levies as a source of local revenue. Based on the background, this study seeks to measure and see the extent of the role of local revenue to the poverty rate, both directly and indirectly through the Economic Structure, Economic Growth, and Labor Absorption in Southeast Sulawesi.

II. OBJECTIVES

The question in this study is whether local revenue influences poverty rate either directly or indirectly through the Economic Structure, Economic Growth, and Labor Absorption in Southeast Sulawesi. So this study intends to test, analyze and describe the influence of Local Revenue to Poverty Rate both directly and indirectly through the Economic Structure, Economic Growth, and Labor Absorption in Southeast Sulawesi.

III. LITERATURE REVIEW

3.1. Review of Poverty Theories and Concepts

The first prerequisite in the concept of poverty is to determine the criteria of who should be the focus of attention/concern and determine general the boundaries/norms as part of these prerequisites (Sen, 1981). The first approach proposed by Rowntree is a biological approach that uses the ability of families to meet their minimum needs as a limitation in defining poverty (Rowntree and Lavers, 1951). In addition to the biological approach, it is also known that the basic needs approach is actually an extension of the biological approach. The latter approach is a relative deprivation approach. This concept is found in the sociology literature (Abercrombie et al, 1988), developed by Stouffer et al (1949) and Merton (1957) who say that many people experience feelings of deprivation when they feel the situation is not as good as the individual or other groups. But the pressure on the individual frame of reference cannot determine a definite

point when relative deprivation is objective and absolute (Abercrombie, 1988).

3.2. Review of Theories and Concepts OF Economi Structure

The definition of Economic Structure in this study is a process of changing the structure of the economy (economic transformation) from the primary sector to the secondary sector then to the tertiary sector where each economy will experience different transformations. Changes in economic structure are changes from traditional conditions to the modern sector, from backward to advanced (Bayhaqi, 2006). Changes in the structure or transformation of the economy from traditional to modern can generally be defined as a change in the economy related to the composition of demand, trade, production and other factors that are needed continuously to increase income and social welfare through increasing per capita income (Chenery 1960, 1964; Chenery, Robinson and Syrquin 1986; Chenery and Syrquin 1975; Chenery and Taylor 1968; Chenery and Watanabe 1958).

3.3. Review of Theories and Concepts of Economic Growth

Economic growth is an important requirement for alleviating society from poverty, although economic growth cannot stand alone to alleviate poverty, economic growth remains the main factor for alleviating poverty (Yudha, 2013). Perry, et.al., (2006) also believes that economic growth is important for poverty alleviation. Thus, economic growth is the main driver in reducing poverty (Fosu, 2010). However, the research of Mustamin, et al (2015) shows different results, namely that new economic growth has a negative effect on poverty after being linked to unemployment.

3.4. Review of Theories and Concepts of Employment

Labor is one of the most important factors in the production process besides natural resources, capital and technology. Sumarsono (2009) states that manpower or Human Resources (HR) is concerned with people who are able to work to provide services or business work. High unemployment rates cause low incomes which in turn triggers poverty (Yacoub, 2012). Kakwani (2000) and Osinubi (2005) find a very strong relationship between poverty rates and unemployment rates. Octaviani's (2001) study on the effect of unemployment on poverty rate in Indonesia with the Forrester Greer & Horbecke analysis approach also concluded that rising unemployment results in an increase in poverty, on the contrary the smaller the unemployment rate will lead to lower poverty rates in Indonesia. But De Fina's (2002) study in the United States found that poverty does not have a strong correlation with unemployment

3.5. Review of Theory and Concept of Local Revenue

In the context of its relationship with government, it will bring up fiscal relations between governments (Fiscal Intergovernmental Relationship). According to Bird and Vaillancourt (1998), there are two models of intergovernmental relations currently in force. First, fiscal federalism and second is federal finance. Theory of Fiscal Federalism (Fiscal Federalism Theory) is a theory that seeks to provide an understanding for the public about the effects of decentralization carried out by the government (Sari and Supadmi, 2016). This theory discusses the financial relationships between different levels of government. Fiscal decentralization will provide optimal benefits if followed by adequate financial capacity by autonomous regions. One source of revenue used for local government funding in the implementation of fiscal decentralization is Local Revenue.

IV. METHODOLOGY

This research is a verificative research that aims to test the existence of a theory or the results of previous studies so that the results obtained that strengthen or invalidate the theory or the results of previous research. The data in this study are secondary data. The data used are pooled data, which is a combination of times series data (in 2010-2017) and cross sections in twelve (12) districts/cities in Southeast Sulawesi Province. Estimation of the model is done by the Least Square method.

 $Y_4 = f(Y_1, Y_2, Y_3, X_1)$

$$Y_4 \ = \ \delta_0 + \delta_1 \, Y_1 + \delta_2 \, Y_2 + \delta_3 \, Y_3 + \delta_4 \ln X_1 + \mu_4$$
 Where:

 Y_1 = Economic Structure, expressed in units of percent

 Y_2 = Economic Growth, expressed in percent

 Y_3 = Labor Absorption, expressed in percent

 Y_4 = Poverty Rate, expressed in percent units

 X_1 = Local Revenue, expressed in units of Rupiah

V. RESULT AND DISCUSSION

The results of the study showed that the original regional income had a negative and significant direct effect on poverty rate. This means that an increase in regional original income has actually proven to be able to reduce poverty rate in Southeast Sulawesi.

This finding is in line with the results of the research of Ramirez, Diaz, and Bedoya (2017) who found the fact that an increase in municipal tax revenues significantly reduced the level of multidimensional poverty in Colombia. This finding is also in line with the results of Sanogo's research (2019) which states that an increase in regional original income can increase access to public services and reduce poverty. Likewise Sepulveda and Martinez's research (2011) which analyzed data samples from 34 developing countries during the period 1970 to 2000 and managed to find a significant negative relationship between regional income and poverty reduction. These findings reinforce the research results of Rahayu (2004), Simanjuntak (2006), Santosa (2013), Lisna, et al (2013), Ulfa, et al (2015), Widianto, et al (2015), Firmansyah, et al (2015), Putri (2015), Joliannis (2016), Manek and Badrudin (2016), Paulus, et al (2017) and Rori, et al (2016).

The results of these studies have rejected the findings of previous studies conducted by Von Braun and Grote (2000) who found a positive relationship between income and poverty rate in 50 developing countries. The findings of this study contradict the research of Khakim, et al (2011) who found the fact that local revenue has a positive and significant effect on economic growth and the level of community welfare. The results of this study are also different from the findings in Pratomo and Hendarto's (2015) research which states that local revenue has no significant effect on poverty.

So the high local original income can be maximally utilized by the local government to finance development activities programs that have an impact on increasing the people's income. An increase in community income can partly be used by the community to meet all of its basic needs and some of it is used to meet the needs of productive activities. With the fulfillment of the basic needs of the community, then they have at least been freed from the condition of the severity as a basic measure of poverty according to Rowntree and Lavers (1951). Productive community activities that are successfully managed are sources of genuine regional income through the imposition of tax rates and user fees that must be paid. Therefore, the original Regency / City revenue in Southeast Sulawesi has increased consistently from year to year with an average growth of 3.93 percent as listed in Figure 5.1. reflect the level of community welfare.



Source: Ministry of Finance DJPK Data Attachment Processed





Source: BPS Data Processed

Fig.5.2: Development of Poverty Rate in Regencies/Cities in Southeast Sulawesi Province in 2010-2017

The indirect effect of regional income on poverty through economic structure, economic growth, and employment in this study is not significant. This insignificant relationship lies in the effect of economic growth on employment. The findings in this study have been contradicted by many opinions and findings from other studies which state that economic growth has a positive and significant effect on employment.

VI. CONCLUSION

Based on the findings of the effect of regional ownsource income on poverty both directly and indirectly through economic structure, economic growth, and employment, the conclusion is that: Directly, regional own-source revenue has a significant negative effect on district / city poverty in Southeast Sulawesi. Indirectly through economic structure, economic growth, and employment, local own-source revenues have no significant effect on poverty in districts / cities in Southeast Sulawesi.

The implication of this conclusion is the need for greater attention to the formation of regional economic

growth rates and the pattern of their relationship to employment. Every development policy taken needs to consider and pay attention to the interrelationship of the relationships between research variables comprehensively.

REFERENCES

- [1] Abercrombie, N.Stephen Hill and Bryan S.Turner. 1988. *The Penguin Dictionary of Sociology*. London: Penguin Books, New Editions.
- [2] Aranson, T and Lofgren, Karl-Gustaf. 2007. *Welfare Theory: History and Modern Results*. Sweden: Department of Economics Umea University.
- [3] Bahl, Roy W. and J. Linh. 1992. Urban Public Finance in Developing Countries. New York: Oxford University Press.
- [4] Bayhaqi, Akhmad. 2006. Book Review: Reinventing Leviathan: The Politic of Administrative Reform in Developing Countries. *Progress in Development Studies*. SAGE Journals.
- [5] Bellinger, W. K. 2007. *The Economics Analysis of Public Policy*. Routledge: Oxon.
- [6] Bird, Richard M. 1993. Threading The Fiscal Labyrinth: Some Issues in Fiscal Decentralization. *National Tax Journal, Vol. 46(3), page 207-227.*
- [7] Bird, Richard M., Ebel, R., and Wallich, C. 1995. Decentralization of The Socialist State: Intergovermental Finance in Transition Economics. Washington DC: World Bank.
- [8] Bird, Richard M and Francois Vaillancourt. 1998. Fiscal Decentralization in Developing Countries. Cambridge University Press.
- [9] Chenery, H. B. and T. Watanabe. (1958). "International Comparisons of the Structure of Production". *Econometrica XXVI 487-521.*
- [10] Chenery, Hollis B. 1960. Patterns of Industrial Growth. The American Economic Review, Vol.50. No.4, sept, 1960, pp.624-654. American economis Association. http://www.jstor.org/stable/1812463.
- [11] Chenery, Hollis B. 1964. "Land: The Effects of Resources on Economic Growth", Economic Development with Special Reference to East Asia, January 1, 1964. New York: St. Martin.
- [12] Chenery, H. B. and Taylor L. 1968. Development Patterns: Among Countries and Overtime. *Review of Economics and Statistics, November 1968, 50, pp 391-416.*
- [13] Chenery, H. B. and Syrquin, Morshe. 1975. Pattern of Development 1950-1970. Washington DC: The World Bank. 1975.
- [14] Chenery, H. B.; Robinson, Sherman; and Syrquin, Morshe.
 1986. Industrialisation and Growth. New York: Oxford University Press.Gabardo, Fransisco Adilson, et. al. 2017. The Incorporation of Structural Change into Growth Theory, A Historical Appraisal. *Economi, Vol.18, Issue 3, Sept-Des 2017, page 392-410.*
- [15] De Fina, Robert H. 2002. The Impact Of Unemployment On Alternatif Poverty Measures, *Working Paper*,

Departement Reseach Federal Reserve Bank Of Filadelfia, May 2002.

- [16] Firmansyah, A.K; Wibisono, Sunlip; dan Suswandi, Petrus Edi. 2015. Pengaruh Pendapatan Asli Daerah (PAD) dan Dana Perimbangan terhadap Jumlah Penduduk Miskin di Kabupaten Banyuwangi Tahun 2000-2012. Artikel Ilmiah Mahasiswa. 2015.
- [17] Fosu, Augustin Kwasi. 2010. Growth, Inequality, and Poverty Reduction in Developing Countries: Recent Global Evidence. CSAE Working Paper WPS, 07.
- [18] Gala, Paulo et al. 2018. Sophisticated Job Matter for Economic Complexity: An Empirical Analysis Based On Input-Output Matrices and Employment Data. *Structural Change & Economic Dynamics, Vol.45, June 2018, page 1-*8.
- [19] Gramlich, E. 1993. A Policy Maker's Guide to Fiscal Decentralization. *National Tax Journal, Vol.XLVI, page* 229-235.
- [20] Jolianis. 2016. Analisis Pengaruh PAD, DAU, dan DAK Terhadap Kemiskinan Pada Kabupaten/Kota di Provinsi Sumatera Barat dengan Pertumbuhan Ekonomi sebagai Variabel Intervening. ECONOMICA Journal of Economic and Economic Education, Vol 4, No.2 (192-246).
- [21] Kakwani N, Pernia EM. 2000. What is pro-poor growth? *Asian Development Review* 18:1, 1-16.
- [22] Khakim, Luqman dkk. 2011. Potensi Fiskal terhadap Pertumbuhan Ekonomi dan Kesejahteraan Masyarakat. Jurnal Ekonomi Pembangunan. Volume 12, Nomor 2, Desember 2011, hlm.281-296
- [23] Liow, Jeifi Indri., Gene H.M. Kapantow, dan Mex L. Sondakh. 2016. Faktor-Faktor yang Mempengaruhi Penyerapan Tenaga Kerja pada Industri Rumah Panggung Kecamatan Tompasu Baru, Kabupaten Minahasa Selatan. *Agri-Sosioekonomi, Volume 12 No.2A (2016).*
- [24] Lisna, Vera, dkk. 2013. Dampak Kapasitas Fiskal terhadap Penurunan Kemiskinan: suatu Analisis Simulasi Kebijakan. Jurnal Ekonomi dan Pembangunan Indonesia, Vol.14, No.1, Juli 2013: 1-26, ISSN 1411-5212.
- [25] Manek, Marianus dan Badrudin, Rudy. 2016. Pengaruh Pendapatan Asli Daerah dan Dana Perimbangan terhadap Pertumbuhan Ekonomi dan Kemiskinan di Provinsi Nusa Tenggara Timur. *Telaah Bisnis. Vol.17, No.2, Desember* 2016, hal.81-98. ISSN 1411-6375(cetak) dan 2541-6790(online).http://journal.stimykpn.ac.id/index.php/tb
- [26] Martinez, V.J.M., and McNab, R. 2001. Fiscal Decentralization, Economic Growth, and Democratic Governance. *Working Paper*.
- [27] Martinez, V.J.M., and McNab, R. 2001. Fiscal Decentralization, Economic Growth, and Democratic Governance. *Working Paper*.
- [28] Merton, Robert K. 1957. *Social Theory and Social Structure*. New York: Free Press.
- [29] Mustamin, Siti Walida, Agussalim, Sri Undai Nurbayani. 2015. Pengaruh Variabel Ekonomi Makro Terhadap Kemiskinan Di Kota Makassar provinsi Sulawesi Selatan. Jurnal Analisis, Desember 2015, Vol.4, No.2: 165-173. ISSN: 2303-100XX.

- [30] Oates, Wallace E. 1993. Fiscal Decentralization and Economic Development. *National Tax Journal, Vol. 46 (3),* page 237-243.
- [31] Octaviani, Dian. 2001. Inflasi, Pengangguran, dan Kemiskinan di Indonesia: Analisis Indeks Forrester Greer & Horbecke, *Media Ekonomi*, Hal. 100- 118, Vol. 7, No. 8.
- [32] Osinubi, Tokunbo Simbowale. 2005. Macroeconometric Analysis Of Growth, Unemployment and Poverty in Nigeria, *Pakistan Economic and Social Review*. Volume XLIII, No. 2 (Winter 2005), pp. 249-269.
- [33] Paulus, Dewi I.S.; Rosalina A.M. Koleangan; dan Daisy S.M. Engka. 2015. Analisis Pengaruh PAD, DAU, dan DAK terhadap Kemiskinan Melalui Belanja daerah di Kota Bitung. Jurnal Pembangunan Ekonomi dan Keuangan Daerah.Vol. 19, No.2 (2017).
- [34] Perry GE, Arias OS, Lopez JH, Maloney WF, Serven L. 2006. *Poverty Reduction and Growth: Virtuous and Vicious Circles*. New York: World Bank.
- [35] Peterson, G.E. 1996. Decentralization in latin America: Learning Through Experience. Washington DC: World Bank.
- [36] Phillips, K.L. and Woller, G. 1997. Does Fiecal Decentralization Lead to Economic Growth? *Working Paper*.
- [37] Prud'homme, Remy. 1995. The Danger of Desentralization. *The World Bank Research Observer, Vol.10, No,2*
- [38] Pratomo, Andyka Arief.dan Hendarto, R. Mulyo. 2015. Pengaruh Pendapatan Asli Daerah, Dana Alokasi Umum, Dana Bagi Hasil, dan Belanja Daerah Terhadap Tingkat Kemiskinan DKI Jakarta. Diponegoro University.
- [39] Putri, Zuwesty Eka. 2015. Analisis Pengaruh Pendapatan Asli Daerah (PAD), Dana Alokasi Umum (DAU), dan Inflasi terhadap Pertumbuhan Ekonomi di Kabupaten/Kota Provinsi Jawa Tengah. *Esensi. Jurnal Bisnis dan Manajemen. Vol.5, No.2. Oktober 2015.*
- [40] Rahayu, Siti Aisyah Tri. 2004. Peranan Sektor Publik Lokal dalam Pertumbuhan Ekonomi Regional di Wilayah Surakarta (1987-2000). *Kinerja, Volume 8, No.2, Th.2004, hal.133-147.*
- [41] Ramirez, Juan Mauricio; Diaz, Yadira and Bedoya, Juan Guillermo. 2017. Poperty Tax Revenues and Multidimensional Poverty Reduction in Colombia: A Spatial Approach. World Development, Vol.94, June 2017, Page 406-421. Elsevier.
- [42] Rori, Chindy Febry, dkk. 2016. Analisis Pengaruh Pendapatan Asli Daerah (PAD) terhadap Pertumbuhan Ekonomi di Provinsi Sulawesi Utara Tahun 2001-2013. Jurnal Berkala Ilmiah Effisiensi. Volume 16, No.02 Tahun 2016.
- [43] Rowntree, BS and GR Lavers. 1951. *Poverty and the Welfare State*. London: Longmans Green and Co.
- [44] Samaniego, Roberto M & Sun, Juliana Y. 2016. Productivity Growth and Structural Transformation. *Review* of Economic Dynamics, Vol 21, Juli 2016, page 266-285.
- [45] Sanogo, Tiangboho. 2019. Does Fiscal Decentralization Enhance Citizens'access to Public services and reduce Poverty? Evidence from Cote d'Ivoire Municipalities in a

Conflict Setting. World Development, Vol.113, January 2019, page 204-221. Elsevier.

- [46] Santosa, Budi. 2013. Pengaruh Pendapatan Asli Daerah dan Dana Perimbangan Daerah terhadap Pertumbuhan, Pengangguran, dan Kemiskinan 33 Provinsi di Indonesia. Jurnal Keuangan dan Bisnis. Fakultas Ekonomi Universitas Trisakti Jakarta. Vol. 5, No.2
- [47] Sari, Ida Ayu Candra dan Ni Luh Supadmi. 2016. Pengaruh Pendapatan Asli Daerah dan Belanja Modal Pada Peningkatan Indeks Pembangunan Manusia. *E-Jurnal Akuntansi, Vol.15, No.3, Juni 2016.* Universitas Udayana.
- [48] Sen, Amartya. 1981. Poverty and Families: An Essay on Entitlement and Deprivation. Oxford: Clarendon Press.
- [49] Sepulveda, Cristian and Martinez, Jorge-Vazquez. 2011. The Consequences of Fiscal Decentralization on Poverty and Income Inequality. Environment and Planning C: Gonerment and Policy 2011, Vol. 29, page. 321-343.
- [50] Simanjuntak, Dahlan. 2006. Analisis Pengaruh Pendapatan Asli Daerah terhadap Pertumbuhan Ekonomi di Kabupaten Labuhan Batu. *Tesis Sekolah Pascasarjana USU Medan*.
- [51] Simanjuntak, Robert. 2010. Desentralisasi Fiskal dan Manajemen Makroekonomi: Urgensi Suatu Grand Design di Indonesia. *Prisma, Vol.29, No.3 Tahun 2010.*
- [52] Stouffer, S.A., et. al. 1949. The American Soldier: Adjustment During Army Life. Studies in Social Psychology in World War II, Vol.I. Princeton, NJ: Princeton University Press.
- [53] Sumarsono, Sonny. 2009. Teori dan Kebijakan Publik Ekonomi Sumber Daya Manusia. Yogyakarta: Graha Ilmu.
- [54] Swiecki, Tomasz. 2017. Determinants of Structural Change. Review of Economic Dynamics, Vol.24, March 2017. Page 95-131.
- [55] Ulfa, dkk. 2015. Pengaruh PDRB (Produk Domestik Regional Bruto) dan PAD (Pendapatan Asli Daerah) Terhadap Tingkat Kemiskinan di Satuan Wilayah Pengembangan (SWP) IV Jawa Timur. Artikel Ilmiah Mahasiswa. Universitas Jember.
- [56] Vu, K.M. 2017. Structural Change and Economic Growth: Empirical Evidence and Policy Insights from Asian Economies. *Structural Change and Economic Dynamics*, *Vol.41, June 2017, page 64-77.*
- [57] Von Braun, J and Grote, U. 2000. Does Decentralization Serve The Poor?. In International Monetary Fund Conference on Fiscal Decentralization. Washington, DC, November (pp. 20-21).
- [58] Wibowo, P. 2008. Mencermati Dampak Desentralisasi Fiskal Terhadap Pertumbuhan Ekonomi Daerah. Jurnal Keuangan Publik, Vol.5 (1), hal. 55-83.
- [59] Widianto, Andri, dkk. 2015. Pengaruh Pendapatan asli Daerah terhadap Belanja Modal, Pertumbuhan Ekonomi, dan Kemiskinan Kabupaten/Kota di Daerah Istimewa Yogyakarta.

https://www.researchgate.net/publication/299820202/article:Sept ember 2015.

[60] World Bank. 1997. *The World Development Report*. New York: Oxford University Press.

- [61] Yacoub, Yarlina. 2012. Pengaruh Tingkat Pengangguran terhadap Tingkat Kemiskinan Kabupaten/Kota di Provinsi Kaimantan Barat. *Jurnal EKSOS*. Volume 8, Nomor 3, Oktober 2012 hal 176-185. ISSN 1693-9093.
- [62] Yudha, Okta Ryan Pranata. 2013. Pengaruh Pertumbuhan Ekonomi, Upah Minimum, Tingkat Pengangguran Terbuka, dan Inflasi terhadap Kemiskinan di Indonesia Tahun 2009-2011. Jurusan Ekonomi Pembangunan Fakultas Ekonomi Universitas Negeri Semarang.
- [63] Zhang, T. and Zou, H. 1998. Fiscal Decentralization, Public Spending, and Economic Growth in China. *Journal of Public Economics, Vol.67, page 221-240.*
- [64] Zhang, T. and Zou, H. 2001. The Growth Impact of Intersectoral and Intergovermental Allocation of Public Expenditure: With Application in China and India. *China Economics.*

TDI and Drug Trafficking: Comparison between Brazilian and Argentine Legislations – Part II

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Abstract— The article analyzes the incorporation of the criminal law theory of the enemy of Gunther Jakobs in the criminal drug policy in Brazil and Argentina, from two main characteristics, pointed out by the doctrine, as Categories: Restriction of criminal and procedural guarantees and punishment as a security measure for the enemy. Qualitative research used the comparative method, between the two drug laws of the countries, with exploratory descriptive interpellation. It was analyzed and confronted the characteristics of both laws with the theory of Jakobs, and concepts of Durkheim. The countries legislated practically in the same way, with similar expressions and sentences, marked by restrictions of procedural and legal guarantees, establish differences between people convicted of crimes of narcotics and other criminals and the adoption of safety measures for the chemical dependents. To despise the idea of security, in terms of criminal law, maybe the first step in reinterpreting criminal law, from the perspective of the basic democratic principles of the rule of law, interpreted and implemented in line with the Human rights.

Keywords— Criminal Law of the enemy, narcotic, human rights.

I. INTRODUCTION

This study is the continuity of the comparative analysis between the anti-drug laws of Brazil and Argentina, in light of the theory of the criminal law of the enemy.Thus, two main characteristics were chosen by the doctrine, from Jakobs's theory, as categories:restriction of criminal and procedural guarantees; the enemy must be punished with a security measure.

Starting from these categories of analysis, we sought in both laws, correlated or divergent points, with the premise of the theory of the criminal law of the enemy,

and the concepts of Durkheim, among others, the social coercion, understood as power, or strength, with the which the cultural patterns of a society impose on the individuals who integrate it, forcing these individuals to fulfill them.

1.1 RESTRICTION OF CRIMINAL AND PROCEDURAL GUARANTEES

In this category, articles were selected in both laws which restrict, in some way, guarantees provided by criminal law or other sparse legislation, such as a prescription deadline, limits right, such as provisional freedom, among others.

Themes	Brazil	Argentina
Destroying crime products	Art. 32	Art. 30
Prohibiting amnesty, Grace, pardon, bail, penalties restrictive of	Art. 44	
rights		
Simplify expertise	Art. 50	
Infiltrateagent	Art. 53	Art. 31 Bis a
Prohibit recourse in freedom	Art. 59	
Apprehend and use carefully the goods	Art. 60, 61, 62	Art. 30 e 39
Decreebusiness bankruptcy	Art. 69	Art 10, § 1°
Suspend penal prescription		Art.; 19, § 3°
Adopting the figure of the Snitch	41	29, Bis, 29 Terc

In Brazil, it is foreseen the immediate destruction of illicit plantations, by the police itself, after expertise performed on the site, heard only the public prosecutor, and preceded by judicial order. Look, there's no defense participation here. The same article also provides for the expropriation of property, under the Brazilian Federal Constitution (BRASIL, 2006; 1988). In Argentina, in its art. 30, provides that the judge must order the destruction, by the National Sanitary Authority, of narcotics in breach or elements intended for its elaboration, unless they belong to a non-responsible third party or except those which may be used by the same authority, Expressing the constancy of use to attribute them. Also, it is required expertise, and the destruction must take place within five days after. In addition, it shall be the confiscation of the goods and instruments employed to commit the crime, except when they belong to a person outside the act and the circumstances of the case or objective elements prove that they could not know about this illicit employment. The economic benefit obtained by the crime will also be apprehended (ARGENTINA, 1989).

The fact that is not repeated in Argentina is the prohibition of amnesty, Grace, pardon, bail, penalties restrictive of rights. Nucci (2006, p. 801) says that amnesty is forgiveness through the forgetfulness of facts, granted by the National Congress, by law, founded on criteria of criminal policy.Grace is the individual indulgence, consistent in clemency granted by the president of the Republic, by decree, equally for reasons of criminal policy. Pardon is the collective forgiveness, granted by the President of the Republic, by decree, using criminal policy, the indeterminate sentenced, when they fulfill some conditions.

The prohibition of provisional Freedom in this law, became reasons for jokes, because by prohibiting the granting of provisional freedom with or without bail for these offenses, remained the contradiction: whoever is arrested in the act of heinous or equaled crime, cannot obtain in Justice to provisional freedom, however, if you are at liberty and are prosecuted or arraigned, the decree of preventive detention is not mandatory. In short, a smart drug dealer does not let himself be arrested in the act, a message left by Brazilian law, whose corrections are expected to be made in internal jurisprudence.

As for bail is the legal impossibility of establishing the benefit of provisional freedom through the payment of money or another real guarantee, delivered to the state to ensure the attendance to all procedural acts, under penalty of losing the amount deposited. Interpreted restrictively this article, this seal is incoherent with art. 310 of the Code of Criminal Procedure, since the Brazilian legislator admits the granting of provisional freedom without bail, provided that the requirements for preventive detention are absent.

It is also forbidden the sursis, innovation in the Drug Law of 2006, whose concept is defined in the art. 696 of the Code of Criminal1 procedure, the conditional suspension of the penalty imposed on the agent. The judge may suspend the fulfillment of the private penalty of liberty imposed on the defendant, if the same suit the requirements of the law, and undertakes to comply with the conditions that are inflicted upon them.

Another article without correspondence in Argentine legislation is the simplification of expertise in art. 50, since the Brazilian law says that the forensic examinations must be formulated by two official experts. In the absence of these, it should be done by two suitable persons, with diplomas of higher course, preferably with a qualification in the area related to the nature of the crime. For the observation of the provisional report, there is no need for so much formality, just being a suitable person.

Both laws understudy foresee the figure of the undercover agent in Argentina called a covert agent. Pray art. 53 of the Brazilian law that at any stage of the investigation, the police authority may represent by the infiltration of its agents into criminal groups, heard the prosecution, and decided by the judge of the cause, in order to identify and punish the largest number of people as well as the major traffickers (BRAZIL, 2006). The Argentine law also foresaw the judicial authorities to act on this agent, provided that it is to obtain the identification or detention of the authors, participants or coverers, or to obtain and guarantee the necessary means of proof, and it is not possible to obtain the proof in another way (ARGENTINA, 1989).

It is to be said that the Argentine legislation has further detailed the role of the undercover agent by

¹ CPP - Art. 696. The judge may suspend, for a period of not less than 2 (two) or more than six (6) years, the execution of imprisonment and detention sentences not exceeding two (2) years, or, for a period of not less than 1 (one) or more than three (3) years , the execution of the simple prison sentence, provided that the sentenced:

I-have not suffered, in the country or abroad, condemnation unappeable by another offence the penalty of deprivation of liberty, except the provisions of the single paragraph of art. 46 of the Penal code;

II-The antecedents and the personality of the convict, the motives and circumstances of the crime authorize the pretion that will not make the Delinqugo.

Single paragraph. If the beneficiary is prosecuted for another offence or contravention, the deadline for the suspension of the penalty until the definitive judgment shall be deemed extended.

establishing the way in which these people should act, way of identification, punishment for the possible crimes committed, even predicting Retirement in some special situations:

(a) They are introduced as members of criminal organizations with the purpose of commissioning the offenses provided for in this law or article 866 of the Customs Code, and

b) Participate in the realization of any of the acts provided for in this law or in Article 866 of the Customs Code.

The designation shall include the true name of the agent and the false identity with which he will act in the case, and shall be reserved outside the proceedings and with due certainty.

The information that the undercover agent is achieving will be immediately brought to the attention of the judge. The appointment of an undercover agent must be kept strictly secret. Where it is absolutely essential to providing as evidence the personal information of the covered agent, the person shall declare as a witness, without prejudice to the adoption, where appropriate, of the measures provided for in Article 31-year.

Article 31 Ter.- The undercover agent shall not be punishable if, as a necessary consequence of the development of the action entrusted, he has been compelled to commit a crime, provided that it does not imply a certain danger of endangering the life or physical integrity of a person or the imposition of serious physical or moral suffering on another.

Where the undercover agent has been charged in proceedings, he shall make known confidentially to the intervening judge, who is a reserved manner shall collect the relevant information from the appropriate authority.

If the case corresponds to the provisions of the first paragraph of this article, the judge shall decide without revealing the true identity of the accused.

Article 31 Quarter - No Law Enforcement officer may be required to act as an undercover agent. The refusal to do so will not be regarded as an unfavorable interposition for any purpose.

Article 31 Five- Where the security of the person who has acted as an undercover agent is at risk of having revealed his true identity, he shall have the right to choose between remaining active or moving into retirement, whatever the number of years of service he had. In the latter case, you will be recognized as a retirement credit equal to the one that belongs to the one who has two more grades than he has.

As soon as it is compatible, the provisions of Article 33a (ARGENTINA, 1989) shall apply.

Brazil has committed itself internationally to using the technique of infiltration of police or intelligence agents, through Decree 5.015/2004, which promulgate the United Nations convention against transnational organized crime.

Another restriction on the rights found only in Brazil is the restriction of freedom to appeal (art. 59), to those convicted in crimes of illicit drug trafficking, and typified offenses of art. 34 to 37, unless the defendant is a primary and good antecedent (BRAZIL, 2006). It can be seen that the legislator extracted a standardized form for all the accused, without individualizing the conduct, in clear adherence to the criminal law of the author, not the fact.

As for the assets of the accused, both laws foresee restriction on the full exercise of the right of ownership, legitimizing both the police authority and the Public Prosecutor's Office to propose, still in the police investigation phase the seizure and other measures and immovable property, of persons accused of offences provided that they are products of the crime, or obtained from criminal practice. See that in Brazilian law, after the decree of the measures of apprehension, is that the accused subject may manifest in the sense of proving the lawfulness of the product, well or value object of the decision. Only after the proof of the lawful origin is that the judge will decide on the return, preceded by the personal attendance of the accused in court.

Another relevant fact is the seizure of vehicles, vessels, aircraftand any other means of transport, machinery, instruments, and objects used in the practice of crimes, which will be under the responsibility of the judicial authority, which may Including, use these products. There is still a prediction of the loss of these assets in favor of the state.

Argentina also brought as an effect to the accused of trafficking, the confiscation of the goods and instruments employed to commit the offense, except when they belong to a person outside the act and the circumstances of the case or objective elements prove that they could not know about this illicit job. The economic benefit obtained by the crime will also be apprehended. The judge of the cause does not have to wait until the final sentence of the criminal prosecution to decide the fate of the seized assets and the economic benefits earned, which will be destined to combat illegal narcotics trafficking, its prevention, and rehabilitation by consumption. The fines will have the same destinations (ARGENTINA, 1989).

Again in this topic, the legislator does not consider the hypothesis of acquisition of the accused, along the criminal instruction, to expropriate his assets, and much less a minimum amount of narcotics to generate this effect, which leads to the conclusion that just a small quantity, and if considered trafficking, the loss of goods will occur, without observing any proportionality as to the quantity, quality, personal condition of the accused, or even of the goods. In the words of Rusconi (1995, p. 163) for those who, without proportionality, the functioning of the penal system is not feasible, not only through the idea that the insignificant cannot be punished, but because the totality of the dosimetric system of distribution of threats of feathers is founded on it.

Brazil has predicted the bankruptcy decree of companies or establishments that possess, commercially or deal in any form with narcotic and related substances (BRASIL, 2006). The country in comparison predicted that in the case of business places, where there are criminal practices related to narcotics, there will be an ancillary penalty of inability to exercise trade at the same time of the penalty, which will be increased to double the same If it is a business for fun, including in a preventive decision, there may be the closure of the premises (ARGENTINA, 1989). In this respect, the laws are also convergent. An interesting fact and not replicated in Brazil, is the creation, in foreign law, of a suspensive cause of prescription, while the accused is subjected to treatment for detoxifying (ARGENTINA, 1989).

Both countries also predicted the figure of the whistle-blower, that is, the accused subject, who voluntarily collaborated with the investigations and/or the criminal process in identifying the other co-authors or participants of the crime, and in the even partial recovery of crime products, you may have your penalty reduced to two-thirds. In Argentina, there is also the possibility of penalty exemption, as long as the conspiracy is revealed before the execution of the act. When there is a revelation of the identity of the other participants, with the processing of the accused, or significant advancement of the investigation, the penalty may be reduced to half of the maximum, or even exempt from it. Therefore, both countries reward the enemy who is faithful to the norm, because when granting exemption from penalty or even its decline under the pretext of collaborating with justice and law enforcement, a naked man is guaranteed to punish this citizen.

The legislative option for restriction of fundamental criminal and procedural safeguards, with different penitentiary or criminal enforcement regulations for criminal subjects related to drug trafficking, remains evident. By prohibiting the exercise of a right to freedom of appeal, prohibiting the granting of criminal benefits, such as bail, amnesty, grace or even substitution of custodial sentences for restrictive rights, the legislative option for the penalty remains evident. Private freedom as a political fact, without any justification, in a progression of punitive power.

It jumps to the eye that this disproportionate increase of punishment for unique and unique intimidating purposes not only offends the principle of proportionality but also generates in society a sense of injustice, obstructing the process of social adherence to the norm.

Toledo (2008) clarifies that it is not benevolence with a crime, because no one reasonably could be. It is about how to contain it, within socially tolerable limits, in a serious and truly efficient way, with laws that extrapolate the role and that sentences are fulfilled, for the reasons mentioned or for lack of appropriate penal establishments. In Durkheim's thinking, it is about maintaining the social order, since, for him, social rules and discipline are part of the social organization, which, far from being alienating, is integrative and is part of mental health.

1.2 THE ENEMY MUST BE PUNISHED WITH A SECURITY MEASURE

With this category comes to the height of the question: is the individual who commits crimes related to the drug, an enemy to be restrained by society? To what extent is containment supposed to act? It is highlighted that the security measures, in general, constitute a state response to authors of Deviant conducts, but without the necessary discernment to understand the illicit character of the facts.

Safety measure is all criminal, detention or non-detention reaction, which binds to the practice, by the agent, of a typical illicit fact, has as assumption and principle of measure its dangerousness and aims for social defense purposes linked to special prevention, be in the form of safety, whether in the form of resocialization (DIAS *apud* LEVORIN, 2003, p. 161).

In this tuning fork, it is perceived that the safety measures have a preventive nature of new occurrences of offenses, insofar as the subject is presumed dangerous for his deviant conduct, and, in order to protect the society of this person, must be restrained. Within the meaning of Durkheim (1978, 2003) that all morals are coercive and collective, the coercion is exercised by the whole of society and the laws, preventive or punitive, so only reflect the morals defended by social groups in power, to protect themselves.

In the law of drugs, both in Brazil and Argentina, there is a clear application of this modality of criminal response to the user of narcotics, who commits some offense provided by the laws. The traffickers will receive a security measure, only to confess to being chemically dependent, and they want it, otherwise, they will receive only custodial imprisonment of freedom, in general. It is also possible to extend the therapeutic measures to the relatives of the accused, as described below.

Table 2 – Articles related to the category "The enemy must be punished with a security measure"

Theme	Brazil	Argentina
User treatment	5°, 22, III and IV, 23-A,	16, 17, 18, 19, 21
	26 and 26-A, 28, 45, p.	
	Only, 47	

The countries under study also predicted in the internal planning, therapeutic treatment policies for the dependent chemist and his family (penalty passes from the person of the convict), even when he is in prison, and in both, constitutes a crime the use of narcotic substance, however in Brazil, subject to a warning penalty on the use of drugs and measurement of attendance to program or educational course (BRAZIL, 2006).

Differentiation factor is that Argentina predicted, in addition to the penalty, treatment of detoxification for convicts in any of the crimes defined in the anti-drug law, and rehabilitation for the time necessary for these purposes, which will cease by judicial resolution, by a prior opinion of experts advising him (ARGENTINA, 1989). Argentina also establishes the suspension of the penalty to subject the condemned to a measure of curative safety, for the time necessary for detoxifying and rehabilitation and provides preventive treatment to the defendant, provided that he consents or when there is a risk of damaging himself or others, without detailing what these possible losses would be.

At this point, it should be clarifying that it brings an oscillating picture, the situation of Argentina has changed substantially from the percent of the Supreme Court of Justice of the country, in the famous case "Arriola, Sebastian and others/resource in fact" of 25 August 2009, in which the unconstitutionality of art was declared. 14second paragraph of Law 23,737. In this decision, the Argentine High Court, argued that the pragmatic and utilitarian reasons invoked in previous precedents of the same court deserved to be revised, for nineteen years ago, criminalizing consumers proved to be a Failure. It was also demonstrated through reports of information, which incriminate a drug holder does not allow to combat the conduct of drug trafficking, in which, the light of statistics and investigations, had grown remarkably. On the basis of the judgment, the Argentine court reproduced and discussed the arguments ofFallo:"Bazterrica" (Failures: 308:1392, the year 1986), emphasizing the achievement of the dignity of the human person, and the right to personal autonomy. This, we added the convenience of pursuing the consumer and thus, to have state resources to repress the conduct of drug commercialization.

Look at this.

"Thus, international treaties, in their texts, recognize various rights and guarantees provided for in the National Constitution of 1853, including – and in what is of interest here – the right to privacy that prevents people from being subjected to arbitrary interference or abusive in their private lives (article 11.2 of the American Convention on Human Rights; Article 5 of the American Declaration of the Rights and Duties of Man; article 12 of the Universal Declaration of Human Rights and article 17.1 of the Covenant International Civil and Political Rights). With regard to this right and its link to the principle of "personal autonomy", at the inter-American level, it has been noted that "the development of the human being is not subject to the initiatives and care of the public authority. From a general perspective, he possesses, retains and develops, in more or less broad terms, the ability to lead his life, to solve on the best way to do so, to use means and instruments for this purpose, selected and used with autonomy — which is a pledge of maturity and condition of freedom-and even legitimately resist or reject the misconduct and aggressions directed at him. This exalts the idea of autonomy and discards oppressive temptations, which could be hidden under an alleged eagerness to benefit the subject, establish his convenience and anticipate or enlighten his decisions" (IACHR in the case Ximenes Lopes vs. Brazil, on July 4, 2006, paragraph 10 of judge Sergio García Ramírez's vote). These principles are in line with the provisions of "Bazterrica".

In the same sense, art 18 $^{\circ}$ says:

"That the principle of the dignity of man, proclaimed in the international human rights system (Preamble to the International Covenant on Civil and Political Rights, and the American Convention), is also more compatible with the solution proposed in " Bazterrica." Indeed, such a principle of dignity which consecrates man as an end in itself precludes him from being treated only."

In particular, Minister Zaffaroni punctuated:

"That despite the results described, this type of criminal generates innumerable inconveniences and limitations to the individual freedom of the inhabitants who carry out conducts that do not harm or endanger the legal property of others, without the processes originating come to an end in the way that all criminal proceedings are supposed to do. At the same time, a huge disputing of the effort, money and time of the police forces, inappropriate in criminal political proceedings, as evidenced by the nearly twenty years since this Court reversed the jurisprudence sat in the case "Bazterrica" (Failures: 308:1392), with the dictation of the judgment "Montalvo" (Failures: 313:1333)".

For this added that:

"Similar considerations can be made with respect to judicial work. Both police and judicial activities distract efforts that, with healthy criminal political criteria, should be devoted to combating the trafficking of toxics, especially those that are most harmful to health, such as those that are now circulating among the sectors poorest and younger people in our society, with lethal results of very short term and with a high likelihood of neurological sequelae in children and adolescents who manage to recover. That the processing of users, on the other hand, becomes an obstacle to the recovery of the few who are dependent, because it only stigmatizes them and reinforces their identification through the use of the toxic, with clear prejudice to the advancement of any detoxification therapy and behavior modification that, precisely, the reverse objective is proposed, that is, the removal of that identification in pursuit of their self-esteem on the basis of other values".

From another approach, the Argentine Court had especially considered that:

"As regards demand containment, in addition to the persecution of supply, States are required to prepare their public health apparatus, assistance, and education, so as to ensure that addicts can receive physical and psychological treatments to heal the self-addictions."

Incoherence withthehighestArgentine court, in unanimous form, after leaving expresslyclarifiedthatthe decision was taken "in modesomelegalizingthe drug "highlighted "the inescapablecommitmentthatshould assume all institutions or fight drug trafficking".

As a consequence, it resolved: "To urge all public authorities to ensure a State policy against illicit drug trafficking and to adopt preventive health measures, with information and education deterred from consumption, focused mainly on the most vulnerable groups, especially minors, in order to provide adequate compliance with international human rights treaties underwritten by the country".

The aforementioned precedent reduced the criminal process against drug users in Argentina, however, there are no indications that the actions necessary to address drug trafficking control or the assistance of drug users have been fulfilled in an upward spiral.

Law 23.737 was not modified in Argentina.

Recapitulating, both legislations see the user as a lower subject, little evolved and unable even to take care of his own health and therefore must be obliged to do so, through the state which acts by means of a "penalty". The criminal law arises as to the necessary and unique instrument for the containment of the masses of chemical dependents, subject to be punished according to their dangerousness and not affected by what they have done. The laws do not consider for the fixation of these measures, time of chemical dependence, which substances, or even personal conditions of the subject. It only determines the treatment measure for which it should be forwarded, for an indefinite period in Argentina, and in Brazil for 5 months if primary, 10 months if repetitive, with the sanitary authorities, the determination of its dosage, in an inaccuracy of the standard, without legislative technique for a criminal law, and mainly, without observance of basic principles such as the offence, the externalization of the fact, the objective imputation.

The drug user is not perceived here as a citizen who holds rights and duties, because these transgressors cannot even decide whether to receive treatment, are labeled as enemies and do not possess certain fundamental rights inherent to the person. Thus, this criminal law is based on the classical idea of the dignity of the human person, grounded in the democratic State of law, with freedom, especially about himself. The medical-sanitary discourse is reinforced and the drug user has seen and treated as the victim of evil, the patient infected by the "plague", the moral issue was seen as a public health problem, and the drug consumer ceases to be bad to be seen as a D Who needs help from the whole society, reinforced by the effective legislative changes in 2019, by Law N. 13,840, amending some articles of law 11.343/2006.

From the viewpoint of Nilo Batista (1997), perhaps the most respected researcher on the anti-drug criminal policy is from the decree that ratified the International Opium Convention that Brazil adopts a "sanitary model", or rather a sanitarian discourse of Control that gains breath with the consolidation of penal laws of 1932. Maierovitch (2006), cited by Flavio Augusto Fontes de Lima (2009, p 172) considers the US arrogant when imposing the model of treatment in Latin America, because:

> Therapeutic justice is, in fact, a euphemism, a pleasant way to talk about an unpleasant theme created by the Brazilian government. It is a euphemism because it represents a form of authoritarian solidarity, false solidarity, improper and inadequate. This is all for a democratic state of law. They opened a criminalizing breach in the law. establishing the following: The one who is surprised by drug possessions and is primary, has the possibility, as if it were a "favor" of the state, to choose between the chain and the mandatory treatment. Evident to those who have a minimum of critical sense, that is not an option, it is coercion. Brazil, in turn, adopted this same policy and called it therapeutic justice.

The policy of combating drugs selects the enemy and the right of Jakob's structure in the legal field the segregation and neutralization of this enemy, in the present case, the user of narcotics. The legislator of the two countries did not bother to know the social facts motivators of drug trafficking, and much less the consumption of these substances, limiting themselves only to banning them and criminalizing them, therefore, opted to treat drug users on the sidelines of society, and only accepts them if they stop consumption, in a clear option for the harm reduction policy. It is to be said that Brazil and Argentina are developing countries, but with high rates of unemployment and little harmony in the distribution of income, socially motivating factors in the pursuit of profit and struggle for survival.

Even after more than twenty years of drug prohibition in both countries, subsequent legislative changes were taken following the same line of punitive, symbolic discourse, without even knowing how the application of their predecessors was given. Thus, in the analysis of Durkhein, founder of the Sociological School of Law, the object of legal sociology, which in this case is to investigate how the legal rules were built real and effectively, and the way legal norms work in society does not fulfilled.

Again here we have a negative factor of efficacy of the norm, because the laws, while providing treatment for the drug user, including their relatives, in the material plane there is omission of the authority in applying the law, because the judges have nowhere to forward users for treatment, triggering in the lack of structure for this application, because not only do not exist these treatment sites of the chemical dependents, free of charge, and in all places of the territories, there is not even knowledge of how it is the treatment of chemical dependents in the public health system by the operators of law. Two noncommunicable instances, the judiciary, and the health team.

The growing number of consumers in this narcotic market demands a new action by the legislator, which cannot be grounded in symbolism, in populism, under penalty of making life more difficult in collectivity. The legislative power, unfortunately, is limited by the social force that elects it (real factors of power), ideological, political, economic, professional, religious, cultural and moral factors that cannot prevail over this performance. This crime associated with drug use has as its main victim the collectivity, because the damage is diffuse, with increased criminality, damage to life or the health of the collectivity.

The social institutions, like the legislative power, did not advance scientifically, and the imbalance between the knowledge sciences and the social institutions further aggravated the social problems, because there are no transformations in the social life due to the Worsening of social problems, due to the loss of its main objective, man, insofar as the legislative power tries to dominate the human being (in this case the user of narcotics), without considering his individualities (reasons why he uses certain Substance, type, quantity, among others), its notion of lawlessness or not on the consumption of narcotic drugs, allowing a climate conducive to the struggle of classes, domination, ideological shocks, increased criminality and prison population related to the trafficking of narcotics.

From the marginalized, the punitive selectivity is seen because drug traffickers are poor in low schooling. They are reserved for the rigors of penal law and the proximity to the current defended by the germanpenalist, Gunther Jakobs, entitled criminal law of the enemy (MORAES, 2006).

At this point, it is appropriate to bear in mind the scope of the principle of the act, whereby only the externalized manifestations of the will are punishable. This precept seems weakened by the anti-drug legislation analyzed, since the permanence offenses are based on the expression "Tener", which does not describe any conduct such as Rusconi and Kierzenbaum correctly argue, citing Struensee (2016, p. 42).

This component introduces a well-founded objection of the constitutional angle to the regulations examined. Secondly, one should not lose sight of the objections surrounding the crimes of the abstract danger of the requirements of the principle of lesivity and the voluminous critical doctrinal of which they are tributaries. (Rusconi, 2009, p. 20 y ss.).The above table shows the exception note of the legislation related to the control of narco-criminality and its constitutional bases. In short, this scenario demonstrates the tensions to the state of constitutional law caused by the policies of drug control, its lack of control and the tendency to naturalize the exercise of criminal power and its effective efficacy.

Thus, this chapter concludes that Brazil and Argentina opted for the criminal law of the enemy, defended by Jakobs, which results from the sum of the factors of the expansion of criminal law, the emergence of symbolic criminal law and the resurface of punitivism, whose goal is to maintain the vigilance of the norm, combat dangers, working with the criminal law of the author, assuming the dangerousness of the agents users, traders, drug producers, or even agents who possess for these activities. This right is not concerned with consumed or attempted conduct, as it must anticipate criminal guardianship, to punish preparatory acts (criminal Law of danger).

II. FINAL CONSIDERATIONS

The criminal law, throughout history, was and continues to be reissued, with old legal logic send the constantly: violence, inaccuracy, updated and exceptionality are all aspects of a logical of modern law. The obsession with security guides decision-making in the legislative aspect, fostering practices within the penal sphere that signify the development of criminal policies guided by this ideal, converting the criminal policy into security policy. It is lost in view of the fact that the level of conflict of a society depends on the result of basic public policies and that the last resource is criminal policy because it is the violent tool by definition (Angriman 2017, pp. 170 and segs.).

This study explored the criminal law theory of the enemy within the criminal drug policy (Argentina and Brazil) which is fully incorporated, and subjecting it to criticism of human rights, it is possible to establish, that this theory has as one of its pillarsrestriction of penal and procedural guarantees, and prediction of punishment of the enemy with security measure, which served as categories to compare the drug laws of Brazil and Argentina.

Throughout the discussion, it remains evident the integral adoption of this purely punitive model in its internal drug policy, which is copied from the United States, without further study of criminology by the Latin American legislature on the subject. The international treaties ratified by the two countries demonstrate this option.

Likewise, the common terms found in the laws of the States, the criminalization of conducts practically in the same way, with very similar expressions and sentences, marked by restrictions of procedural and legal guarantees, establishing Differences between people convicted of crimes of narcotics and other criminals, high feathers, and especially the adoption of safety measures for the chemical dependents leave no doubt about it.

It was also demonstrated that in the legislation of the nations under study, there are other traces of the adoption of the criminal law of the enemy. However, in retracing the policy of the previous century and analyzing the current postures against terrorism, a modern policy inclination to expose the state of exception as a model of government, shifting provisional and extraordinary measures for techniques of public administration.

The indivisibility between the powers characterizes the constancy of the state of exception, generates a pernicious circle in which the absolutist measures legitimated for the defense of the democratic constitutions are those that destroy it because there is no institutional protection able to ensure that emergency powers are effectively used in order to safeguard the Constitution. This characteristic is present in both Brazil and Argentina.

The criminal labels are paradigms for the action of the agents of persecution, and also of the policies, and conduct judicial reasoning in the choice of numerous factors between the hypotheses of condemnations or absolutory and the determination of quantity, quality and kind of punishment.

In Latin countries, because of the uncertainties of the perception of terrorism, organized crime in drug trafficking makes room for the adoption of the justifying emergency criminal law. Thus, recalls Alejandro Aponte (2004) to be the modification of the practical criminal spectacle perceptible:

Combating narco-trafficking and organized crime, in the theory of the enemy's criminal law and the fixation of the state of permanent exception, obstructions the boundaries between security policies and criminal law. The obstacle, starting from the perspective of ensuring, is that the right and criminal proceedings must be the measures to contain the constant violence from the instruments of repressive policy. Otherwise, if they act on legitimation and not in the delegitimation of violence, the tendency is the spreading and loss of control of power.

The contradiction between security and assurance, in this tuning fork, is possibly one of the biggest illusions served to the public consumer of criminal law. There is no bifurcation between the maintenance of individual rights and guarantees and the creation/maintenance of democratic systems of crime control. The conflict in conception can only be concrete if you opt for authoritarian pursuers models.

The widespread Ghana of punishment accomplishes the connivance of the perception that the process of constructing democracy is slow and sagacious, implanting, in the raw reality of repressive programming, a surface democracy captured by punitive density.

The current conjuncture can be interpreted from the prevailing belief in science (penal) and in the desire for the reason logos punitive. The confidence in the ability of criminal science to solve outstanding issues in humanity since the most remote beginnings, such as drugs (criminal narcissism) obtains the growth excessive generalization of repression.

The social institutions, like the legislative power, did not advance scientifically, and the imbalance between the knowledge sciences and the social institutions further aggravated the social problems, because there are no transformations in social life as a result of the worsening of social problems, due to the loss of its main objective, man, insofar as the legislative power tries to dominate the human being (in this case people related to the trade of narcotics), without considering their individualities (reasons why it uses a certain substance, type, quantity, local or regional trade, funding agent, among others), its notion of lawfulness or not about the consumption of narcotics, allowing a climate conducive to the struggle of classes, domination, shocks Crime and prison population related to trafficking.

In relation to the contributions to the understanding this problem in the light of the criminal Sciences and the democratic State of law and for studies on the criminology and legislative process of the countries of the Southern hemisphere and the agreements International standards for this issue, it can be recommended that the penal system be occupied, as *"última ratio"* the investigation and possibly sanction of severely harmful conduct. The healthy coexistence, the recovery of public spaces, the claim of security as an integral and constructive end of the state through the prediction of sanitary, educational, work, environmental, health, among others, especially freedom and respect for the other, the preventive and restorative intervention of the rights affected, are proposed for the criminal policy to really occupy itself.

Despising the idea of security in terms of criminal law may be the first step in reinterpreting criminal law in respect of the basic democratic principles of the State of law, interpreted as implemented in line with the rights of human beings, whose conquest stems from enlightenment. To return to darkness and practices that contradict and deny the rule of law, is to violate secular achievements.

REFERENCES

- AGAMBEN, G. Estado de Exceção. São Paulo: Boitempo, 2004.
- [2] ANGRIMAN, Graciela Julia: Derechos de las Mujeres, Género, y Prisión, Editorial Cáthedra Jurídica, Buenos Aires, 2017.
- [3] ANGRIMAN,Graciela J.. Medios extraordinarios de investigación y tráfico de estupefacientes. Su problemática a partir de la desfederalización de la competencia. Revista INECIP, Buenos Aires N° 2, Ed. Lajouane, Buenos Aires, 2007, pp.89 y ss.
- [4] ARAUJO, F. H. de M. *et al*.Tráfico de drogas:razões fático-jurídicas de sua hediondez. 2016. Disponível em <<u>https://www.conjur.com.br/dl/artigo-trafico-drogashediondez.pdf</u>>Acesso em 24 Jan. 2018.
- [5] ARENDT, H. A Condição Humana. 10 ed. Rio de Janeiro: Forense Universitária, 2000.
- [6] ARGENTINA, Câmara Federal de San Martín.Causa nº 573 "Sequeira", reg. Nº 610, 1995. Disponível em<<u>https://www.pjn.gov.ar/02 Central/Index2.Asp?Nodo= 1559&Rubro=2</u>> Acesso: 12 Dez. 2017.
- [7] ARGENTINA, Juzgado Correccional N° 5. Causa n. J-0408. Departamento Judicial de Morón, P.B.A., Jueza Dra. Graciela Julia Angriman.Ciudad de Morón, 20 de Agosto de 2.009.
- [8] ARGENTINA. Ley n. 23.737, 1989. Disponível em <<u>https://twiki.ufba.br/twiki/pub/Observa/LeisInternacionais</u> /LeiArgentina.pdf> Acesso: 12 Dez. 2017.
- [9] ARGENTINA. Ley n. 24.424. Disponível em <<u>http://infoleg.mecon.gov.ar/infolegInternet/anexos/0-4999/138/texact.htm</u>> Acesso: 12 Dez. 2017.
- [10] ARGENTINA. Ley n. 24.430, Constitucion de laNacion Argentina (1853).Disponível em: <u>http://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/804/norma.htm. Acesso em 16 Dez. 2017.</u>
- [11] ARGENTINA. Ley n. 24072, Aprobación de laConvencion de NU contra el tráfico ilícito de estupefacientes y sustancias psicotrópicas. Disponível em <<u>http://federacionuniversitaria21.blogspot.com.br/2008/</u>

05/ley-24072-aprobacin-de-la-convencionde.html>Acesso: 12 Dez. 2017.

- [12] ARGENTINA. Ley n. 25.632. Convenção Internacional contra a Criminalidade Organizada Transnacional e protocolos complementares. Disponível em <<u>http://servicios.infoleg.gob.ar/infolegInternet/anexos/7500</u> 0-79999/77329/norma.htm>Acesso: 12 Dez. 2017.j
- [13] ARGENTINA. Ley N° 23.984. CodigoProcesal Penal.Disponível em<u>http://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/383/texact.htm</u>Acesso: 12 Dez. 2017.

- [14] BARATTA, A. Criminologia Crítica e Crítica do Direito Penal: introdução à Sociologia do Direito Penal. 6. ed. Rio de Janeiro: Revan, 2011.
- [15] BATISTA, N. A violência do estado e os aparelhos policiais. In: Discursos Sediciosos. Rio de Janeiro: Instituto Carioca de Criminologia, 1997.
- [16] BITENCOURT, C. R. **Tratado de direito penal**. Parte geral. 17 ed. Rev. Ampl e atual. São Paulo: Saraiva, 2012.
- [17] BRASIL, Código Penal. Decreto-Lei n. 2.848, de 7 de dezembro de 1940. Disponível em <<u>http://siabi.trt4.jus.br/biblioteca/direito/legislacao/codigos</u> /cp/del %201940 2848 cp.pdf> Acesso em: 03 Out 2017.
- [18] BRASIL. **Constituição da República Federativa do Brasil**. Brasília: Senado Federal, 1988.
- [19] BRASIL. Lei 11.343, de 23 de agosto de 2006. Disponível em <<u>http://www.planalto.gov.br/ccivil_03/_ato2004-</u> 2006/2006/lei/11343.htm>Acesso em: 03 Out 2017.
- [20] BRASIL. Lei 11.464/06. 2006. Disponível em <<u>http://www.bu.ufsc.br/Lei114642007.pdf</u>. Acesso em: 03 Out 2017.
- [21] BRASIL. Lei <u>13.840/19.</u> 2019. <u>Disponivel em < http://www.planalto.gov.br/ccivil_03/_Ato2019-2022/2019/Lei/L13840.htm#art5. Acesso em 18 de agosto de 2019.</u>
- [22] BRASIL. Lei 6.368/76. 1976.Disponível em <<u>http://www.planalto.gov.br/ccivil_03/leis/L6368.htm</u>>Ace sso em: 03 Out 2017.
- [23] BRASIL. Lei 3689/41. 1941.Disponível em <<u>http://www.planalto.gov.br/ccivil 03/decreto-</u> lei/del3689.htm> Acesso em: 18 ago. 2019.
- [24] COMISSÃO INTERAMERICANA SOBRE DIREITOS HUMANOS - CIDH. Convenção Americana sobre Direitos Humanos ou do Pacto de San José de Costa Rica. 1969. Disponível em <<u>http://www.cidh.oas.org/basicos/portugues/c.convencao_a</u> mericana.htm>Acesso em: 09 Out.2017.
- [25] DURKHEIM, E. A ciência social e a ação. Lisboa: Bertrand, 1975.
- [26] DURKHEIM, E. A educação moral. Petrópolis, RJ: Vozes (Coleção Sociologia), 2008.
- [27] DURKHEIM, E. Educação e sociologia. São Paulo: Melhoramentos, 1978.
- [28] DURKHEIM, E. Ética e sociologia da moral. São Paulo: Landy, 2003.
- [29] FALLO ARRIOLA, S. et al. Causa n° 9080. A. 891. XLIV. (25/08/2009) RECURSO DE HECHO. Corte Suprema de Justicia, Buenos Aires. Disponível em: <u>http://www.saij.gob.ar/corte-suprema-justicia-nacion-federal-ciudad-autonoma-buenos-aires-arriola-sebastianotros-recurso-hecho-causa-9080-fa09000059-2009-08-25/123456789-950-0009-0ots-eupmocsollaf</u>. Acesso em 18/08/19.
- [30] FERRAJOLI, L. Escritos sobre Derecho Penal Nacimiento, evolución y estado actualdelgarantismo penal.Hammurabi, Depalma editor, Buenos Aires, 2014, T° 2, p. 153 y ss.

- [31] JAKOBS, G. **Direito Penal do Inimigo**. Rio de Janeiro: Lumen Juris, 2009.
- [32] JAKOBS, G. MELIÁ, M. C. Direito Penal do Inimigo: Noções e Críticas. 6. ed, Porto Alegre: Livraria do Advogado, 2012.
- [33] LIMA, F. A. P. Justiça Terapêutica: em busca de um novo paradigma.261 fls. Tese (Doutorado). Faculdade de Direito USP. São Paulo. 2009.
- [34] MORAES, A. R. A. A terceira velocidade do direito penal: o direito penal do inimigo. 2006. 327 f. Dissertação (Mestrado em Direito Penal). São Paulo: PUC SP, 2006. Disponível em <<u>http://livros01.livrosgratis.com.br/cp008973.pdf</u>> Acesso em: 05 Jan. 2018.
- [35] MUNOZ, F. C. Crítica ao Direito Penal do Inimigo. Rio de Janeiro: Lúmen Juris, 2011.
- [36] NUCCI, G. de S. Código de Processo Penal Comentado.5. ed. São Paulo: Revista dos Tribunais, 2006.
- [37] ORGANIZAÇÃO DAS NAÇÕES UNIDAS. Declaração dos Direitos dos Homens e Cidadão. 1969. Disponível em: http://www.ohchr.org/EN/UDHR/Documents/UDHR_Tran

slations/por.pdf. Acesso em 16 Dez.2017.

- [38] RIBEIRO, P. S. Durkheim e o Fato Social. In: Brasil Escola. 2012. Disponível em <http://brasilescola.uol.com.br/sociologia/durkheim-fatosocial.htm>. Acesso em: 24 Jan. 2018.
- [39] RUSCONI, MAXIMILIANO A. Derecho Penal, parte geral. Buenos Aires: Ad-Hoc, 1995.
- [40] RUSCONI, MAXIMILIANO ADOLFO. ElSistema Penal desde las Garantías Constitucionales, Hammurabi, Buenos Aires, 2013, pp. 217 y ss.
- [41] RUSCONI, MAXIMILIANO ADOLFO. Derecho Penal Parte General.Ad Hoc, 2.ed, Buenos Aires, 2009, p. 66.
- [42] RUSCONI, M. A. e KIERZENBAUM. Elementos de la parte general delderecho penal, Hammurabi, Buenos Aires, 2016, p.42.
- [43] TOLEDO, F. A. Princípios básicos de direito penal.5 ed. São Paulo: Saraiva, 2008.
- [44] ZAFFARONI, E. R. O Inimigo no Direito Penal. 3 ed. Rio de Janeiro: Revan& Instituto Carioca de Criminologia, 2011.
Modified Momentum Euler EquationforWater Wave Modeling

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Abstract— In this research, weighted total acceleration for a function f(x, z, t) was formulated. This total acceleration equation was done at the Euler momentum equation. Then, the Euler momentum equation was done together with free surface boundary condition equation to formulate water wave constant at the solution of Laplace equation. The velocity potential of the solution of Laplace equation actually consists of two components that were used in this research.

Keywords—weighted total acceleration, convective acceleration, complete velocity potential.

I. INTRODUCTION

Momentum equation is an important basic equation in mathematic modeling of hydrodynamics, including water wave modeling. Momentum equation commonly used in water wave modeling is Euler momentum equation. There is a constraint in this equation, i.e. Euler momentum equation has no hydrodynamic force in the horizontal direction or convective acceleration has a value of zero when velocity potential is substituted to the term. To overcome this problem, weighted total acceleration equation was formulated where there are two weighted coefficients, i.e. at the time*t* differential term and at the differential term of vertical-zdirection.

Laplace equation solution consists of two velocity potential components (Dean (1991)). However, only one component that has been used. Equations from water wave constant, i.e. wave number k and wave constant Gcan be formulated using only one velocity potential component, but the value is determined by both the two velocity components. In this research, the water wave surface equation is formulated using the two velocity potential components, then the condition of the water wave surface that has been produced is studied.

II. WEIGHTED TOTAL ACCELERATION

Hutahaean (2019a) formulated weighted total acceleration in a function f = f(x, t), x is horizontal axis and t is time, using Taylor series. The formulation of weighted total acceleration in a function f = f(x, z, t), z is vertical axis, is done using similar method, therefore the formulation of weighting total acceleration in f =f(x, z, t) will be preceded by reviewing the formulation of weighting total acceleration in f = f(x, t)to obtain a clearer description.

2.1. Weighted Total Acceleration for the function of f = f(x, t)

The changes in the value of a function in a function f = f(x, t) for a very small δx and δt using Taylor series only until the second derivative is,

$$f(x + \delta x, t + \delta t) = f(x, t) + \delta x \frac{\mathrm{d}f}{\mathrm{d}x} + \mathrm{d}t \frac{\mathrm{d}f}{\mathrm{d}t} + \frac{\delta x^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}x^2} + \delta t \delta x \frac{\mathrm{d}^2 f}{\mathrm{d}t \mathrm{d}x} + \frac{\delta t^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}t^2}$$

By working on the argument of Courant (1928) that in order to obtain a good result on horizontal velocity $u = \frac{dx}{\gamma dt}$, then weighting coefficient γ , is done which is a positive number, in time differential in Taylor series.

$$f(x + \delta x, t + \gamma \delta t) = f(x, t) + \delta x \frac{\mathrm{d}f}{\mathrm{d}x} + \gamma \mathrm{d}t \frac{\mathrm{d}f}{\mathrm{d}t} + \frac{\delta x^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}x^2} + \gamma \delta t \delta x \frac{\mathrm{d}^2 f}{\mathrm{d}t^2} + \frac{\gamma^2 \delta t^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}t^2} \dots \dots (1)$$

At the limit δx , δt close to zero the following equation is obtained,

$$\frac{Df}{dt} = u \frac{\mathrm{d}f}{\mathrm{d}x} + \gamma \frac{\mathrm{d}f}{\mathrm{d}t} \mathrm{or} \frac{Df}{\mathrm{d}t} = \gamma \frac{\mathrm{d}f}{\mathrm{d}t} + u \frac{\mathrm{d}f}{\mathrm{d}x} \qquad \dots \dots (2)$$

This equation is weighted total derivative equation or weighted total acceleration for the function of f = f(x, t) where γ is weighting coefficient.

The method of calculating weighting coeffecient γ will be formulated using Taylor series (1). The second derivative term can be omitted if,

$$\left|\frac{\frac{\delta x^2 a^2 f}{2 a x^2} + \gamma \delta t \delta x \frac{a^2 f}{a t a x} + \frac{\gamma^2 \delta t^2 a^2 f}{2 a t^2}}{\delta x \frac{a f}{a x} + \gamma a t \frac{a f}{a t}}\right| \leq \varepsilon \dots (3)$$

Then it was defined $\delta x = C\delta t = \frac{L}{T}\delta t = \frac{2\pi}{kT}\delta t = \frac{\sigma}{k}\delta t$, where *C* is wave celerity, *k* is wave number *T* is wave period, $\sigma = \frac{2\pi}{T}$ is angular frequency. δx in (3) is substituted with $\frac{\sigma}{k}\delta t$, and the following equation is obtained,

$$\frac{\left|\frac{\sigma^{2}\delta t a^{2}f}{2k^{2} ax^{2}} + \frac{\gamma \sigma \delta t a^{2}f}{k a t ax} + \frac{\gamma^{2} \delta t a^{2}f}{2 at^{2}}\right|}{\frac{\sigma d f}{k dx} + \gamma \frac{d f}{dt}} \le \varepsilon \quad \dots \dots (4)$$

The completions of this equation requires a function form of f = f(x, t). And the following sinusoidal function form will be used,

$$f(x,t) = \cos kx \cos \sigma t \quad \dots (5)$$

This equation is water wave surface equation of the linear wave theory. The derivative of the function is as follows

Table.1: Derivative Equation of (5)		
$\frac{\mathrm{d}f}{\mathrm{d}x} = -k\sin kx\cos\sigma t$	$\frac{\mathrm{d}^2 f}{\mathrm{d}x^2} = -k^2 \cos kx \cos \sigma t$	
$\frac{\mathrm{d}f}{\mathrm{d}t} = -\sigma \cos kx \sin \sigma t$	$\frac{\mathrm{d}^2 f}{\mathrm{d} t \mathrm{d} x} = k\sigma \sin kx \sin \sigma t$	
	$\frac{\mathrm{d}^2 f}{\mathrm{d}t^2} = -\sigma^2 \cos kx \cos \sigma t$	

Using the condition of $coskx = sinkx = cos\sigma t = sin\sigma t$, the elements of sinusoidal function will cancel out each other as a result of a division. Substitute the derivative equations to (4), the following equation is obtained

$$\left|\frac{\frac{1}{2} - \gamma + \frac{1}{2}\gamma^2}{1 + \gamma}\right| \le \frac{\varepsilon}{\sigma\delta t}$$

The numerator $(1 + \gamma)$ is a positive number, then the equation can be written as,

$$\left|\frac{1}{2} - \gamma + \frac{1}{2}\gamma^{2}\right| \leq \frac{\varepsilon}{\sigma\delta t}(1+\gamma)$$

If equals (=) relation is used, then
$$\frac{1}{2} - \gamma + \frac{1}{2}\gamma^{2} = \frac{\varepsilon}{\sigma\delta t}(1+\gamma) \dots (5)$$

Considering that γ is a positive number, the right side of the equation is a positive number. Therefore, the left side of the equation is also a positive number. The calculation of the value γ can be done by releasing the sign | |in the left side of the equation, i.e. using equation (5).

The calculation of the value γ with (5) requires an input δt . The value of δt , is obtained from the function f = f(t). The approximation of Taylor series for the function is,

$$f(t + \delta t) = f(t) + \delta t \frac{\mathrm{d}f}{\mathrm{d}t} + \frac{\delta t^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}t^2}$$

In order to be able to be used only until the first derivative, then $\left|\frac{\delta t^2 a^2 f}{\delta t \frac{af^2}{dt}}\right| \leq \varepsilon \operatorname{or} \left|\frac{\delta t a^2 f}{\frac{2}{dt}}\right| \leq \varepsilon$. For the function, $f(t) = \cos \sigma t$; $\frac{af}{at} = -\sigma \sin \sigma t$; $\frac{a^2 f}{dt^2} = -\sigma^2 \cos \sigma t$ and it is done in a $\cos \sigma t = \sin \sigma t$ condition, and

$$\frac{\frac{\delta t}{2}(-\sigma^2)}{-\sigma} \le \varepsilon \text{ or,} \delta t = \frac{2\varepsilon}{\sigma} \dots (6)$$

is obtained . Substitution of (6) to (5) obtains (7)

$$\gamma = 3 ...(7)$$

It is obtained that γ has a constant value, i.e. independent of wave period or the level of accuracy ε .

2.2. Weighted Total Acceleration for the function f = f(x, z, t)

To obtain weighted total acceleration equation in a function f = f(x, z, t), the similar method will be done as in the function f = f(x, t), where,

$$f(x + \delta x, z + \gamma_z \delta z, t + \gamma \delta t) =$$

$$f(x,t) + \delta x \frac{df}{dx} + \gamma_z \delta z \frac{df}{dz} + \gamma dt \frac{df}{dt}$$

$$+ \frac{\delta x^2}{2} \frac{d^2 f}{dx^2} + \gamma_z \delta z \delta x \frac{d^2 f}{dz dx} + \frac{(\gamma_z \delta z)^2}{2} \frac{d^2 f}{dz^2}$$

$$+ \gamma \delta t \delta x \frac{a^2 f}{dt ax} + \gamma \gamma_z \delta t \delta z \frac{a^2 f}{dt dz} + \frac{(\gamma dt)^2}{2} \frac{a^2 f}{dt^2} \qquad \dots \dots (8)$$
In (8), for $\delta z = \delta x$, it is meant that $\gamma_z \delta z \frac{df}{dz} = \delta z \left(\gamma_z \frac{df}{dz}\right)$, therefore in a change of z for $\delta z = \delta x$, the value of the first derivative function against z is $\left(\gamma_z \frac{df}{dz}\right)$, and so also $\gamma_z \delta z \delta x \frac{a^2 f}{dz dx}$ is meant $\delta z \delta x \left(\gamma_z \frac{a^2 f}{dz dx}\right)$ and $\frac{(\gamma_z \delta z)^2}{2} \frac{a^2 f}{dz^2}$ which means as $\frac{\delta z^2}{2} \left(\gamma_z^2 \frac{a^2 f}{dz^2}\right)$. As in the previous section, the value of δx and δz is $\delta x = \delta z = C \delta t = \frac{L}{T} \delta t = \frac{2\pi \delta t}{kT} = \frac{\sigma \delta t}{k}$. Then, a function $f(x, z, t)$ is reviewed with the following form.

 $f(x, z, t) = coskxcoshk(h + z) cos\sigmat....(9)$

At z = 0, $c_1 = cosh(kh)$ and $c_2 = sinh(kh)$ are defined and done in the deep water where tankh = 1 with the value of $kh = 2.0\pi$. Then $c_1 = cosh(2.0\pi) = c_2 =$ $sinh(2\pi)$, and (8) is done in a condition of coskx = $sinkx = cos\sigma t = sin\sigma t$, then the sinusoidal function cancelled out each other. The derivative equations (9) can be written in the forms shown in Table (2).

Table.2: Differential of (9).

đf	$\mathrm{d}^2 f$	$a^2 f$
хБ	$\frac{1}{\mathrm{d}x^2} = -k^2 c_1$	$\frac{1}{\mathrm{d}t\mathrm{d}x} = \sigma k c_1$
$=-kc_1$		

$\frac{\mathrm{d}f}{\mathrm{d}z} = kc_2$	$\frac{\mathrm{d}^2 f}{\mathrm{d}x\mathrm{d}z} = -k^2 c_2$	$\frac{\mathrm{d}^2 f}{\mathrm{d}t \mathrm{d}z} = -\sigma k c_2$
$\frac{\mathrm{d}f}{\mathrm{d}t} = -\sigma c_1$	$\frac{\mathrm{d}^2 f}{\mathrm{d}z^2} = k^2 c_1$	$\frac{\mathrm{d}^2 f}{\mathrm{d}t^2} = -\sigma^2 c_1$

To simplify the writing, the followings are defined

$$A = \frac{\delta x^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}x^2} + \gamma_z \delta z \delta x \frac{\mathrm{d}^2 f}{\mathrm{d}z \mathrm{d}x} + \frac{(\gamma_z \delta z)^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}z^2} + \gamma \delta t \delta x \frac{\mathrm{d}^2 f}{\mathrm{d}t \mathrm{d}x} + \gamma \gamma_z \delta t \delta z \frac{\mathrm{d}^2 f}{\mathrm{d}t \mathrm{d}z} + \frac{(\gamma \mathrm{d}t)^2}{2} \frac{\mathrm{d}^2 f}{\mathrm{d}t^2} \\B = \delta x \frac{\mathrm{d}f}{\mathrm{d}x} + \gamma_z \delta z \frac{\mathrm{d}f}{\mathrm{d}z} + \gamma \mathrm{d}t \frac{\mathrm{d}f}{\mathrm{d}t}$$

In order for (8) to be able to be used with only the first derivate, then

 $\left|\frac{A}{B}\right| \leq \varepsilon$ (9)

The substitution of differential equations in Table (2) to (9) will obtain,

$$-\frac{\gamma^2}{2}c_1 + \gamma - \frac{c_1}{2} - \frac{\varepsilon}{\sigma\delta t}(-\gamma c_1 - c_1)$$
$$-\left(\gamma + 1 + \frac{\varepsilon}{\sigma\delta t}\right)c_2\gamma_z + \frac{c_1}{2}\gamma_z^2 = 0$$

Substitute δt from (6), $\delta t = \frac{2\varepsilon}{\sigma}$

$$-\frac{\gamma^2}{2}c_1 + \gamma - \frac{c_1}{2} - \frac{1}{2}(-\gamma c_1 - c_1)$$
$$-\left(\gamma + 1 + \frac{1}{2}\right)c_2\gamma_z + \frac{c_1}{2}\gamma_z^2 = 0 \dots(10)$$

With (10), γ_z can be calculated where γ is a known from(7). With an input $\gamma = 3$, $\gamma_z = 1,630$ is obtained for $c_1 = \cosh(2.0\pi)$ and $c_2 = \sinh(2.0\pi)$ where $c_1 = c_2$. As a result the second derivative in (8) can be omitted and the total derivative equation for function f = f(x, z, t) is $\frac{Df}{dt} = \gamma \frac{\mathrm{d}f}{\mathrm{d}t} + u \frac{\mathrm{d}f}{\mathrm{d}x} + \gamma_z w \frac{\mathrm{d}f}{\mathrm{d}z} \quad \dots \dots (11)$

III. A Complete Velocity Potential Equation

By completing the Laplace equation with separation variable method and after doing the time periodic boundary condition and lateral periodic boundary condition, Dean (1991) obtained velocity potential equation that consisted of two potential velocities, i.e.

$$\varphi(x, z, t) = A \cos k x (Ce^{kz} + De^{-kz}) \sin \sigma t$$

+B sin k x (Ce^{kz} + De^{-kz}) sin σ t...(12)
$$\varphi(x, z, t) = \varphi_A(x, z, t) + \varphi_B(x, z, t)...(13)$$

$$\varphi_A(x, z, t) = A \cos k x (Ce^{kz} + De^{-kz}) \sin \sigma t$$

...(14)
$$\varphi_B(x, z, t) = B \sin k x (Ce^{kz} + De^{-kz}) \sin \sigma t$$

...(15)

There are four constants that should be determined, i.e. A, B, C and D. Hutahaean (2019b) has shown that the two equations have similar constant value, or in other words

there is only one constant value in velocity potential total (12). However, in the next section it will be proven again with another method that (12) has one constant value.

The constants of A, B, C and D will be formulated using (14) and (15), where it will be proven that either using (14) or (15) similar constant will be obtained. The formulation is done by doing kinematic bottom boundary condition on flat bottom, as was done by Dean (1991).

Alternative I a.

The constantsA, B, C and D will be determined using (14) where water particle velocity at the vertical-zdirection is

$$w = -\frac{\partial \varphi}{\partial z} = -(A+B)k\cos k x$$
$$(Ce^{kz} - De^{-kz})\sin \sigma t$$

Substitute equation for w to the kinematic bottom boundary condition equation $w_{-h} = -u_{-h}\frac{\partial h}{\partial x}$, where at flat bottom $\frac{\mathrm{d}h}{\mathrm{d}r} = 0$, $-(A+B)k\cos k x(Ce^{-kh} - De^{kh})\sin \sigma t = 0$

The equation is divided by $-(A+B)kcoskxsin\sigma t$ for $coskx \neq 0$ and $sin\sigma t \neq 0$ $Ce^{-kh} - De^{kh} = 0$ or $C = De^{2kh}$. Substitute C (14) $\Phi(x, z, t) = (A + B)\cos k x$ $(De^{2kh}e^{kz} + De^{-kz})\sin\sigma t$

or

$$\Phi(x, z, t) = (A + B)De^{kh}\cos k x$$
$$(e^{k(h+z)} + e^{-k(h+z)})\sin \sigma t$$

A new constant is defined

The constants A, B, C and D will be determined using (15),

$$w = -\frac{\partial \varphi}{\partial z} = -(A+B)k \sin k x$$
$$(Ce^{kz} - De^{-kz}) \sin \sigma t$$

Substitute equations for u and w to the kinematic bottom boundary condition equation

$$w_{-h} = -u_{-h}\frac{\partial h}{\partial x}$$
, where $\frac{\partial h}{\partial x} = 0$

 $\begin{aligned} -(A+B)k\sin kx(Ce^{-kh} - De^{kh})\sin \sigma t &= 0\\ \text{The equation is divided by } -(A+B)ksinkxsin\sigma t for sinkx \neq 0 \text{ and } sin\sigma t \neq 0\\ Ce^{-kh} - De^{kh} &= 0 \text{ or } C = De^{2kh}. \text{ Substitute } C \text{ to } (15)\\ \Phi(x,z,t) &= (A+B)\sin kx\\ (De^{2kh}e^{kz} + De^{-kz})\sin \sigma t \end{aligned}$

or

 $\Phi(x, z, t) = (A + B)De^{kh} \sin k x (e^{k(h+z)} + e^{-k(h+z)}) \sin \sigma t$

A new constant is defined

$$G_B = (A + B)De^{kh} \qquad \dots \dots (18)$$

$$\Phi(x, z, t) = G_B \cos k x$$

$$(e^{k(h+z)} + e^{-k(h+z)}) \sin \sigma t \dots \dots (19)$$

From(16) and (18) obtained that $G_A = G_B = G$, so it is proven that in (1) there is only one wave constant value *G*, then (7) becomes

$$\begin{split} \Phi(x,z,t) &= G(\cos k\,x + \sin kx) \\ \left(e^{k(h+z)} + e^{-k(h+z)}\right)\sin\sigma\,t....(20) \end{split}$$

The hyperbolic function equation is, $e^{k(h+z)}$ +

 $e^{-k(h+z)} = 2coshk(h+z),$ (13) becomes

 $\Phi(x, z, t) = 2G(\cos kx + \sin kx)\cosh k(h + z)\sin \sigma t$ Defined G = 2G

 $\Phi(x, z, t) = G(\cos kx + \sin kx) \cosh k(h + z) \sin \sigma t$(21)

A complete velocity potential equation is obtained with the form as in (21). In that equation, there are still two wave constants where the form should be known, i.e. wave number k and wave constant G. Considering that the values of wave number k and wave constant G is similar along the wave curve, then the calculation of the two parameters will be done at the point of characteristic where coskx = sinkx, at this condition,(21) becomes, $\Phi(x, z, t) = 2Gcoskxcoshk(h + z) sin \sigma t....(26)$

The particle velocity in horizontal-x direction is,

 $u = -\frac{d\phi}{dx} = 2Gksinkxcoshk(h + z)sin\sigma t \quad(27)$ The particle velocity in vertical-zdirection is, $w = -\frac{d\phi}{dz} = -2Gkcos \ kx \sinh k(h + z) \sin \sigma t \quad(28)$

IV. Application of Weighted Total Acceleration on Euler Momentum Equation

From (28), the total derivative for horizontal xdirection velocity is,

 $\frac{Du}{dt} = \gamma \frac{\mathrm{d}u}{\mathrm{d}t} + u \frac{\mathrm{d}u}{\mathrm{d}x} + \gamma_z w \frac{\mathrm{d}u}{\mathrm{d}z}$

With this total derivative equation, the Euler momentum equation in horizontal-xdirection becomes,

 $\gamma \frac{\mathrm{d}u}{\mathrm{d}t} + u \frac{\mathrm{d}u}{\mathrm{d}x} + \gamma_z w \frac{\mathrm{d}u}{\mathrm{d}z} = -\frac{1}{\rho} \frac{\mathrm{d}p}{\mathrm{d}x}$

By doing the characteristic of irrotational flow, $\frac{du}{dz} = \frac{dw}{dt}$ obtained.

$$\gamma \frac{\mathrm{d}x}{\mathrm{d}t} + \frac{1}{2} \frac{\mathrm{d}}{\mathrm{d}x} (u^2 + \gamma_z w^2) = -\frac{1}{\rho} \frac{\mathrm{d}p}{\mathrm{d}x} \dots \dots \dots (29)$$

Total derivative equation for vertical velocity in axis-*z* direction.

$$\frac{Dw}{dt} = \gamma \frac{\mathrm{d}w}{\mathrm{d}t} + u \frac{\mathrm{d}w}{\mathrm{d}x} + \gamma_z w \frac{\mathrm{d}w}{\mathrm{d}z}$$

The Euler momentum equation in vertical-zdirection becomes,

$$\gamma \frac{\mathrm{d}w}{\mathrm{d}t} + u \frac{\mathrm{d}w}{\mathrm{d}x} + \gamma_z w \frac{\mathrm{d}w}{\mathrm{d}z} = -\frac{1}{\rho} \frac{\mathrm{d}p}{\mathrm{d}z} - g$$

The execution of irrotational flow characteristic, $\frac{dw}{dx} = \frac{du}{dz}$ $\frac{dw}{dx} = \frac{1}{dx} \frac{dw}{dx} = \frac{1}$

$$\gamma \frac{dw}{dt} + \frac{1}{2} \frac{d}{dz} (u^2 + \gamma_z w^2) = -\frac{1}{\rho} \frac{d\rho}{dz} - g.....(30)$$

(29) and (30) are modified Euler momentum equations, where there are time weighting coefficient γ and weighting coefficient vertical zdirection of weighting coefficient, i.e. γ_z . Using (30) pressure p equation will be formulated where (30) is written as an equation for pressure p.

$$-\frac{1}{\rho}\frac{\mathrm{d}p}{\mathrm{d}z} = \gamma \frac{\mathrm{d}w}{\mathrm{d}t} + \frac{1}{2}\frac{\mathrm{d}}{\mathrm{d}z}(u^2 + \gamma_z w^2) + g$$

This equation is multiplied by dz and integrated against vertical-z axis.

$$\frac{p}{\rho} = \gamma \int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz + \frac{1}{2} \left(u_{\eta}^{2} + \gamma_{z} w_{\eta}^{2} \right) \\ - \frac{1}{2} \left(u^{2} + \gamma_{z} w^{2} \right) + g(\eta - z)$$

Differentiated against horizontal-xaxis

$$\frac{1}{\rho}\frac{\mathrm{d}p}{\mathrm{d}x} = \gamma \frac{\mathrm{d}}{\mathrm{d}x} \int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz + \frac{1}{2}\frac{\mathrm{d}}{\mathrm{d}x} \left(u_{\eta}^{2} + \gamma_{z}w_{\eta}^{2}\right) \\ - \frac{1}{2}\frac{\mathrm{d}}{\mathrm{d}x} \left(u^{2} + \gamma_{z}w^{2}\right) + g\frac{\mathrm{d}\eta}{\mathrm{d}x}$$

Substituted to (29)

$$\gamma \frac{\mathrm{d}u}{\mathrm{d}t} + \gamma \frac{\mathrm{d}}{\mathrm{d}x} \int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz$$
$$+ \frac{1}{2} \frac{\mathrm{d}}{\mathrm{d}x} \left(u_{\eta}^{2} + \gamma_{z} w_{\eta}^{2} \right) = -g \frac{\mathrm{d}\eta}{\mathrm{d}x} \dots (31)$$

The completion of $\frac{a}{dx} \int_{z}^{\eta} \frac{dw}{dt} dz$ is done using velocity potential (21), where the particle velocity in horizontal direction is in equation (27), and the particle velocity in vertical-zdirection (28). From (28) the following is obtained,

$$\frac{\mathrm{d}w}{\mathrm{d}t} = -2Gk\sigma coskxsinhk(h+z)cos\sigma t$$

This equation is integrated against time t,

$$\int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz = -2G\sigma coskx$$

 $(coshk(h + \eta) - coshk(h + z))cos\sigma t$ Then, it is differentiated against horizontal-*x* axis

$$\frac{\mathrm{d}}{\mathrm{d}x} \int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz = Gk\sigma sinkx$$
$$(coshk(h+\eta) - coshk(h+z))cos\sigma$$

Equation (27) is differentiated against time t, $2Gk\sigma sinkx coshk(h + z) cos\sigma t$, and it is seen that this form is in $\frac{d}{dx}\int_{z}^{\eta}\frac{dw}{dt}dz$, so the following relation is obtained

 $\frac{\mathrm{d}}{\mathrm{d}x} \int_{z}^{\eta} \frac{\mathrm{d}w}{\mathrm{d}t} dz = \left(\frac{\mathrm{d}u_{\eta}}{\mathrm{d}t} - \frac{\mathrm{d}u}{\mathrm{d}t}\right)$ Substitute this equation to (31) $\gamma \frac{\mathrm{d}u_{\eta}}{\mathrm{d}t} + \frac{1}{2} \frac{\mathrm{d}}{\mathrm{d}x} \left(u_{\eta}^2 + \gamma_z w_{\eta}^2 \right) = -g \frac{\mathrm{d}\eta}{\mathrm{d}x} \dots (32)$

This equation is a surface momentum equation that will be used in the calculation of Gandk.

V. THE FORMULATION OF AN EQUATION FOR THE CALCULATION OF G AND k

As has been mentioned in the previous section that the calculation of G and k is done in the point of characteristic where coskx = sinkx. Therefore, (27) is used as the particle velocity in horizontal x direction and (28) is particle velocity equation in vertical z direction.

5.1 Wave number conservation equation

In the formulation of an equation for the calculation of Gandkin the following sub-chapter, the wave number conservation equation will be done. The equation come from the principle of variable separation at the completion of Laplace equation, i.e. that velocity potential is considered as a multiplication of three functions, i.e. $\Phi(x, z, t) = X(x)Z(z)T(t)$ where X(x) is just a function-x, Z(z) is just a function-zandT(t) is just a function-t. In this case Z(z) = coshk(h + z). As just function-zthen, $\frac{\mathrm{d}Z(z)}{\mathrm{d}Z(z)}=0.$

$$\frac{dz}{dcoshk(h+z)} = sinhk(h+z)\frac{dk(h+z)}{dx} = 0$$

For sinhk(h+z) is not equal to zero, then
$$\frac{dk(h+z)}{dx} = 0 \quad \dots (33)$$

This equation (33) is called wave number conservation equation. This means that all area of calculation has similar values for the function tanhk(h + z), coshk(h + z)z) dan sinhk(h + z). As deep water, it can be defined as water depth where $tanhk(h + \eta) = 1$, where $\eta = \eta(x, t)$ is the water surface elevation against still water level. Bearing in mind that the wave number conservation equation or law, in the entire domain applies

 $tanhk(h + \eta) = 1$ (34) In this research, the following is used $k(h + \eta) = 2.0 \pi$ (35) Where $tanh(2.0\pi) = 0.999993$.

 $sinhk(h + \eta) = coshk(h + \eta) = sinh(2.0\pi) =$ $cosh(2.0\pi)$ (36)

Bearing in mind this wave number conservation law, then even though the weighting coefficient is formulated in deep water condition, it will also apply in other depths. 5.2. Substitute Velocity Potential to Momentum Equation From (27),

$$u = 2Gksinkxcoshk(h + z)sin\sigma t$$

$$\frac{du}{dx} = 2Gk^{2}coskxcoshk(h + z)sin\sigma t$$

$$u\frac{du}{dx} = 4G^{2}k^{3}sinkxcoskxcosh^{2}k(h + z)sin^{2}\sigma t$$
At $z = \eta$

$$u\frac{du}{dx} = 4G^{2}k^{3}sinkxcoskxcosh^{2}k(h + \eta)sin^{2}\sigma t....(37)$$
From (28)

At

ı

$$w = -2Gk\cos kx \sinh k(h+z) \sin \sigma t$$
$$\frac{dw}{dx} = 2Gk^2 \sin kx \sinh k(h+z) \sin \sigma t$$
$$w \frac{dw}{dx} = -4G^2 k^3 \sin kx \cosh kx \sinh^2 k(h+z) \sin^2 \sigma t$$
At $z = \eta$
$$w \frac{dw}{dx} = -4G^2 k^3 \sin kx \cosh kx \sinh^2 k(h+\eta) \sin^2 \sigma t$$

..(38)

In deep water where $tanhk(h + \eta) = 1$, then $sinhk(h + \eta) = 1$ η) = coshk(h + η). Substitute (37) and (38) to the convective velocity,

$$\left(u\frac{\mathrm{d}u}{\mathrm{d}x} + \gamma_z w\frac{\mathrm{d}w}{\mathrm{d}x}\right)_{z=\eta} = (1 - \gamma_z)G^2 k^3 \sin kx \cosh^2 k(h+\eta) \sin^2 \sigma t$$

At the characteristic point, i.e. a point where $coskx = sinkx = cos\sigma t = sin\sigma t$, where $\eta = \frac{A}{2}$,

$$\left(u\frac{du}{dx} + w\gamma_z \frac{dw}{dx}\right)_{z=\eta} = \frac{1}{4}(1-\gamma_z)G^2k^3\cosh^2k\left(h+\frac{A}{2}\right) \dots(39)$$

If in (39) $\gamma_z = 1$ is used, then $\left(u\frac{du}{dx} + w\gamma_z \frac{dw}{dx}\right)_{z=\eta} = 0$
will be obtained. So, it is found that if at the term $w\frac{dw}{dx}$ and $\gamma_z = 1$ is used or without weighting coefficient γ_z , hydroynamic force of the surface in horizontal direction has a value of zero or there is no hydrodynamicforce. From (27), at the characteristic point, $\frac{du}{dt} = Gk\sigma \cosh k\left(h+\frac{A}{2}\right) \dots(40)$
Substitute (39) and (40) to (32), $\gamma\sigma Gk \cosh k\left(h+\frac{A}{2}\right) + \frac{1}{2}(1-\gamma_z)G^2k^3\cosh^2k\left(h+\frac{A}{2}\right) = -g\frac{d\eta}{dx}\dots(41)$

Where $g \frac{d\eta}{dx}$ is worked at the characteristic point. This equation is a relation between Gandkwhere wave amplitude Ais the input.

5.2 The formulation of wave amplitude function

The weighted total acceleration equation (2), done at the water wave surface equation $\eta = \eta(x, t)$, obtained $\frac{D\eta}{dt} = \gamma \frac{d\eta}{dt} + u_\eta \frac{d\eta}{dx}$. The original kinematic free surface boundary condition (KFSBC) equation is, $w_\eta = \frac{d\eta}{dt} + u_\eta \frac{d\eta}{dx}$. By comparing the two equations, then the KFSBC equation should be in the form of $w_\eta = \gamma \frac{d\eta}{dt} + u_\eta \frac{d\eta}{dx}$, or $\gamma \frac{d\eta}{dt} = w_\eta - u_\eta \frac{d\eta}{dx}$...(42) Substitute ufrom (27) and wfrom (28) and done at $z = \eta$,

$$\gamma \frac{d\eta}{dt} = -2Gksinhk(h + \eta)coskxsin\sigma t$$
$$-2Gkcoshk(h + \eta)sinkxsin\sigma t \frac{d\eta}{dx} \dots (43)$$

Water wave surface equation was obtained by integrating (43) against time t. The right side of the equation is a non-linear function against time tof which the integration completion is difficult. However, there is an argument that can simplify the integration (43) completion. First bearing in mind (36), i.e. $coskh(h + \eta) = cosh(2.0\pi) = constant$. Then, (43) is written as,

$$\gamma \frac{\mathrm{d}\eta}{\mathrm{d}t} = -2Gk$$

$$\left(coskxsinhk(h+\eta) + sinkxcoshk(h+\eta) \frac{\mathrm{d}\eta}{\mathrm{d}x} \right) sin\sigma t$$
...(44)

In (44) the one that is the function of time *t* is only the element of $sin\sigma t$. In addition, as a periodical function against time *t*, the element $-2Gk\left(coskxsinhk(h + \eta) + 2sinkxcoshk(h + \eta)\frac{d\eta}{dx}\right)$ should be a constant number against time *t*. Thus, the integration (44) against time *t*, is sufficient by integrating only the $sin\sigma t$ element, obtained

$$\eta(x,t) = \frac{2Gk}{\gamma\sigma}$$

$$\left(coskxsinhk(h+\eta) + sinkxcoshk(h+\eta)\frac{d\eta}{dx}\right)cos\sigma t$$
.....(45)

At the characteristics point, (45) can be written as

$$\eta(x,t) = \frac{2Gk}{\gamma\sigma}$$
$$\left(sinhk(h+\eta) + coshk(h+\eta)\frac{\mathrm{d}\eta}{\mathrm{d}x}\right)coskxcos\sigma t$$
..(46)

The form coskx was selected because thas been determined that the velocity potential component that was used is coskx component. It is defined

$$A = \frac{2Gk}{\gamma\sigma} \left(sinhk(h+\eta) + coshk(h+\eta) \frac{\mathrm{d}\eta}{\mathrm{d}x} \right)$$

Then (46) becomes

....

 $\eta(x,t) = Acoskxcos\sigma t$ (47) At the characteristic point, then $\eta = \frac{A}{2}$, wave amplitude function equation,

$$A = \frac{2Gk}{\gamma\sigma} \left(sinhk\left(h + \frac{A}{2}\right) - coshk\left(h + \frac{A}{2}\right) \frac{kA}{2} \right)$$

From (36) where $sinhk\left(h + \frac{A}{2}\right) = coshk\left(h + \frac{A}{2}\right)$ the wave amplitude function equation becomes, $A = \frac{2Gk}{\gamma\sigma} coshk\left(h + \frac{A}{2}\right)\left(1 - \frac{kA}{2}\right).....(48)$

5.3 Equation for the calculation of k and GSubstitute (47) to (41) at the characteristic point

$$\gamma \sigma Gk \cosh k \left(h + \frac{A}{2}\right) + \frac{1}{2}(1 - \gamma_z)G^2 k^3 \cosh^2 k \left(h + \frac{A}{2}\right) = g \frac{kA}{2}$$

Substitute wave amplitude function,

$$G\gamma\sigma\cosh k\left(h+\frac{A}{2}\right) + \frac{1}{2}(1-\gamma_z)G^2k^2$$
$$\cosh^2 k\left(h+\frac{A}{2}\right) = g\frac{Gk}{\gamma\sigma}\cosh k\left(h+\frac{A}{2}\right)\left(1-\frac{kA}{2}\right)$$
The equation is divided by $\frac{Gk}{\gamma\sigma}\cosh k\left(h+\frac{A}{2}\right)$,

$$\gamma^{2}\sigma^{2} + \frac{\gamma\sigma}{2}(1 - \gamma_{z})Gk^{2}\cosh k\left(h + \frac{A}{2}\right) = gk\left(1 - \frac{kA}{2}\right)$$

Wave amplitude equation is written as an equation for *G*

Wave amplitude equation is written as an equation for G, i.e.

$$G = \frac{A\gamma\sigma}{2\operatorname{kcosh} k\left(h + \frac{A}{2}\right)\left(1 - \frac{kA}{2}\right)} \dots \dots (49)$$

and substitute it to the last equation,

$$\gamma^2 \sigma^2 \left(1 - \frac{kA}{2} \right) + \frac{\gamma^2 \sigma^2}{4} (1 - \gamma_z) kA = gk \left(1 - \frac{kA}{2} \right)^2$$
.....(50)

The calculation of the value k with this equation using Newton-Rhapson method requires initial estimation of k for the initial value of the iteration. The initial value of k can be obtained by ignoring convective acceleration, then (50) becomes

$$\gamma^2 \sigma^2 = gk \left(1 - \frac{kA}{2}\right) \dots (51)$$

This equation is the quadratic equation of wave number k that can be easily completed. The use of (51) maximum value of wave amplitude A in a wave period in deep water is obtained, i.e. if the determinant D from (51) has a value of zero.

$$A_{max} = \frac{g}{2\gamma^2 \sigma^2} \dots (52)$$

1

The value of G can be calculated using (49).

VI. THE FORMULATION OF WATER WAVE SURFACE EQUATION.

Water wave surface equation is formulated using a complete velocity potential equation, i.e. equation (21).

By using (21), particle velocity in horizontal-*x*direction and particle velocity in vertical-*z*direction are consecutively,

$$u = Gk(\sin kx - \cos kx)\cosh (h + z)\sin \sigma t$$

$$w = -Gk(\cos kx + \sin kx)\sinh k(h+z)\sin \sigma t$$

The two particle velocity equations are done at $z = \eta$ and substituted to equation KFSBC (42),

$$\gamma \frac{d\eta}{dt} = -Gk(\cos kx + \sin kx)\sinh k(h + \eta)\sin \sigma t$$
$$-Gk(\sin kx - \cos kx)\cosh k(h + \eta)\sin \sigma t \frac{d\eta}{dx}$$

....(53)

As in the previous section, the water wave surface equation is obtained by integrating (53) against timet, where the integration is sufficient to be done only at the $sin \sigma t$ element,

$$\begin{split} \eta(x,t) &= \\ \frac{Gk}{\gamma\sigma}(\cos kx + \sin kx)\sinh k(h+\eta)\cos\sigma t \\ &+ \frac{Gk}{\gamma\sigma}(\sin kx - \cos kx)\cosh k(h+\eta)\cos\sigma t\frac{\mathrm{d}\eta}{\mathrm{d}x} \end{split}$$

In the deep water the equation can be written as,

 $\eta(x,t) = c_0 \left((c_2 + c_1) + (c_1 - c_2) \frac{d\eta}{dx} \right) c_3 \dots (54)$ where, to simplify the writing $c_0 = \frac{Gk}{\gamma\sigma} coshk(h + \eta), c_1 = sinkx, c_2 = coskx$ dan $c_3 = cos\sigma t$ are defined. Equation (54) is differentiated against horizontal-*x* axis $\frac{d\eta}{dx} = c_0 k \left((-c_1 + c_2) + (c_2 + c_1) \frac{d\eta}{dx} \right) c_3 \dots (55)$ Equation (54) is water wave surface equation that is used to calculate water surface elevation where $\frac{d\eta}{dx}$ in (54) is calculated using (55). η in $c_0 = \frac{Gk}{\gamma\sigma} coshk(h + \eta)$ is calculated using the equation,

 $\eta(x,t) = A(\cos kx + \sin kx)\cos \sigma t \dots (56)$ Whereas $\frac{a\eta}{ax}$ in (55) it is calculated with, $\frac{a\eta}{ax} = Ak(-\sin kx + \cos kx)\cos \sigma t \dots (57)$

VII. THE RESULTS OF THE EQUATION.

7.1 The characteristic of water wave surface.

In the calculations that will be done in this section, the value of $\gamma = 3.0$ and $\gamma_z = 1.630$ are used and the calculation is done in the deep water. Deep water depth h_0 is obtained with the following equation

$$h_0 = \frac{1}{k} \left(2.0\pi - \frac{kA}{2} \right) \quad \dots(58)$$
Where *A* is calculated using (52)

Where *A* is calculated using (52).

Table.3: The	result of calculation of wave parameter and
	other characteristic

Т	Н	L	Н	Н	η_{max}
(sec)	(m)	(m)	L	\overline{A}	H
6	1,409	5,026	0,28	2,865	0,851
7	1,918	6,842	0,28	2,865	0,851
8	2,506	8,936	0,28	2,865	0,851
9	3,171	11,309	0,28	2,865	0,851
10	3,915	13,962	0,28	2,865	0,851
11	4,737	16,894	0,28	2,865	0,851
12	5,638	20,105	0,28	2,865	0,851
13	6,617	23,595	0,28	2,865	0,851
14	7,674	27,365	0,28	2,865	0,851
15	8,81	31,413	0,28	2,865	0,851

Using water wave surface equation, the elevation of wave crest η_{max} and the elevation of wave trough η_{min} are calculated. The wave height is $H = \eta_{max} - \eta_{min}$, whereas Wilson (1963) criteria is $\frac{\eta_{max}}{H}$. Table (3) presented the result of the calculations of wave height, wavelength, wave steepness, and the comparison of wave height *H* and wave amplitude *A*.

Wave-steepness $\frac{H}{L} = 0.280$, where considering the calculation used maximum wave Amplitude A that was calculated using (52), then wave steepness is critical wave steepness.

Table.4: Types of wave,	according to	Wilson	criteria
	(1963)		

Wave Type	η_{max}	
	Н	
Airy waves	< 0.505	
Stoke's waves	< 635	
Cnoidal waves	$0.635 < \frac{\eta_{max}}{H} < 1$	
Solitary waves	= 1	

The critical wave steepness is bigger than the criteria of Michell (1893) i.e. $\frac{H}{L} = 0.142$. The comparison between wave height and wave amplitude is $\frac{H}{A} = 2.865$ which is bigger than 2. Therefore, therelation between wave height and wave amplitude isH = 2A cannot be used. The obtained Wilson parameter is $\frac{\eta_{max}}{H} = 0.851$. Based on Wilson criteria (1963), Table (4), the value of the parameter shows that the wave profile has a cnoidal wave type, with wave profile presented inFig.1.and Fig.2.for wave period T = 8 sec.



Fig.1. Wave profile with wave period of 8 sec., in one wave length



Fig.2. Wave profile with wave period of 8 sec., in3 wave lengths.

7.2. Comparison with Wiegel equation

Using data from an observation, Wiegel (1949-1964) formulated relation between wave period *T* and maximum wave height H_{max} in a wave period, i.e.

$$T_{Wieg} = 15.6 \sqrt{\frac{H_{max}}{g}}$$
.....(58)

Table.5: Comparison with Wiegel equation

	$\gamma = 3.0$		$\gamma = 2.97102$	
Т	$\gamma_z = 1.63164$		$\gamma_z = 1.60095$	
	H _{max}	T_{Wieg}	H _{max}	T_{Wieg}
(sec)	(m)	(sec)	(m)	(sec)
6	1,40943	5,91305	1,45118	6
7	1,9184	6,89858	1,97523	7,00002
8	2,50569	7,88412	2,57992	8,00007
9	3,1713	8,86969	3,26522	9,00007
10	3,91518	9,85522	4,03119	10,0002
11	4,73746	10,8408	4,87774	11,0002
12	5,63796	11,8264	5,80504	12,0003
13	6,61695	12,8121	6,81286	13,0004
14	7,67409	13,7976	7,90155	14,0006
15	8,80954	14,7831	9,07066	15,0006

The comparison was done by calculating T_{Wieg} in (58) using the wave height which is the result of a calculation

using the model, where the input in the model is wave period *T* and wave amplitude calculated using (52), so that the wave height that is obtained is the wave height maximum H_{max} in the related wave period.

Table (5) shows that for $\gamma = 3$, the obtained T_{Wieg} is almost similar with the *T*that is a wave period to calculate H_{max} with the model. Whereas in $\gamma = 2.97102$, it can be said that the obtained T_{Wieg} is equal with *T*. The result of this calculation concludes that the values of γ , γ_z and equations formulated in this research are in line with the result of Wiegel research (1949-1964) which is the result of an observation.

VIII. CONCLUSION

If the characteristic of ideal fluid i.e. irrotational flow is done at Euler momentum equation, and the velocity potential as the product of Laplace equation solution is substituted, the hydrodynamic force or convective equation in the horizontal direction becomes zero. This problem can be solved using weighted total acceleration where there is weighting coefficient at the differential term against vertical-*z* axis and the resulted model producewave height that corresponds to Wiegel equation. Another finding that should be noticed is that the value of wave height is not twice the value of wave amplitude.

A further research needed is formulating shoaling and breaking model by doing the weighted total acceleration equation, because there are many researches result in the laboratory on breaker height that are stated in the form of Breaker Height Index equation, so that the shoalingbreaking model and its various basic theories can easily be calibrated.

REFERENCES

- Dean, R.G., Dalrymple, R.A. (1991). Water wave mechanics for engineers and scientists. Advance Series on Ocean Engineering.2. Singapore: World Scientific. ISBN 978-981-02-0420-4. OCLC 22907242.
- [2] Hutahaean , S. (2019a). Application of Weighted Total Acceleration Equation on Wavelength Calculation. International Journal of Advance Engineering Research and Science (IJAERS). Vol-6, Issue-2, Feb-2019. ISSN-2349-6495(P)/2456-1908(O).

https://dx.doi.org/10.22161/ijaers.6.2.31

[3] Hutahaean , S. (2019b). Water Wave Modeling Using Complete Solution of Laplace Equation. International Journal of Advance Engineering Research and Science (IJAERS). Vol-6, Issue-8, Aug-2019. ISSN-2349-6495(P)/2456-1908(O).

https://dx.doi.org/10.22161/ijaers.6.8.33

[4] Courant, R., Friedrichs, K., Lewy, H. (1928). Uber die partiellen Differenzengleic hungen der mathemtischen Physik. Matematische Annalen (in German). 100 (1): 32-74, Bibcode:1928. MatAn 100.32.C. doi :10.1007/BF01448839.JFM 54.0486.01 MR 1512478.

- [5] Michell, J.H. (1893). On the highest wave in water: Philosofical Magazine, (5), vol. XXXVI, pp. 430-437.
- [6] Wilson, B.W., (1963). Condition of Existence for Types of Tsunami waves, paper presented at XIII th General
- [7]Wiegel,R.L. (1949). An Analysisis of Data from Wave Recorders on the Pacific Coast of tht United States, Trans.Am. Geophys. Union, Vol.30, pp.700-704.
- [8]Wiegel,R.L. (1964). Oceanographical Engineering, Prentice-Hall, Englewoods Cliffs, N.J.

The use of Misoprostol for birth Induction in Maternal Child Hospital In Gurupi-To City

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Abstract— Objective: To analyze the main factor that has led to the use of misoprostol in labor induction at the Maternal Infant Hospital in the city of Gurupi - TO. *Method:* We analyzed 999 (nine hundred and ninety-nine) medical records that correspond to the total number of deliveries performed by the Hospital, of these, only 59 patients used misoprostol and were notified at the unit between March and August 2016. After data collection, the data were descriptively analyzed using the Microsoft Excel® version 2010 program, and the results were presented through graphs and tables.*Results:* There was a significant difference between the number of pregnant women who used misoprostol to induce miscarriage 40 (100%), the dominant age group was> 20 years 33 (82, 50%); with gestational age <40 weeks 37 (92, 50%); having its indication of induction for other reasons 33 (82, 50%); Regarding marital status, single women predominated, 31 (77, 50%); brown race, 34 (85.0%). *Conclusion:* It is noted that the use of misoprostol is effective in inducing labor, but its indications are restricted to certain situations.

Keywords— Labor; Induction; Misoprostol.

I. INTRODUCTION

Pregnancy is a sensitive period in women's lives that finish with childbirth that can be natural or induced. Obstetricians recommend that this phenomenon occurs naturally, but in some situations, it is not possible to do so. The most common complication is the lack of maturation of the cervix, which often poses a risk to the fetus.(BARBOSA; CAMPOS, 2013; RANGEL FILHO et al., 2007). In most pregnancies, childbirth begins spontaneously between 37 and 42 weeks. Softening and shortening of the cervix occur, the membranes rupture, the uterus dilates and contracts to expel the baby. Induction is the artificial stimulation of uterine contractions to perform the childbirth before spontaneous onset, these stimuli that trigger the process are called of childbirth inducers.intending to certify the birth of the child at a certain time when it is estimated that the baby is safer outside the womb than inside (ARAÚJO et al., 1999).

Induced childbirth, therefore it is indicated when spontaneous childbirth would result in risks. Induced labor, therefore, is indicated when spontaneous labor would result in risks. With all, it should only be induced if there is a condition of beginning and ending (MORAES FILHO et al., 2005; PASSOS et al., 2011).

Misoprostol is a synthetic prostaglandin E1 analog developed for the treatment of stomach ulcers, due to its ability to cause uterine contractions, is adopted by obstetricians to induce childbirth in patients with complications, because the main purpose of obstetrics is to reduce the amount of cesarean delivery and to avoid possible complications that pose risks to the mother and fetus. According to Santos Filho, Andrade and Miranda (2009) in Brazil, the effectiveness of misoprostol has been accompanied by scientific basement, it is also evidenced in the practice of childbirth induction. According to these authors, despite the efficacy of this drug, its application should only be used by suitable professionals and establishments, aim at ensuring the effectiveness of the method.

In the municipality of Gurupi, this reality is no different with regard to the use of misoprostol in childbirth induction, this practice is increasingly being adopted among local obstetricians. Given this problem, an investigation was made of the medical records of patients treated at the Gurupi — TO maternal Infant Hospital to verify the main factor that has led to the use of misoprostol to induce childbirth.

II. MATERIAL AND METHODS

This research was authorized by the Nucleus for Teaching and Research (NTR) of the Regional Hospital of Gurupi - TO and by the Research Ethics Committee (REC) of the UNIRG University Center. This research is an exploratory quantitative descriptive study, held at the maternal and children's hospital of Gurupi – TO, through the analysis of 999 (nine hundred and ninety-nine) records that correspond to the total number of deliveries performed by the Hospital, it's from patients who used misoprostol and were notified in the unit between March and August 2016.

From the total of medical records analyzed, 59 cases were selected, in which misoprostol was used to induce childbirth, soon after, they were analyzed based on the selected parameters and the following variables were observed: (age, marital status, race, gestational age, induction indication). Inclusion criteria were the medical records of pregnant women who used misoprostol and had a medical follow-up at the hospital.Being are excluded Incomplete or erased medical records because they do not contain sufficient information, and medical records of patients who did not use misoprostol. After collection, the data were descriptively analyzed using the Microsoft Excel® version 2010 program, and the results were presented through tables and percentage.

III. RESULTS AND DISCUSSION

We analyzed 999 medical records of pregnant women who had their deliveries at the maternal and children's Hospital, between March and August 2016, and from these, we selected the cases in which misoprostol was used to induce childbirth. The following data correspond to the discussion of the present study. Table.1: Characteristics of parturients who used misoprostol to induce normal childbirth at the maternal Infant hospital in the municipality of Gurupi-TO from March to August 2016

march to magnist 2010.			
Variable	n	%	
Age			
>20	8	66,67	
<20	4	33,33	
Total	12	100	
Gestational Age			
>40 weeks	7	58,33	
<40 weeks	5	41,67	
Total	12	100	
InductionIndication			
HypertensiveSyndrome	4	33,33	
Postdatism	8	66,67	
Total	12	100	

Regarding the distribution of cases with characteristics of parturients, who used misoprostol to induce normal delivery, Regarding the distribution of cases with characteristics of parturients, who used misoprostol to induce normal delivery, the frequency of cases increased with age, with a higher incidence of cases in the age group above 20 years (66.67%) (Table - 1). Sampaio et al. (2004) show that the number of pregnant women over 20 years old who underwent misoprostol use is significant, pointing out that there has been an increase in the number of cases where the use of this medicine progresses with the age of the patients, The analysis of the data collected in the study reveals that the use of Misoprostol as inducer of normal delivery reached a greater proportion among pregnant women over 20 years old (58.7%), compared to pregnant women under 20 years old (46.7%) the use was lower.

Aquino (2001) in his study with a total sample of 105 pregnant women, also observed that the use of Misoprostol as a measure of induction of normal delivery was 19 indications with pregnant women under 20 years (18.9%) and 86 indications. For pregnant women over 20 years old (81.91%). Regarding the gestational age (GI) of pregnant women as shown in table — 1, the data were approximate, being (58.33%) GA over 40 weeks and (41.67%) GI less than 40 weeks. It was also observed that (33.33%) presented hypertensive syndrome and (66.66%) post-dates. These data show that the incidence of misoprostol for labor induction was more evident in cases of gestation older than 40 weeks with post-dates. Aquino (2001) in his research shows the prevalence of misoprostol use for induction of normal delivery in cases of gestational age greater than 40 weeks, was more evident, reaching a total (81.9%) of the total cases analyzed. Of this total, the cases of postdatism were also very evident, reaching (61.9%).

Table.2: Sociodemographic characteristics of parturientswho used misoprostol to induce normal delivery at theMaternal Infant Hospital in the municipality of Gurupi —

TO from March to August 2016.			
Variable	Ν	%	
Marital status			
Married	2	16,67	
Stableunion	0	0	
Sigle	10	83,33	
Total	12	100	
Breed			
Black	1	8,33	
Brown	11	91,67	
White	0	0	
Total	12	100,00	

The sociodemographic characteristics of the patients (Table 2), It was observed that single pregnant women had higher rates with the use of Misoprostol, reaching (83.33%) and the prevalent occurrences are minimal (16.67%). Regarding the results obtained in this stage of the research, wherein most of these, the incidence of misoprostol use was higher in married pregnant women.

According to Aquino (2001) reports in his study done in Campinas-SP that the prevalence of misoprostol use in married pregnant women, was much higher reaching (53.34%) against (46.66%) in single pregnant women.

Regarding race, table-2 shows that among the total of pregnant women who had a normal birth (91.67%) were brown. In relation to the race of the pregnant women analyzed, the brown color was predominant and the black color was also evidenced.

Although the use of misoprostol for labor induction was more evident in black and brown pregnant women, it should be noted that it should not be considered as a confirmatory hypothesis of this variable. For, some studies affirm this hypothesis and others that deny it.

Araújo et al. (1999) confirm this in their study where the frequency of cases reached higher incidences in the non-white race (black and brown) (64.2%) and lower incidence in the white race (35.8%). Araújo et al. (1999) confirm this in their study where the frequency of cases reached higher incidences in the non-white race (black and brown) (64.2%) and lower incidence in the white race (35.8%).

However, Aquino (2001) says that black women with 14.28%, browns with 17.14% and white with 68.57%

prevalence. Regarding the distribution of cases with characteristics of parturients who used misoprostol for cesarean section induction, the frequency of cases increased with age, with a higher incidence of cases in the age group above 20 years (71.43%), followed by the age below 20 years (28.57%) (Table-3).

Table.3: Characteristics of parturients who used misoprostol to induce cesarean section at the Maternal Infant Hospital in Gurupi — TO from March to August 2016

2010.	•	
	Ν	%
Variable		
Age		
>20	5	71,43
<20	2	28,57
Total	7	100
Gestational Age		
>40 Weeks	4	57,14
<40 Weeks	3	42,86
Total	7	100
InductionIndication		
HypertensiveSyndrome	3	42,86
Postdatism	4	57,14
Total	7	100

It was observed that there was a significant difference regarding this variable, showing that the need for cesarean delivery was much higher in pregnant women over 20 years of age.

Regarding the parameter "Gestational age," It was observed that pregnant women with gestational age greater than 40 weeks presented an index of (57.14%) against (42.86%) pregnant women with gestational age below 40 weeks.

It was also observed that (57.14%) presented postdatism and (42.86%) hypertensive syndromes. These data show that the incidence of misoprostol for labor induction was more evident in cases of gestation older than 40 weeks with postdatism.

These results show that pregnant women who were induced to use Misoprostol may have had complications during pregnancy that influenced the choice of cesarean section by the doctor, because currently it is now believed that the choice for normal birth is the best option for the newborn's future, so that the number of cesarean deliveries was so large in the group of pregnant women over the age of 20, GA greater than 40 weeks and an indication of induction by postdatism can be said that the prolongation of gestation time did interfere in the choice, but there are no reports in the literature that can disagree with such hypothesis. Table-4 shows the sociodemographic characteristics of the patients who underwent cesarean with use misoprostol. The observed data show that single pregnant women had lower rates with misoprostol, reaching (28.57%), the married women had the same index, that is, (28.57%), while the pregnant women with stable union presented the equivalent value (42.87%).

Table.4: Sociodemographic characteristics of parturients who used misoprostol to induce cesarean section at the Maternal Infant Hospital in Gurupi - TO from March to August 2016.

Variable	Ν	%
Marital status		
Married	2	28,57
Stable union	3	42,86
Single	2	28,57
Total	7	100
Breed		
Black	0	-
Brown	6	85,71
White	1	14,29
Total	7	100

The data presented are in agreement with the study by Aquino (2011) in which he states that the cesarean section rate was much higher in married or stable union pregnant women than single pregnant women.

When comparing the variable "race", it is observed that there is a remarkable predominance of brown pregnant women with an index of (85.71%), followed by white pregnant women with (14.29%), while black patients did not obtain significant values for the research (0%). However, there are no reports in the literature that agree or disagree with the results obtained.

Table.5: Regarding the characteristics of the parturients who used misoprostol to induce miscarriage, it was observed that (82.50%) of the pregnant women were over

20 years old			
Variable	Ν	%	
Age			
>20	33	82,50	
<20	7	17,50	
Total	40	100	
Gestational Age			
>40 Weeks	3	7,50	
<40 Weeks	37	92,50	
Total	40	100	
Induction Indication			
Hypertensive Syndrome	4	10,00	
Postdatism	3	7,50	
Others	33	82,50	
Total	40	10	

Matsubara (2010) in his study conducted in Paraná, reports that the abortion rate is more prevalent in the age group over 20 years (77.94%) and only (22.06%) of abortions performed in women under 20 years.

Diniz and Medeiros (2010) state that abortion grows according to the age of women, with a variation of (6%) for pregnant women under 20 years and (22%) of pregnant women aged 35 to 39 years, thus demonstrating that Abortion is a common act in the reproductive life of women and more than one fifth of Brazilian women have had abortion.

According to table-5, when the abortion index and the indication of induction were evaluated, it was observed that pregnancies with (IG) over 40 weeks had a lower index, making a total of (7.50%) against (92, 50%) of gestation with (GI) below 40 weeks.

Regarding this variable, the data presented were different when compared with cesarean section and normal delivery. This fact confirms that the risk of pregnant women having an abortion is more evident in the first weeks of pregnancy.

It is evident here that the abortion rate was more prevalent in pregnant women over the age of 20 years, gestational age less than 40 weeks and by several factors, such as anembryonic pregnancy, placental detachment, ectopic pregnancy, etc.

This confirms the study by Nader, Blandino and Maciel (2007), where the results of gestational ages below 40 weeks are as follows: 10 weeks (52.4%), 13 - 16 weeks (14.3%) and over 17 weeks (4.7%) of the total of 61 women in the municipality of Serra-ES.

Regarding the sociodemographic characteristics of the parturients (Table 6) who used misoprostol in abortion, it can be observed that among the pregnant women surveyed (77.50%) were single. According to the results, there is a higher incidence of miscarriage in single pregnant women.

Table.6: Sociodemographic characteristics of parturients who used misoprostol to induce spontaneous abortion at the Maternal Infant Hospital in Gurupi-TO from March to

August 2016.			
Variable	Ν		
Marital status			
Married	3	7,50	
União Estável	6	15,00	
Stableunion	31	77,50	
Total	40	100	
Breed			
Black	0	-	
Brown	34	85,00	
White	6	15,00	
Total	40	100	

This fact can be confirmed, according to studies by Souza et al. (2001), where he reports that (81.6%) of the parturients surveyed were single, (12%) married and (6.4%) had a stable union, suggesting that the vast majority of young women without a partner end up with a troubled pregnancy and this affects the fetus and leads to miscarriage Because, among the many factors that can interfere with a pregnancy, the lack of family and partner support are the main cause. When compared to the variable "race", it is observed that there is a remarkable predominance of brown pregnant women making up an index of (85.0%), followed by white pregnant women with (15.0%), while black patients did not obtain significant values for a survey (0%). However, there are no reports in the literature that agree or disagree with the results obtained.

IV. CONCLUSION

This study aimed to analyze the main reason for the use of misoprostol in labor induction at the Maternal Infant Hospital in Gurupi-TO during the study, it has been observed that the incidence of misoprostol use in induction of normal delivery has been steadily increasing. It has also been highlighted the use of it to promote complete expulsion in case of miscarriage or fetal death, thus, This research aimed to verify if this fact is also evidenced in the referred hospital because a For this, a thorough search was performed in the medical records of pregnant women who attended the hospital during the months of the research. Thus, we looked for incidences of some variables, seeking the one that stood out and that could represent the reality of the hospital facing labor induction. Research data indicated that abortion is the most evident factor among the various cases that the hospital attends. Being its highest prevalence in cases of pregnant women aged over 20 years, with a gestational age below 40 weeks.

REFERENCES

- AQUINO, M.M.A. Misoprostol versus ocitocina para indução do parto: ensaio clínico controlado aleatorizado. 2001.117 f Dissertação (Doutorado em medicina tocoginecologica) - Universidade Estadual de Campinas, Campinas - SP, 2001.
- [2] ARAÚJO, D.A.C. et al., Indução do parto com Misoprostol: Comparação entre duas doses. RBGO.Juiz de Fora – MG, n.9, 1999, p.527-531.
- [3] BARBOSA, A.R.C.; CAMPOS, D A. Misoprostol na prevenção da hemorragia pós-parto.Acta ObstetGinecol Port. Portugal, n.4, 2013, p. 298-305.
- [4] CECATTI, J.G. et al., Aborto no Brasil: um enfoque demográfico. Rev. Bras. Ginecol. Obstet. Campinas – SP, n. 3, 2010, p. 105-111.

- [5] DINIZ, D.; MEDEIROS, M. Aborto no Brasil; uma pesquisa domiciliar com técnica de urna. Ciências e Saúde Coletiva. Brasília - DF, n.1, 2010, p.959-966.
- [6] MATSUBARA, F.C. Aborto: Prevalência em um município do nordeste do Paraná. Revista Saúde e Pesquisa. Paraná, n. 1, jan./abr. 2010, p. 17-23.
- [7] MORAES FILHO, O.B.; CECATTI, J.G.; FEITOSA, F.E.L. Métodos para indução do parto. Revista BrasGinecol Obstet.Recife, n.8, 2005, p.493-500.
- [8] NADER, P.R.; BLANDINO, V.R.P.; MACIEL, E.L.N. Características de abortamentos atendidos em uma maternidade pública do Município da Serra-ES. Rev. Bras. Epidemiol, Espirito Santo, n. 4, 2007, p. 615-624,
- [9] PASSOS, E.P., et al.,Indução do parto. In: FREITAS, F.; MARTINS-COSTA, S.H.; RAMOS, J.G.L.; MAGALHÃES, J.A. Rotinas em Obstetricia.6 ed. São Paulo: Artmed, 2011. p.343-353.
- [10] RANGEL FILHO, F.A., et al., Baixas doses de misoprostol vaginal (12,5 versus 25 mcg) para indução do parto a termo. Rev Bras Ginecol Obstet. Fortaleza, n.12, 2007, p.639-646.
- [11] SAMPAIO, Z. S.; et al., Fatores associados ao parto vaginal em gestantes de alto risco submetidas á indução do parto com misoprostol. **RBGO.** Campina grande - PB, n.8, 2004, p.21-29.
- [12] SANTOS FILHO, A.G; ANDRADE, V.M.; MIRANDA, V.R. O uso do misoprostol para indução do parto de feto vivo. FEMINA. Rio de Janeiro, n.8, 2009, p.434-436.
- [13] SOUZA, G.N., et al., Métodos de indução do trabalho de parto. FEMINA. São Paulo – SP, n. 1, jan./fev. 2013, p. 47-54.
- [14] SOUZA, V.L.C., et al., O aborto entre adolescentes. Rev. Latino-am Enfermagem. Campinas - SP n. 2, mar. 2001, p. 42-47.

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Abstract— The multidisciplinary team provides research optimization and complementarity of ideas. Engineers working in biomedical engineering can make your work routine easier by sharing them with healthcare professionals who can help you understand physiology. The main objective is to address key points in cardiac physiology and arrhythmia pathophysiology in order to lessen the efforts of biomedical engineering professionals implementing implantable heart rate sensitive devices. It is a descriptive and critical theoretical analysis, which selected the main and current bibliographical references, directed to the fulfillment of the main objective. As a result, we obtained that the most important points are about the electrocardiogram graph and its association with cardiac bioimpedance as a good physiology of arrhythmias that help to understand the need. to deploy. Pacemakers. We can conclude that early identification of the gradual ST segment distance may prevent future cardiac arrest and, in frequency-sensitive pacemakers, it is possible to identify from bioimpedance. There is a challenge in implantable devices in differentiating between normal cardiac changes and arrhythmias, and with the ability of biomedical engineering, the possibility of improving the performance of these devices is always real.

Keywords—Action potential, bioimpedance, cardiovascular diseases, electrocardiogram, implantable devices.

I. INTRODUCTION

When proposing biomedical devices that influence the functioning of any organ, it is necessary to have a minimum knowledge about its structure and behavior, so that it is possible to identify and differentiate normal physiological changes from pathological changes.

Working in the field of biomedical engineering, there is a need for both physiological and technological knowledge, and therefore the multidisciplinary of the team is justified.

This study addresses the key points selected by a healthcare professional about heart anatomy, physiology, biophysics, and pathophysiology in a simplified manner to facilitate understanding and work of engineering professionals implementing implantable heart devices, particularly those that are frequency sensitive pacemakers.

II. METHODS

To answer the proposed research problem: What does a biomedical engineer need to know about heart functioning in order to implement a system that helps with frequencysensitive pacemaker? A critical review of the literature was produced, where analyzes and synthesis of the available content in the main scientific publications on the studied subject were performed.

It was used as inclusion criterion of publications, current scientific texts (2015 to 2019) that contain information that help in solving the research problem, being excluded texts without scientific character, from years before 2015 and without relevance to the theme.

III. RESULTS AND DISCUSSION

The heart is the main organ of the circulatory system and has a responsibility to provide nutrients and oxygen to each tissue through the blood. It is divided into four cardiac chambers, where the upper part is composed of right and left atria and the lower part, right and left ventricles (Fig. 1) [1].

Typically, the implantable device electrodes are placed in the right-side chambers. These chambers are separated by fibrous tissue, considered a bad current conductor, forming walls around the atrioventricular (AV) valve openings and preventing the electrical current generated by the organ itself from passing rapidly and disorderly through the cardiac tissue [2].



The left ventricular wall is thicker because it has the function of ejecting the blood for a large circulation and, therefore, the related electrocardiogram (ECG) signal may have a larger wavelength than the right.

Cardiac behavior from the beginning of one heartbeat to the beginning of the next is called the heart cycle [4], and from it, it is possible to obtain several parameters that, if interpreted correctly, reveal the possible failures in your homeostasis.

The generation of this beat occurs from the electrical current released by the sinoatrial node or sinus node (SA), located above the right atrium, at the entrance of the superior vena cava (Fig. 1). The atrioventricular (AV) node slows the pulse from the upper to the front of the ventricles and the AV beam conducts the current to the lower syncytium, while Purkinje fibers distribute energy equally throughout the heart muscle tissue [5].

Some cardiac fibers are capable of self-excitation, which facilitates the generation of rhythmic automatic discharge with consequent contractions at the same rate. Hence the ease of a single point of current generation (SA node) dictating the rhythm of the entire organ [6].

If there is AV block, for example, the pulse does not pass from the atrial syncytium to the ventricular. The atria remain contracting with normal frequency and the ectopic pacemaker usually developed in the Purkinje fibers leads to ventricular muscle frequencies between 15 and 40 beats per minute (bpm). With this sudden blockage, the Purkinje system takes about 5 to 20 s to react. During this time, the ventricles become bloodless and after 4-5 s due to lack of blood flow to the brain region, fainting and, in more severe cases, death may occur [1].

This property, when decompensated, can generate ectopic excitation points in various parts of the tissue and

this is one of the factors that leads to the arrhythmia process. In addition, there is a possibility of failure in the production of electrical current by the SA node, triggering the lack of chronotropism (stable heart rate).

If it occurs again, one of the predisposes is the need for artificial pacemaker implantation. However, there are other possibilities, one being partial or total AV node block, His bundles or Purkinje fibers.

The action potential (AP) recorded in the ventricle is about 105 millivolts (mV). Thus, the intracellular potential is approximately -85mV at rest and reaches about + 20mV during each beat. After BP onset, a membrane remains in depolarization (with electropositive intracellular medium) for 0.2 s, which is recorded as a plateau after repolarization, which is the moment of return of the intracellular medium to the negative pole [6].

Action potential in the atriums is -55 to -60 mV, while in the ventricles -85 to -90 mV. This is because sinoatrial fibers have a better permeability to sodium (Na⁺) and calcium (Ca²⁺) ions and their positive charges counteract some intracellular negativity. As this node is located in the atrium, electronegativity is lower in this region [7].

Potassium ions (K⁺) exert a strong influence on membrane potentials and Ca^{2+} act on activation of the muscle contraction mechanism. Combining both information, it can be said that the concentration of each in the extracellular medium is essential for the cardiac pumping process [8].

In excess, K^+ may cause myocardial dilation with consequent sagging, reducing the frequency of beats. It can also block the conduction of the atrial current towards the ventricles, and if this increase is two to three times beyond normal concentration, it is possible that beat weakness is fatal [9].

Excess Ca^{2+} has the opposite action because it induces the myocardium to produce contraction in the form of spasms. Speaking of disability, it precedes a fall similar to lack of K⁺, however, the body can maintain its levels more easily without major clinical concerns [8].

Figure 2 shows the cardiac cycle events that were extracted based on the left side of the heart. The curve "a" represents the pressure in the aorta. It can be noted that the aortic valve opens at the time of systole and with its pressure is increased and soon after its closure, the diastole is started and the pressure decreases.

This parameter is not directly perceived by implantable devices, but knowing that this opening depends on the ventricular force, if pacing is not sufficient for the heart's blood ejection process, the ideal pressure will not be reached and the ideal blood volume will not come out of the ventricle. Curve "b" represents atrial pressure. It is noted that the amplitude is much smaller than that of the ventricle, because its structure is smaller and its wall less thick [5]. Curve "c" represents ventricular pressure, approaching 120 mmHg for aortic valve opening and blood ejection for large circulation [10]. If current flow to the ventricle is impaired, it will lose its ability to contract, which causes the chamber to empty. In the figure 2, ventricular volume is represented on curve "d".

The electrocardiogram (curve e) is composed of P wave, QRS complex, T wave and eventually U; which are electrical voltages generated in the heart and recorded by the equipment on the body surface. The P wave represents the spread of atrial depolarization. After approximately 0.15s, there is the QRS complex, representing ventricular depolarization, and then the T wave representing ventricular repolarization. The U wave, when identified, corresponds to the repolarization of the papillary muscles [11].



Fig. 2: In a) Graph of aortic pressure during the left cardiac cycle, b) Left atrial pressure in systole and diastole, c) Left ventricular pressure in systole and diastole, d) Ventricular volume in the period of relaxation and contraction, in e) Signal electrocardiogram with the waves P, QRS and T, and in f) the left cycle phonocardiogram [1]

There is a delay of 0.1 s in the passage of this impulse from the atriums to the ventricles, allowing atrial systole, which brings blood to the ventricles and then ventricular systole, to take blood to the organs. This delay is essential so that systole does not occur at the same time in all chambers [2].

Electrocardiogram graph is indispensable when it comes to heart health research and, in frequency-sensitive pacemakers, its parameters can be used. The bioimpedance signal, for example, is a condition that can be read by this type of device as an ideal or pathological indicator of functioning, mainly because it behaves synchronously with the ST segment.

ST segment provides information on the delay time between systole and ventricular diastole and the progressive distance between it is indicative of future cardiac arrest [12]. Implantable devices do not read the ECG directly; However, by perceiving the cardiac bioimpedance signal, this parameter can be extracted and used as a pathological alert.

In addition, there are other associated physiological conditions, such as heart rate (HR), number of beats in one minute, and cardiac output (CO), which correspond to the volume of blood that passes through the heart in one minute [2].

At rest, a healthy individual can pump 4-6 liters of blood per minute and, in intense physical activity, has the ability to increase this value up to seven times. This volume control is based on the intrinsic cardiac regulation of the variation in the amount of fluid reaching the heart and the control of the heart rate, as well as its pumping force, which are the responsibility of the Autonomic Nervous System (ANS) [1].

The sympathetic and parasympathetic (or vagus) nerves innervate myocardial tissue and are part of the pumping effectiveness. Sympathetic stimulation can increase cardiac output by 100%, beats usually 70 per minute can reach 250 and increase systolic strength by up to two times in cases of physical activity or stressful situations such as fear.

The parasympathetic can slow down and even stop beating for a few seconds, and then tap again 20 to 40 times per minute while vagal stimulation is stimulated, for example, by meditation. It is important to report that, as parasympathetic fibers are more concentrated in the atria, their stimulation is able to reduce HR, but not considerably the contraction force [11], considering that variations in cardiac output (CO) resulting from nerve stimulation imply changes in HR and contraction force [2].

When a frequency-sensitive pacemaker has the ability to extract ST segment information associated with CO and HR, it increases its reliability of accuracy when acting, considering the property of interpreting physiological changes by disease process or physical activity, as an example.

Intense physical stress requires more circulatory system activity due to the need to increase blood flow to the muscles currently being exercised. Non-athletes may have an increase in cardiac output up to five times above normal, whereas in a top athlete it reaches up to seven times [2]. In order to perform this special nourishment of the active tissues, the heart is stimulated by the sympathetic nervous system to considerably increase its frequency and pumping force, and in turn inhibits the parasympathetic nervous system [3].

In addition, most peripheral circulation arterioles are very contracted except active muscle arterioles, as they are very vasodilated. This is exactly why the heart needs to respond by sending more of its supply through pumping blood, and the body can still redirect fluid from where it is most needed at the moment. Interestingly enough, too, is the considerable increase in systemic filling pressure that occurs because the vein walls contract with a very powerful force [2].

Sympathetic stimulation is important for the consequent increase in blood pressure, resulting in vasoconstriction of arterioles in the body. For active muscles, there is increased frequency of beats and increased blood ejection pressure in the body [12].

When an individual comes out of rest, the oxygen-rich blood supply must be increased to nourish the muscles used. The more circulation needed, the greater the cardiac output (how much blood circulates in the heart per minute) and pulmonary ventilation [1]. Heart rate changes isolated from ventilatory behavior indicate pathological process that should be researched.

Cardiac contraction force can be increased by elevating the temperature by physical activity. However, in states where the condition continues, such as fever, HR can bend and deplete metabolic systems, causing weakness. If hypothermia occurs, consequently there is a reduction in this frequency, which can lead to death [12].

Outside of physical activity, there is still the possibility of the heart manifesting inappropriate behavior. When such events occur frequently and are correctly diagnosed, the cardiologist may consider it necessary to implant an artificial pacemaker to assist in the process of induced activity regularization and, consequently, to increase life expectancy.

Cardiovascular disease is the leading cause of death from disease worldwide, with an estimated 17.7 million deaths in 2015 (31% worldwide) and 17.9 million in 2016 (44% worldwide). In addition, more than 75% of these occurred in low-income and middle-income countries [13].

The main clinical features of arrhythmias required for pacemaker implantation are: hypersensitive carotid syndrome, neurocardiogenic syncope, SA node disease, non-drug-responsive bradycardic syndrome, ventricular control atrial fibrillation, AV-grade AV block, and seconddegree type. II AV, advanced AV block, fiber bundle injury, alternative bundle branch block and other related consequences [3].

The general pathophysiology of arrhythmias is divided into three, namely: hyperautomaticity; triggered activity; and reentry process.

Hyperperaeromaticity is a process represented by the activation and acceleration of cardiac cells that results in spontaneous depolarizations. This hyperactivity can be derived from nervous system dysfunction or even fever, shock, acidosis and endocrinopathies [3]. In the triggered activity, the changes are generated from the variation of the membrane potential, which generates new action potentials and, consequently, arrhythmias. This may be due to decreased ion efflux in the cell or even increased positive ion influx. The reentry process is the main reason for ventricular and supraventricular arrhythmias. Occurs by the presence of an obstacle in the anatomical structures through which the electric current is conducted [2].

It is possible, by observing the action potential wavelength (Fig. 3), to identify if there are pathological changes in the current conduction. The formula consists of: Wavelength = Conduction Speed x Refractory Period. Thus, when the wavelength exceeds the anatomical size of the circuit, the arrhythmia is extinguished. And if the wavelength is shorter than the arrhythmic circuit, the arrhythmia will be maintained [6].





With this graph it is possible to visualize the moments of depolarization (0), rapid and incomplete repolarization (1), plateau moment (2), depolarization (3) and electrical diastole (4), thus completing a cardiac cycle.

IV. CONCLUSION

It is a fact that there is much more complex information, from the anatomy to the pathophysiology of arrhythmias, however, with the information present in this text, after a practical observation of the difficulties encountered by biomedical engineers in the development of this type of project, it is believed to be sufficient to facilitate understanding of heart function and propose technologies that can solve pathological problems.

One of the main points that deserves due attention is the early identification of ST segment detachment on the electrocardiogram, as it may prevent future cardiac arrest. When it comes to frequency-sensitive pacemakers, this behavior can be identified by reading the bioimpedance.

Getting the implantable device to identify when cardiac change occurs due to normal day conditions or pathological disorders is always a challenge. However, with the ability of biomedical engineering, the possibility of improving the performance of these devices is always real.

REFERENCES

- Guyton, A.C. e Hall, J.E. (2017). Tratado de fisiologia médica, 13rd ed. Rio de Janeiro: Elsevier, 1168p.
- [2] Berne, R.M e Levy, M.N. (2018). FIsiologia. 7th ed, vol. 7. Rio de Janeiro: Elsevier, 880p.
- [3] Mc Graw-Hill. Available in: https://br.pinterest.com/. Accessed in October 11, 2019.
- [4] Vanputte, C.L., Regan, J.L. e Russo, A.F. (2016). Anatomia e fisiologia de seeley.10th ed. Porto Alegre: Artmed, 1264p.
- [5] Boron, W.F. e Boulpaep, E.L. (2017). Medical physiology. 3st ed. Philadelphia: Elsevier, 1312p.
- [6] Duran, J.E.R. (2015). Biofísica conceitos e aplicações.2nd ed. Pearson, 320p.
- [7] Gandon-Renard, M., Bedioune, I., Karam, S., Varin, A., Lechène, P., Bichali, S., Leroy, J., Algalarrondo, V., Stratakis, C., Mercadier, J.J., Benitah, J.P., Gomez, A.M., Fischmeinster, R. e Vandecasteele, G. (2019). The cAMPdependent protein kinase type, I regulates cardiac excitationcontration coupling. Archives of Cardiovascular Diseases Supplements (ISSN 1878-6480), 11(2), 261-266. https://www.sciencedirect.com/journal/archives-ofcardiovascular-diseases-supplements
- [8] Catterall, W, Lenaeus, J, El-Din, T.M. (2019). Structure and pharmacology of voltage-gated sodium and calcium channels. Annual Review of Pharmacology and Toxicology (ISSN 1545-4304). https://doi.org/10.1146/annuareypharmtox-010818-021757.
- [9] Guerri, G., Krasi, G., Precone, V., Paolacci, S., Chiurazzi, P., Arrigoni, L., Cortese, B., Dautaj, A., Bertelli, M. (2019). Cardiac conduction defects. Acta Biomed (30(10), 20-29). DOI: 10.23750/abm.v90i10-S.8751
- [10] Silverthorn, D.U. (2017). Fisiologia humana: uma abordagem integrada. 7th ed. Porto Alegre: Artmed, 960p.
- [11] Santos, J.L.F. (2016). Eletrocardiograma ao alcance de todos. 3rd ed. São Paulo: Phorte, 176p.
- [12] Timperley, J., Leeson, P., Mirchell, A. R. J., Betts, T. (2019). Cardiology pacemakers and ICDs. 2nd ed. Oxford Medical Publications, 7109p.

- [13] OPAS. Doenças cardiovasculares. 2017. Disponível em: https://www.paho.org/bra/index.php?option=com_content& view=article&id=5253:doencascardiovasculares&Itemid=1096. Accessed in October 11, 2019.
- [14] Ikonnikov, G., Yelle, D. (2013). Physiology of cardiac contraction and contractility. Available at: http:// www.pathophys.org/physiology-of-cardiac-conduction-andcontractility/#Electrophysiology. Accessed in October 11, 2019.

Solidary Economy as a Sustainability and Social Transformation Perspective for Artisan Fisheries in Bahia Semiarid

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Abstract— In this article we discuss solidarity economy as one of the models of economic development and the perspective of social transformation in the face of capitalism. From the analysis of points of view of authors who bring to the center of the discussion this economic model. The research discusses within the context of human emancipation in communities the interdisciplinary understanding of local development, solidarity, dignity, culture and sustainability. The object of study is the reality of the Colony of Fishermen and Aquaculture Z-86, in Bahian semiarid. The methodology used consisted of a review of specific literature, in order to associate the theoretical debate with the academic one. This research is expected to assist readers and scholars in the area in understanding the self-management attitudes and social relations that occur when practicing solidarity economy; serving as a guiding axis for future decisions, anchored in valorization initiatives, guiding new discussions on the paradigms of artisanal fishery organization, especially with regard to income generation, with the focus on local development and the role of artisanal fishermen.

Keywords— Solidarity Economy. Artisanal Fishermen. Self-management attitudes.

I. INTRODUCTION

The approach of the solidarity economy in Brazil began with the adoption of the concept and format of cooperativism, without, however, observing the other principles of solidarity, self-management and the economic dimension. And he adds that the solidarity economy "comprises different types of 'companies', voluntary associations, whose purpose is to provide their members with economic benefits" (SINGER, 2001; p. 11).

Cooperative (2017) states that solidarity economy "is a different way of producing, selling, buying and exchanging what it takes to live. Without exploiting others, not wanting to take advantage, without destroying the environment. Cooperating, strengthening the group, each thinking about the good of everyone and their own good. "

Taking the same path and seeking to make an analogy between the points of view of Singer (2001) and Cooperative (2017), it is clear that the former argues for a solidary economy with economic benefits, while the latter moves along the same path. It sees a little further and more ethnoecologically when it comes to the environment and the relationship between people, especially when it emphasizes that each participant, in addition to thinking about improving their lives, is also concerned with the good of all.

In this discussion, it is worth mentioning that stated by Culti (2010), when he says that:

The solidarity economy contrasts with the current capitalist system, since, according to the concepts seen, they are not intended to profit from competitive advantage, but rather to solidarity between a group with specific characteristics (generally unemployed, impoverished, informal market workers). and aims to generate work and income (pp. 113- 137).

Bajoit (2004), very well clarifies that if a cooperative does not have this economic initiative, it is not a

solidarity company, but some institution maintained by political and non-governmental organizations whose purpose is to perform only some kind of work. philanthropic.

With regard to a solidarity company, it is important to understand that it gives the employee its participation as co-owner, as their remuneration is the result of their effort and results from the negotiation between all members of the cooperative.

In this context, a singular emphasis will be given to the solidarity economy, as a model of economic development with a strong management tendency, endowed with sustainable and participatory principles, towards the universalization of work.

It is worth highlighting the relevance of the practice of solidarity economy in places where activities are carried out without organization and in isolation, aiming at the realization of the protagonism of professionals in the community, conferred by the decision-making power, clothed with dignity and citizenship; Therefore, the solidarity economy as a strand that enables the uniqueness of the production process, where individuals, in an organized way, become owners of the means of production which they use for the realization of work.

For this research we used as a methodological proposal the literature search of specific literature, which was articulated with readings and reflections on social management models. According to Cervo, Bervian and da Silva (2007, p. 57), bibliographic research "constitutes the basic procedure for monographic studies, by which the domain of the state of the art on a particular subject is sought".

In the same vein, Marconi and Lakatos (2002, pp. 19-29) show:

Its purpose is to put the researcher in direct contact with everything that has been written, said or filmed about a certain subject (..). Thus, bibliographical research is not a mere repetition of what has already been said or written about a certain subject, but it allows the examination of a theme under a new approach or approach, reaching innovative conclusions.

Thus, the look turned to the artisanal fishing of the riverside of the municipality of Gloria, Bahia, and the possibility of implementation of the solidarity economy, believing that this, is shown as one of the elements capable of fostering local development initiatives in the social, cultural and environmental aspects, coated with sustainability.

In this sense, the study and the analysis of proposals were made, starting from the debate between the practices experienced by some social movements and the reality experienced by Gloria-Ba's Colony of Fishermen and Aquacultures Z-86, culminating in the recognition of the economy. solidarity as an alternative for economic development, social and human valorization, based on the appreciation of the environment.

II. THEORETICAL AND CONCEPTUAL RATIONALE

2.1 SOLIDARY ECONOMY

Cooperativism came to Brazil in the early twentieth century, brought by European emigrants, with a cooperative design, without self-management purposes. According to Singer (2001; p. 116), in 1980, Caritas, an entity linked to the Catholic Church, financed PACs (Alternative Community Projects) which later became units of solidarity economy. It also adds that the solidarity economy was also observed through the "takeover of bankrupt companies or about to go bankrupt by their workers, which resurrect them as self-managed cooperatives".

There was also the action of the Landless Workers Movement (MST), which promoted family farming on unappropriated lands of unproductive landowners, in the form of self-managed cooperatives. of isolated initiatives in the production chain, which only articulated the surroundings and took flight towards the national articulation. This significant leap started from the various editions of the World Social Forum, which resulted in the creation of a National Secretariat for Solidarity Economy (SENAES).



Estrutura do Forum Brasileiro de Economia Solidária. Fonte: http://www.fbes.org.br/index.php?option=com_content&task=view&id=61&Itemid=57

As stated by Culti (2010), the Ministry of Labor and Employment (MTE), by detecting the influences of this approach, allied with the creation of the National Secretariat of Solidarity Economy, has been conducting mapping of the solidarity economy since 2006, which is of great importance to visualize behavior over time periods, as well as enabling analysis and discussion.

2.2 CRAFT FISHING

According to the International Labor Organization, fishermen are defined as workers who are engaged in the whole process of the fishing sector, from catching fish to various tasks related to it. Therefore, they perform the duties of fishing boat crew members, performing various fishing tasks that can be compared to sea fishermen (MALDONADO, 1986; p. 77).

In Brazil there are two categories of traditional populations: indigenous peoples and non-indigenous traditional populations; Among the traditional non-indigenous populations there is no definitive identification and classification, and the artisanal fisherman is included in this second classification. (BRAZIL, 2003; DIEGUES; ARRUDA, 2001).

The Code of Fisheries and Aquaculture of the State of São Paulo (Law No. 11.165, of June 27, 2002) states that "artisanal fishing is the one practiced directly by professional fishermen, independently, in an economy family or in partnership with other fishermen for commercial purposes".

Artisanal fisheries are in short steps in relation to technological development, and also need policies that meet the wishes of the people who perform this activity; This is an alarming situation taking into account Maldonado's (1997) view that fishing is not only the main source of income, but also in 80% of the cases practiced as a means of subsistence. Therefore, it is necessary to seek to use efficient technologies and to remove artisanal fishermen from the mere passive agents that offer their workforce, and to give them the rights of participants, making them protagonists and active subjects in decision making.

According to Diegues (1983; p. 287), Brazilian artisanal fishing has numerous and complex specificities that take into account social, political, institutional, economic and environmental factors intrinsic to each location. Thus, its users use various means of production (gadgets, boats and

strategies) to capture various resources that are generally not abundant, amidst constant changes, as well as conflicting social relations. Within this reality come the professional artisanal fishermen.

2.3 SUSTAINABILITY

Today humanity faces disparities within and within nations, such as worsening poverty, hunger, disease and illiteracy, as well as the degradation of ecosystems, which undermines the well-being of humanity. In this scenario, sustainability-related themes stand out, which, according to Valenti (2008; pp 1-11), can be defined as the management of natural, financial, technological and institutional resources in order to guarantee the continuous satisfaction of human needs for women. present and future generations.

It was at the World Commission on Environment and Development (CMMAD), created by the United Nations, with the purpose of discussing and proposing ways to harmonize two objectives: economic development and environmental conservation, that the most accepted definition for sustainable development emerged. It says: "Sustainable development is development that can meet the needs of the present generation without compromising the ability to meet the needs of future generations. It is development that does not deplete resources for the future" (ARANA, 1999).

Sustainable development has led all nations to strike a balance between growth and the protection of natural resources. This was emphasized in the proposal made at the 1992 UN meeting for the sustainable future, the so-called Agenda 21. This document treats water as a vital element because it is a finite and unevenly distributed resource on the planet (SCARE, 2003).

However, if a commonality is struck between environmental and development concerns, coupled with increased attention, it becomes possible to meet basic needs, raise the standard of living of all, achieve a better protected and managed ecosystem, and build a more prosperous and secure future. These are goals that no nation can achieve alone; together, however, we can; a world association for sustainable development (Agenda 21, 1995).

According to CMMAD (1991), the world must soon devise strategies that enable nations to replace their current, often destructive, growth processes with sustainable development.

The idea of a new development model for the 21st century, making the economic, social and environmental dimensions compatible, arose to solve, as a conceptual starting point, the old dilemma between economic growth and poverty reduction, on the one hand, and environmental preservation of another. In fact, the conflict had been dragging on for more than twenty years in open hostility against the environmental movement, while it, in turn, viewed economic development as naturally harmful and business as its most representative agents (CAMARGO, et. (2004).

2.4 LOCAL DEVELOPMENT

In the current scenario we face the economic challenge of inserting traditional groups into the intermediate goods industry. Given this reality is that communities are organized, even without the necessary understanding of theories and create organizational practices, which faces difficulties arising from the lack of investment and public policies for the sector.

For Gallicchio and Camejo (2005), local development is understood as an ambitious process that needs time, human and economic resources, and, above all, capacity for construction and creation, in stages that start from the territorial level that articulates with the global one. Thus, the authors in question intend to differentiate themselves from other practices that limit the incorporation of related intervention methodologies and techniques, without considering long-term processes, regarding the ways of implementation and the sustainability of processes.

In this same area, Martinelli (2004) states that development can only be considered effective if it brings together the sum of human, social and sustainable development, due to the fact that it is concretely sought to improve people's lives (human development). and society as a whole (social development), with concern for both the present and the future, that is, the people who live today and the people who will live tomorrow, thus leading to sustainable development.

According to Ávila (2006) facing local development requires a relationship with their own peripheries, needs and internal and socioeconomically unbalanced poverty. It is understood, therefore, that local development, in part, minimizes social injustice through employment, salary and participatory exploitation of the potential of local actors as generators of income and social welfare in the community.

2.5 COLONIA OF ARTISAN FISHERMEN IN THE CITY OF GLORIA-BA

Given the current reality, it is essential to make a reflection on Brazilian artisanal fishing, from the history of production, where it is perceived the poor planning, the lack of quality statistical information, the tradition inherited by generations of fishing peoples and the prospecting. management models based on power sharing.

It is time, therefore, to implement efficient public policies that value fishermen and make available to them professionals such as Fishery Engineer, Master in Fishery Resources and Aquaculture, among other professionals, with an adequate technological apparatus.

Therefore, we realize that artisanal fishing needs proper planning that enables the balance and maintenance of ecosystems and riverside communities. Artisanal fishing depends on the ecological maintenance of the environment, and it is fundamental to have shared management models that contribute to fairer and more democratic management mechanisms.

Artisanal fishing, even being perceived by the subsistence activity, with low productivity and low profit, suggests the establishment of solidarity economy as an alternative of economic development, so that artisanal fishermen become protagonists of their stories, and perceived by holistic way.

Also in Bahia, specifically in the municipality of Gloria, the solidarity economy model has been shyly presented, lacking a boost in its public policies.

Therefore, even in the face of the difficulties experienced, it is necessary to recognize that the solidarity economy emphasizes human valorization and the projection of sustainable local development.

In Gloriaba's Z-86 Fishermen's and Fishermen's Colony, even though they are experiencing the natural challenges of contemporary times, its members practice fishing as their only source of income, where the family fishes, and profit sharing is made by all family representatives.

Finally, it is important to highlight the interest in seeking ways to articulate the implementation of the solidarity economy, as a means of improving the ethnoecological profile, adding to this scenario the implementation of public policies aimed at generating income, support to fishermen, within a horizon rich in care that clearly avoids environmental impacts from the perspective of sustainability.

III. FINAL CONSIDERATIONS

According to Carlos Brandão (1982), Popular Education does not aim to create subordinate subjects. It aims to participate in the effort that men and women are already making today - from the Indian to the ABC Paulista worker - for the organization of political work that, step by step, opens the way to the conquest of their freedom and their rights. For a better understanding, it is relevant to reflect on the statement below:

It seeks to work pedagogically man and groups involved in the process of popular participation, fostering collective forms of learning and research, in order to promote the growth of critical analysis capacity about reality and the improvement of strategies of struggle and confrontation. It is a strategy of building popular participation in the redirection of social life (VASCONCELOS, 2004, p. 5-17).

Moving through this area and realizing the value of popular participation, it is considered to be of great value to establish a solidary economy in places where activities are carried out without organization and in isolation; in the pursuit of the realization of the protagonism of the professionals in the communities, giving it decisionmaking power. It is noteworthy that the members of the referred fishing colony maintain a harmonious form of relationship with the environment, since from there it sustains, preserves their beliefs, their ideologies.

In this scenario, the solidarity economy presented as a perspective of social transformation comes from the idea of giving this community a better quality of life, that its fish be sold at the right price and that popular education in the countryside can be strengthened with the culture of the community. solidarity between the economic activities experienced there.

In this context, the establishment of the solidarity economy is shown as one of the elements capable of promoting local development initiatives in the social, cultural and environmental aspects. In short, the solidary economy enables the uniqueness of the production process, where individuals, in an organized manner, become owners of the means of production they use for the realization of work.

Finally, from the understanding of the social relations experienced by the Gloria-Ba Colony of Fishermen and Aquacultures Z-86, where fishing activity survives from the environment and its natural factors, it becomes clear that the solidarity economy can be presented as a alternative to the fishing activity of this community.

REFERENCES

- [1] ARANA, L. V. Aquicultura e desenvolvimento sustentável. Florianópolis:, Editora da UFSC, 1999.
- [2] ARRUDA, Marcos. Globalização e Ajuste Neoliberal: Riscos e Oportunidades. Revista 'Tempo e Presença, dezembro de 1995. Rio de Janeiro: Koinonia, 1995.
- [3] BAJOIT, Guy. A economia solidária: um modo de produção alternativo ao capitalismo. In: CIENCIAS

SOCIAIS UNISINOS/ Pós-graduação em ciências sociais aplicadas, Universidade do Vale do Rio dos Sinos. – V 40 nº 164. p.p.46 a 65 – São Leopoldo: UNISINOS, 2004.

- [4] BRASIL. Ministério do Meio Ambiente, dos Recursos Hídricos e da Amazônia Legal. A Caminho da Agenda 21 Brasileira: Princípios e Ações 1992/97. Brasília, 1997.
- [5] BRASIL. Ministério do Meio Ambiente. Plano de ação para produção e consumo sustentáveis (PPCS): 2011 – 2014. Brasília, set. 2010. Disponível em: . Acesso em: 31 maio 2012.
- [6] BRASIL. Decreto-Lei no 221, de 28 de fevereiro de 1967.
 Dispõe sobre a Proteção e Estímulos à Pesca e dá outras providências (Código de Pesca) LEI 11.165.
- [7] CERVO, Amado Luiz.; BARVIAN, Pedro Alcino. & SILVA, Roberto da.Metodologia Científica. 6. ed., São Paulo: Pearson Prentice Hall, 2007.
- [8] COMISSÃO MUNDIAL SOBRE MEIO AMBIENTE E DESENVOLVIMENTO (CMAD). Nosso futuro comum.
 2. ed. Rio de Janeiro: Fundação Getúlio Vargas, 1991.
- [9] COOPERATIVA de apoio ao sistema ecosol no DF, Economia solidária. Disponível em <http://www.ecosolbasebrasilia.com.br/index.php/econom ia-solidaria/videos/>. Acesso em 27 de agosto de 2017.
- [10] CULTI, Maria Nezilda; KOYAMA, MittiAyako H.; TRINDADE, Marcelo. Economia solidária no Brasil: tipologia dos empreendimentos econômicos solidários. São Paulo: Todos os Bichos, 2010.
- [11] CULTI, Maria Nezilda. Sócios do suor: cooperativas de trabalho. In: PRIORI, Angelo (org). O Mundo do Trabalho e a Política: Ensaios interdisciplinares. Maringá: EDUEM, 2000. pp. 113-137.
- [12] DIEGUES, A.C.S. **Pescadores, camponeses e** trabalhadores do mar. São Paulo. Ed. Ática. 1983.
- [13] GALLICCHIO, E., CAMEJO, A. 2005. Desarrollo Local y Descentralización en América Latina – nuevas alternativas de desarrollo. II Cumbre Iberoamericana por el Desarrollo Local/Regional y la Descentralización.
- [14] INSTITUTO DE PESQUISA ECONÔMICA APLICADA (IPEA). Brasil: o estado de uma nação. Disponível em: www.ipea.gov.br. Acesso em 05 jan 2009.
- [15] MALDONADO, S.C. 1986. Pescadores do Mar. Ed. Ática. MALDONADO, W. 1997. Comunidades Caiçaras e o Parques Estadual de Ilhabela. IN: Diegues, A.C.S. (org). Ilhas e Sociedades Insulares. NUPAUB-USP. São Paulo, Brasil.
- [16] MARCONI, Marina de Andrade; LAKATOS, Eva Maria.
 Técnicas de Pesquisa. São Paulo, Atlas, 2002. 5ª ed., p.p 19-29.
- [17] MARX, Karl. Salário, Preço e Lucro. Coleção: Os Pensadores. São Paulo: Abril, 1974. p. 61-105.
- [18] MARX. Karl. Classes sociais e contradição de classes.
 In: IANNI, Otávio. Karl Marx. Coleção: Pensadores. São Paulo: Ática, 1992. p. 120-130.
- [19] MINISTÉRIO DO TRABALHO E EMPREGO. O que é Economia Solidária. Disponível em: http://www.mte.gov.br/ecosolidaria/ecosolidaria_oque.asp . Acesso em 09 jan 2009.

- [20] MINISTERIO DO TRABALHO E EMPREGO. Sistema Nacional de Informações em Economia Solidária. Disponível em: . Acesso em: 19 de Fev. 2010.
- [21] PROGRAMA DAS NAÇÕES UNIDAS PARA O DESENVOLVIMENTO (PNDU). Relatório de desenvolvimento humano 2007/2008: combater as alterações climáticas: solidariedade humana num mundo dividido. Nova York: PNDU, 2007. Disponível em: . Acesso em: 14 set. 2010.
- [22] SILVA E SILVA, Maria Ozanira da; YAZBEK, Maria Carmelita (Orgs.) Políticas Públicas de Trabalho e Renda no Brasil Contemporâneo. Cortez Editora, 2008.
- [23] SINGER, Paul. Economia solidária versus economia capitalista. Sociedade e Estado [on-line], Brasilia, vol. 16, nº 1-2, jun/dez. 2001. Disponível em http://www.scielo.br/pdf/se/v16n1-2/v16n1-2a05.pdf>. Acesso em 27 de agosto de 2017.
- [24] _____Introdução à economia solidária. São Paulo: Editora Fundação Perseu Abramo, 2001.
- [25] Valenti, W. C. 2002. Aqüicultura sustentável. In: Congresso de Zootecnia, 12 o , Vila Real, Portugal, 2002, Vila Real: Associação Portuguesa dos Engenheiros Zootécnicos. Anais...p. 111-118.
- [26] Valenti, W. C. 2008. A aqüicultura Brasileira é sustentável? Palestra apresentada durante o IV Seminário Internacional de Aqüicultura, Maricultura e Pesca,Aquafair 2008, Florianópolis, 13-15 de maio de 2008. p. 1-11 (www.avesui.com/anais).
- [27] Valenti, W. C. & Tidwell, J. H. 2006. Economics and management of freshwater prawn culture in Western Hemisphere In: Leung, P. S. & Engle, C. (Ed.) Shrimp Culture: Economics, Market, and Trade. Oxford, Blackwell Science. p. 263- 278.
- [28] VASCONCELOS, E. M. Educação Popular nos serviços de saúde. São Paulo: Hucitec, 1997.

Use of Balanced Scorecard in Cooperatives Marlowa Zachow¹, Geysler Rogis Flor Bertolini²

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> Abstract— The cooperatives have some particularities connected to their principles, including the issue of selfmanagement. Through self-management it is defined that the members themselves, who are the "owners" of the cooperative, perform the management of the same. Strategic management, which plans the future and monitors results, is an important tool for the success of cooperative organizations. In this context, the Balanced Scorecard (BSC) has proven to be a useful tool for planning and monitoring financial and non-financial indicators. In the article, a systematic review was performed to verify the application of the Balanced Scorecard in cooperatives. The aim of the study was to conduct a theoretical analysis of the scientific discussion about the application of BSC in cooperative organizations. The result found in the 13 articles studied shows that it's possible and useful to apply BSC in cooperatives. Despite the success of the application, the number of articles on the subject can be considered small, and nothing specific was found to evaluate specific indexes of cooperativism, being something to be analyzed as a current limitation of the tool for use in cooperatives.

Keywords—Balanced Scorecard, Strategic management, Cooperative.

I. INTRODUCTION

Cooperativism is a social movement that unites people with common goals. Its main function is to gain strength, to achieve results that would be impossible individually. In Brazil there are currently about 6,828 cooperatives, together 14.6 million members. These bringing cooperatives employ 425.3 thousand people, being a sector of strong representation in the economy of the country. The cooperatives collected to the public coffers in 2018 a total of R\$ 7 billion in tributes, and injected more than R\$ 9 billion into the economy with the payment of salaries and benefits to employees (OCB, 2019a). Cooperatives have been seen as a form of economic development of territories, including helping some countries to overcome the crisis. These companies provide jobs and create wellbeing (ALFONSO; CUMPLIDO; GONZÁLEZ, 2016; JIMÉNEZ; STRANO, 2018).

One of the characteristics of cooperativism is that the members are the administrators. Within cooperatives there is the self-management process, which can be understood as a management process that involves social, political and economic criteria, seeking to eliminate the hierarchy of labor relations and arbitrary decisions (SANTOS, 2012).

Just as any organization is necessary the planning and control of activities to achieve the proposed objectives. However, the cooperative has a pluridimensionality, It's necessary to examine it not only on the basis of economic indicators, but also on a social basis, including issues related to the degree of cooperation (PINHO, 1982). The Balanced Scorecard (BSC) is a planning and control tool designed to evade traditional financial measures. Its creators sought to unite financial and nonfinancial measures, providing multi-item planning within an organization that can be easily monitored by all involved. Since its inception BSC has been widespread around the world, but its use isn't as intense in cooperative organizations (KAPLAN; NORTON, 1997).

A study of 114 articles published on BSC in 20 years realized the great use and importance of the tool. However, this study does not show the number of articles applied to cooperatives (HOQUE, 2013).

Given this, a great similarity is perceived between what cooperatives need for their management, and the objective of the BSC tool. The aim of this study is to conduct a theoretical analysis of the scientific discussion on the application of BSC in cooperatives.

II. THEORETICAL REFERENCE 2.1 Cooperativism

Cooperatives are organizations where a group of people come together for common ends. The basic idea of these ventures is to gain strength and competence to overcome together what would be very difficult individually (CORNELIAN, 2006). To the International Co-operative Alliance-ACI (2019) "A cooperative is an autonomous association of people voluntarily united to meet their common economic, social and cultural needs and aspirations through a democratically controlled and jointly owned organization."

Cooperatives aim to supply their members with goods and services and to carry out educational and social programs. According to the author, the cooperatives are based on the "Rochdale Pioneers Principles", which are: free membership, democratic management, fair interest on capital, proportional return on operations, transactions and money, political, religious and ethnic neutrality, and educational development. Cooperatives have a distinctive feature, which is to realize the interests of all people through a company with certain values and principles. And these principles that shape cooperatives (CHARTERINA, 2015).

The branches of cooperativism aren't a consensus in the literature, therefore, are considered the branches presented by the Organization of Cooperatives of Brazil (OCB), which are 13: Farming, Consumption, Credit, Educational, Special, Infrastructure, Housing, Production, Mineral, Work , Health, Tourism and Leisure, Transportation (OCB, 2019b).

The management of the cooperatives is democratic and free, the members choose the representatives and give them the decision-making power to manage society through accountability. Each member is entitled to only one vote, he may have more than one quota, but the vote is for uniqueness. Self-management can be considered a characteristic of cooperatives, as it is the members themselves who run the organization. While this is a gain, it can be a challenge. Besides the issue of self-management there is still the fact that the cooperative doesn't have the financial purpose of profit. Based on this it's important to remember that management need not only monitor economic indicators, but also social indicators. These indicators are to verify economic health and also health as an association of people, trying to demonstrate, for example, the solidarity of members in the company's activities, the degree of equity practiced in the cooperative, the importance attached to the democratic participation of members, their educational background, and indices that demonstrate the social impact of the cooperative, such as total employees and their distribution, salaries, impact of cooperative activities on their environment (PINHO, 1982).

2.2 Balanced Scorecard

BSC arose from the need for creators, Kaplan and Norton, to escape the traditional accounting model that prioritizes financial factors. According to the authors, the management process based on periodic financial reports no longer meets the needs of today's companies, requiring adaptation to cover other factors, such as valuation of intangible and intellectual assets. BSC tries to balance financial measures and organizational performance measures, becoming a management tool, not just of measures, adopted by many companies as a philosophy (KAPLAN, NORTON, 1997).

Companies that have been using BSC successfully, as a strategic management system to manage long-term strategy follow 5 principles: translate strategy into operational terms; align organization with strategy; turn strategy into everyone's task; convert strategy into continuous process and; mobilize change through executive leadership (KAPLAN; NORTON, 2000).

The Balanced Scorecard has 4 perspectives, which balance the short and long term objectives, the results obtained and the performance vectors of these results, the objective and subjective measures. The perspectives are financial, customer, internal business processes, learning and growth (KAPLAN; NORTON, 1997).

Financial objectives focus on the objectives and measures of other BSC perspectives. The use of financial measures is important as it may be the link between the other perspectives. Every measure selected for a scorecard must be part of a chain of cause and effect relationships that will ultimately result in financial objectives.

The customer perspective allows the company to align its customer-related outcome measures with specific customer segments and markets. Today's companies should be aware that if they don't align with customer preferences, their market will be taken over by competition (KAPLAN; NORTON, 1997).

Considered a third step, the internal process perspective is developed by defining a complete value chain, focusing on 3 main processes: innovation, operations and after sales services (KAPLAN; NORTON, 1997).

Learning and growth perspective objectives provide the infrastructure that makes it possible to achieve ambitious goals in the other three perspectives.

The perspectives were built on the basis of the balanced scorecard and, according to the authors, should not be a "straitjacket", that is, if the company presents another type of need not considered in these 4 perspectives, it can adapt (KAPLAN; NORTON, 1997).

Through extensive literature review and analysis of empirical studies, Quesado, Guzmán and Rodrigues (2018) were able to list numerous advantages and benefits of BSC implementation. The conclusion was that BSC is more than just a performance evaluation system. It is a strategic management tool that clarifies and translates organizational strategy, facilitating communication, alignment and learning.

III. METHODOLOGY

A systematic review was used to analyze the scientific production on Balanced Scorecard applied to cooperatives. Systematic review is a means to identify, evaluate and interpret available researchs relevant to a particular research problem (KITCHENHAM; CHARTERS, 2007).

It's possible through systematic review to know the topics already researched and the research gaps, mapping existing knowledge.

The objective was to analyze if the BSC can be applied in cooperative organizations, how it was done and what are the gains and difficulties. For this, we searched the Web of Science, Scopus and Spell databases, searching for articles from the creation of the tool until 2018. The choice of terms was based on the intended context. First term searched was "balanced scorecard" plus the word cooperative (or cooperativa) in order to verify what the authors have researched on the subject. The languages searched were Portuguese, Spanish and English. Only free articles were considered.

For reading and analysis of the research remained 20 articles. After understanding the articles, 7 were eliminated for not talking about the application or evolution of the balanced scorecard in cooperative organizations. The analysis is therefore based on 13 articles, published in Spanish, English or Portuguese, dealing with the importance or application of the balanced scorecard in cooperatives.

IV. RESULTS AND DISCUSSION

Only articles with the characteristics chosen from 2009 were found, which shows that it was slow to study the application of BSC in cooperatives, considering that the BSC was created in 1992. The number of publications per year doesn't follow any kind of trend or standard as shown in table 1.

	Number of	%
Year	publications	Accumulated
2009	1	7,69
2010	1	15,38
2013	3	38,46
2014	1	46,15
2015	2	61,54
2016	2	76,92
2018	3	100,00
Total	13	

Table 1: Articles published per year

The number of authors of articles varies between 1 and 4, but the highest concentration of articles is with the maximum number of 4 authors, as shown in table 2.

Regarding the language Portuguese is the leader with 10 articles, 3 more in English. No articles in Spanish were found.

Tahle	2	-Number	of	authors	ner	article
rubie	4	-i vaniber	o_I	annors	per	unicie

Number of authors	Number of articles	Accumulated (%)
1	2	15,38
2	3	38,46
3	3	61,54
4	5	100,00
TOTAL	13	

The country with the most articles published was Brazil with 10 articles, 1 published in the United States, 1 in Turkey and 1 in the United Kingdom. The application of the work was done in Brazil, France, Russia and Turkey, according to table 3.

Table 3 – Countries of publication and application	of
articles	

<i>unicies</i>					
Country	Publication	Application			
Brasil	10	10			
Estados Unidos	1	0			
Reino Unido	1	0			
Turquia	1	1			
Rússia	0	1			
França	0	1			
TOTAL	13	13			

Regarding the branch of cooperativism, articles were found in 6 different branches, as shown in table 4.

Table 4. Number of articles by branch of cooperativism

Branch	Quantity of articles
Farming	4
Credit	4
Consumption	2
Health	1
Work	1
Transport	1
TOTAL	13

The largest number of BSC applications is concentrated in farming and credit cooperatives with 4 articles each, followed by the consumer branch with 2 articles. Regarding what was covered in each article, the application of BSC was generally successful, or considered important and useful, as shown in board 1.

Board 1 -	Main	finding	of articles
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Article	Main finding
1	The criation of model uniting BSC and System
	Dynamics. The developed model allowed a
	better understanding of the relations between
	research and agricultural production, thus
	facilitating the process of analysis and decision
	of new investments in research by the managers
	and analysts of the farming cooperative under
	study (PROTIL et al. 2009).
2	Satisfaction assessment of members with BSC
	support. It was possible to evaluate satisfaction
	and to carry out an improvement plan
	(FERREIRA, 2010).
3	Verification if the performance appraisal
	methods in 2010 similar to GECON or BSC.
	The results showed that the managers of the
	institution use concepts from both models in the
	performance evaluation, but that this use was
	instinctive, as they demonstrated not knowing
	the institutionalized use of the models
	(MARTINS et al., 2013).
4	BSC was used to assess internal and external
	customer satisfaction. It was possible to apply
	and propose improvements in management
	(DINIZ et al., 2013).
5	Analysis of performance measures from
	customers perspective, considered most
	important by the cooperative. Realized the
	importance of customer proximity to ensure
6	customer satisfaction (GARCIA et al., 2013).
0	The use of performance measures makes it
	possible to translate organizational strategies at
	is in line with that established by the
	is in the with that established by the
	Scorecard made it possible to correct
	discrepancies between business units
	(BEUREN: SALLA 2014)
7	The use of BSC was considered the most
,	appropriate for developing and practicing
	business strategies (PRIZHIGALINSKAYA et
	al., 2015).
8	BSC is a form of performance appraisal usable
	in cooperative entities that have full definition of
	their long term strategy and forward thinking
	(PECH et al., 2015)
	× ···· · · · · · · · · · · · · · · · ·

9	It was possible to measure the results of the				
	cooperative, allowing to evaluate the				
	effectiveness of management and its				
	sustainability (OLIVEIRA; GIROLETTI, 2016).				
10	BSC is a form of performance appraisal usable				
	in the cooperative and provides a broad view of				
	the company's strategic control. It allows				
	managers to broaden control over organizational				
	performance, since from the annual strategic				
	planning restructuring analysis, one can propose				
	more strategies that can improve the proposed				
	BSC framework (BRIZOLLA et al., 2016).				
11	The use of BSC contributes to the identification				
	of strategies and definition of objectives and				
	goals to be achieved, as well as translating these				
	objectives into initiatives, facilitating decision-				
	making and internal process management				
	(Kruger et al., 2018).				
12	Cooperative members can identify their situation				
	and use the proposed methodology to formalize				
	a cooperative improvement management project				
	(JEANNEAUX et al., 2018).				
13	The importance of the learning and development				
	dimension was verified (BALABAN; FASAL,				
	2018).				

In all articles studied, it was concluded that the implementation of BSC is useful for the management of the Cooperative. In some cases, BSC was used in conjunction with other methodologies, but in neither case was the application interrupted or impossible. In some situations difficulties have arisen, but whenever it can be circumvented.

Despite the success in applying BSC or part of it in cooperatives, it can be said that the number of articles on the subject is small. This can be a symptom of some items, such as: lack of professionalism in the management of cooperatives, difficulty in applying the tool, understanding that management tools are only for profit-seeking companies, among others.

Another item that was verified is the lack of search for social indicators and of cooperation, being a tool that doesn't contemplate all aspects provided for in a cooperative.

V. CONCLUSION

The study of 13 articles selected for the research showed the possibility of applying BSC in cooperative organizations. In all cases of application, it was realized the utility of the tool as a way to provide strategic planning and evaluate the performance of the organization. The low number of articles shows the need to study the subject further, analyzing the reasons for not using the tool. Another fact that highlights the lack of specific studies focused on cooperativism was that there were no studies relating BSC perspectives with the principles of cooperativism.

REFERENCES

- [1] ACI-ALIANÇA INTERNACIONAL DAS COOPERATIVAS. Cooperative identity, values & principles. Retrieved from https://www.ica.coop/en/cooperatives/cooperative-identity.
- [2] ALFONSO, C. G.; CUMPLIDO, F. J. S.; GONZÁLEZ, M. O. B. Cooperativismo, factor empresarial y desarrolo económico: propuesta de um modelo teórico de enlace. *REVESCO*, v. 122, p. 110-134, 2016. Retrieved from https://revistas.ucm.es/index.php/REVE/article/view/52018
- [3] BALABAN, O.; FASAL, A. The importance and necessity of the "learning and development" dimension in the Balanced Scorecard: a study on de agricultural credit cooperatives of Turkey. *Journal Of Organizational Behavior Research*, v. 3, n. 2, p. 66–75, 2018. Retrieved from

https://odad.org/storage/models/article/i9YK0GuYO6xrEU dJPnUGazn8VkXgWkkQqeG2Ajzww7oGcx6NfxLZLc5F 9NvJ/the-importance-and-necessity-o.pdf.

- [4] BEUREN, I. M.; SALLA, N. M. DA C. G. Gerenciando por meio de medidas de desempenho: um estudo do impacto em uma cooperativa médica. São Paulo. Advances in Scientific and Applied Accounting, v. 7, n. 1, p. 38–65, 2014. Brasil. Retrieved from http://www.spell.org.br/documentos/ver/30585/gerenciando -por-meio-de-medidas-de-desempenho--um-estudo-doimpacto-em-uma-cooperativa-medica.
- [5] BRIZOLLA, M. M. B.; KAVESKI I. D. S. FASOLIN L. B.; LAVARDA, C. E. F. Proposta de uma estrutura de Balanced Scorecard para uma Cooperativa Agropecuária do Noroeste do Rio Grande do Sul. *Gestão & Planejamento*, v. 17, n. 3, p. 399–416, 2016. Salvador, Brasil. Retrieved from http://www.gewistes.unifoge.ht/index.php/geh/geth/acticle/view/2

http://www.revistas.unifacs.br/index.php/rgb/article/view/3 295/3034.

- [6] CHARTERINA, A.M. Las cooperativas y su acción sobre la sociedad. Revesco, v. 117, p. 34-49, 2015. Madrid, España. Retrieved from https://revistas.ucm.es/index.php/REVE/article/view/48144
- [7] CORNELIAN, A. R. A concepção de "economia solidária" em Paul Singer: descompassos, contradições e perspectivas. 2006. 99 f. Dissertação (Mestrado em Sociologia)-Faculdade de Ciências e Letras – UNESP, Araraquara, 2006. Retrieved from http://portal.fclar.unesp.br/possoc/teses/anderson_ricardo_c ornelian.pdf.
- [8] DINIZ, J. L. P.; GODOY, L. P.; STEFANO, N. M. O uso da ferramenta Balanced Scorecard com ênfase na satisfação dos clientes em uma cooperativa de pequeno porte.

GESTÃO. Org-Revista Eletrônica de Gestão Organizacional, v. 10, n. 3, p. 653–684, 2013. Recife, Brasil. Retrieved from http://www.revista.ufpe.br/gestaoorg/index.php/gestao/artic le/view/384%5Cnhttp://www.revista.ufpe.br/gestaoorg/inde x.php/gestao/article/viewFile/384/272.

- [9] FERREIRA, V. Balanced Scorecard : uma abordagem voltada ao cliente na Cooperativa de Crédito de Livre Admissão de Associados - Sicoob Canoinhas / SC Balanced Scorecard : an approach back to customer in the Cooperative Sicoob Canoinhas / SC. *Revista Catarinense da Ciência Contábil*, v. 9, n. 26, p. 9–25, 2010. Florianópolis, Brasil. Retrieved from http://www.spell.org.br/documentos/ver/33384/balancedscorecard--uma-abordagem-voltada-ao-cliente-nacooperativa-de-credito-de-livre-admissao-de-associados--sicoob-canoinhas-sc.
- [10] GARCIA, F. T.; FELIPE, L.; LOPES, D.; et al. Um estudo sobre indicadores de desempenho na perspectiva do cliente a partir do balanced scorecard a study on performance indicators in the perspective of customer from the balanced scorecard. *Revista de Administração da UNIMEP*, v. 11, n. 1, p. 51–80, 2013. Piracicaba, Brasil. Retrieved from http://www.raunimep.com.br/ojs/index.php/regen/article/vi ew/429/524.
- [11] HOQUE, ZAHIRUL. 20 years of studies on the balanced scorecard: Trends, accomplishments, gaps and ooportunities for future research. The British Accounting Review, v. 46, p. 33-59, 2013. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S089 083891300084X?via%3Dihub.
- [12] JEANNEAUX, P.; CAPITAINE, M.; MAUCLAIR, A. PerfCuma: A framework to manage the sustainable development of small cooperatives. *International Journal* of Agricultural Management, v. 7, n. 1, p. 54–65, 2018. Retrieved from https://www.researchgate.net/publication/330039585_Perf Cuma_A_framework_to_manage_the_sustainable_develop ment_of_small_cooperatives%0A.
- [13] JIMENÉZ, M. G.; STRANO, A. El cooperativismo social como repuesta a la crisis económica en el territorio calabrés. *REVESCO*, v. 129, p. 102-122, 2018. Retrieved from

https://revistas.ucm.es/index.php/REVE/article/view/62491

- [14] KAPLAN, R. S.; NORTON, D. P. A estratégia em ação -Balanced Scorecard. Rio de Janeiro: Campus, 1997.
- [15] KAPLAN, R. S.; NORTON, D. P. Organização orientada para a estratégia: como as empresas que adotam o balanced scorecard prosperam no novo ambiente de negócios. 13a Reimpr ed. Rio de Janeiro: Elsevier, 2000.
- [16] KITCHENHAM, B.; CHARTERS, S. Guidelines for performing systematic literature reviews in software engineering. , 2007. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.1 17.471.
- [17] KRUGER, S. D.; SIMIONATO, A.; ZANELLA, C. Balanced Scorecrd: uma proposta para a gestão estratégica

de uma cooperativa de crédito rural. *Revista de Administração da UFSM*, v. 11, n. 6, p. 1–18, 2018. Santa Maria, Brasil. Retrieved from http://www.spell.org.br/documentos/ver/49748/balanced-scorecard--uma-proposta-para-a-gestao-estrategica-de-uma-cooperativa-de-credito-rural%0A.

- [18] MARTINS, V. G.; GIRÃO, L. F. DE A. P.; SILVA E FILHO, A. C. DA C.; ARAÚJO, A. O. A Utilização de Modelos de Avaliação de Desempenho Sob a Perspectiva do Gecon e do Balanced Scorecard: Estudo de Caso em uma Central de Cooperativas de Crédito. *Revista Evidenciação Contábil & Finanças*, v. 1, n. 1, p. 99–117, 2013. João Pessoa, Brasil. Retrieved from http://periodicos.ufpb.br/ojs2/index.php/recfin/article/view/ 16276/9489.
- [19] OCB. ANUÁRIO DO COOPERATIVISMO BRASILEIRO. Brasília, 2019a.
- [20] OCB. Ramos do Cooperativismo. 2019b. Retrieved from https://www.ocb.org.br/ramos.
- [21] OLIVEIRA, O. M. DE; GIROLETTI, D. A. Avaliação de Programa de Responsabilidade social Empresarial com Aplicação do Balanced Scorecard: Um Estudo de Caso da Cooperárvore da FIAT Automóveis. *Revista de Gestão Ambiental e Sustentabilidade*, v. 5, n. 1, p. 144–159, 2016. São Paulo, Brasil. Retrieved from http://www.revistageas.org.br/ojs/index.php/geas/article/vie w/478.
- [22] PECH, L. M.; RAMOS, F. M.; FAVRETTO, J.; ARTIFON, R. L. Utilização do balanced scorecard em ambientes cooperativistas. *REUNA*, v. 20, n. 3, p. 5–26, 2015. Belo Horizonte, Brasil. Retrieved from http://revistas.una.br/index.php/reuna/article/view/682/622.
- [23] PINHO, D. B. A empresa cooperativa. In: D. B. Pinho (Org.); Administração de Cooperativas, 1982. São Paulo: CNPQ.
- [24] PRIZHIGALINSKAYA, T. N.; TERNOVSKY, D. S.; UKOLOVA, L. V.; PIANKOVA, M. G. Strategic Potential and Potential of Consumer Cooperation Organizations Development: Methodology of Formation and Assessment. *Journal of Internet Banking and Commerce*, v. s1, n. 006, 2015. Candler, Estados Unidos da América. Retrieved fromhttp://www.icommercecentral.com/openaccess/strategic-potential-and-potential-of-consumercooperation-organizationsdevelopment-methodology-offormation-and-assessment.php?aid=62391.
- [25] PROTIL, R. M.; FERNANDES, A. DA C.; SOUZA, A. B. K. Avaliação da pesquisa agropecuária em cooperativas Agroindustriais Utilizando Um Modelo De Scorecard Dinâmico. *RCO – Revista de Contabilidade e Organizações*, v. 3, n. 5, p. 62–79, 2009. Brasil. Retrieved from http://www.spell.org.br/documentos/ver/4875/avaliacao-da-

http://www.spell.org.br/documentos/ver/48/5/avaliacao-dapesquisa-agropecuaria-em-cooperativas-agroindustriaisutilizando-um-modelo-de-scorecard-dinamico.

[26] QUESADO, P.; GUZMÁN, B. A.; RODRIGUES, L. L.. Advantages and contributions in the balanced scorecard implementation. *Intangible Capital*, v. 14, p. 186-201,

2018.	Retrieved	from
http://www.inta	ngiblecapital.org/index.php/ic/	/article/view/
1110		

[27] SANTOS, J. H. DOS. Recuperação de empresas por meio da autogestão. In: S. O. Pitaguari; S. M. A. Cordeiro; L. M. B. Lanza (Orgs.); *A sustentabilidade da economia solidária: contribuições multidisciplinares*. p.318 105–126, 2012. Londrina: Universidade estadual de Londrina.

Sleep Disorders and Musculoskeletal Complaints in Undergraduate Students who make Constant use of smartphones SIMÃO, Lívia Oliveira, SMARZARO, Luiz Paulo Lucas, SANTOS, Hélio

Gustavo

Abstract— The current study was developed aiming to evaluate sleep habits and musculoskeletal complaints in undergraduate students from São Camilo University Center- ES, who make constant use of smartphones, making it possible to identify the main factors affecting their sleep quality besides the pain levels and sites of the sample analyzed. **Objective:** Within all its functions, Ergonomic Physiotherapy evaluates postural changes and sleep disorders in smartphone users evidencing the students from this university as target audience in this study. Through this evaluation it is possible to identify existing sleep disorders and musculoskeletal complaints. **Method:** The research was carried out with university students during the class hours, employing questionnaires and it counted on 1,603 students from different courses in São Camilo University Center. **Conclusion:** Through this study, we concluded that in the contemporary world more and more people are making frequent use of smartphones, mainly college students.

Keywords—Sleep; Smartphones; Students.

I. INTRODUCTION

Due to the use of smartphones, users acquire a poor posture, which is really harmful to health. Bad postural habits constitute a collective health problem, affecting students of both sexes as well as in different ages [1]. The individual who makes constant use of smartphones tends to acquire this poor posture, mainly in cervical region. According to Kim [2], the term Text Neck refers to the posture of individuals who keep their head tilted, looking at the cellular screen. Specialists state that cases of Text Neck are more and more common, which causes headaches because of tension on neck and back of the neck exactly due to the time the individual spends with head tilted in order to visualize the device. Tamura and Bertolini [3] say that a right posture preserves among others organs and bones, the spine, which is the supporting structure of our body, and also responsible for protecting medulla and nerve roots, and for body movements. According to the authors [4,5], the postural alterations lead to several problems in spine caused by several factors. The pain occurs due to an overload; decreased range of motion caused by unbalance in flexibility; muscle weakness and fatigue due to a long period in a poor posture; disorder in synesthetic perception of body alignment for wrong habit and incapacity to correct posture. It should be recalled that, besides causing postural alterations, the constant use of smartphones also causes sleep disorders. The college students are especially subject to changes in their life style

deal with technologies like smartphones to help in their studies or even in social life in view of facilities and multiple functions technological advancement provides. One can note a significant increase in number of users, mainly during the last decade. Because of its continuous use in personal and professional lives, smartphones became a man's extension concerning systemic relations of use. Thus, it is noticeable some inadequacies in ergonomic aspect [6,7]. In fact, the problem is this overuse inflicts disorders in sleep-wake cycle, because the emitted light by the device disturbs the sleep. Therefore, the higher education students, being most of them young people, can present sleep deprivation and daytime sleepiness. As a consequence, they suffer from memory problems, problems with their academic performance, behavioral issues, irritability, tension and anxiety. Thus, according to Martini et al [8], this target group needs attention concerning their sleep complaints in order to make it possible to prevent and diagnose these disorders as soon as possible. For Castilho et al [9], besides curricular activities in full time, it is important to note that these students, who are in search of a high professional qualification, add other extracurricular activities on their training, such as: free courses, academic league, internships, scientific initiation and tutoring. This way, they are subject a heavy pressure and stress because of high performance and time required in these studies. So, most of them use smartphones for

and in their pattern in sleep cycle, because most of them

unlimited time, impairing the sleep cycle, making it clear that the light of these devices is harmful to the long time users. Martini et al [8] reports that the sleep-wake cycle is influenced by endogenous and exogenous factors and one of their main synchronizers is the emitted light, in other words, the light/ dark cycle. However, social aspects like familiar routine and working hours affect the sleep duration of these individuals.

This study has proposed to evaluate the sleep habits and musculoskeletal complaints of undergraduate students in São Camilo University Center, ES, who use smartphones. Following the methodology, Students of both genders and from different courses and period of study were subject to questionnaires (Identification of the individuals subject to the research, Nordic Questionnaire for musculoskeletal symptoms and Epworth Questionnaire for sleepiness). The site for the questionnaires submission was the University Center (in rooms before prior authorization). The study is characterized as a field study and was carried out in São Camilo University Center, district of Paraíso, in the city of Cachoeiro de Itapemirim, State of Espírito Santo. The research consists in a great number of undergraduates. Today, this University Center has an average of 3.500 undergraduate students, of both genders, attending the following courses: Architecture and Urban Planning, Gastronomy, Administration, Biology, Accounting, Law, Graduation and Bachelor's Degree in Physical Education, Nursing, Environmental Engineering, Civil Engineering, Engineering, Pharmacy, Physiotherapy, Production Nutrition, Information Systems, Mathematics, History, English and Pedagogy. It was selected students between 1st and 10th periods, attending classes in morning, afternoon and night periods. The time for data collecting was from 7 a.m. to 22 p.m. (start and finish times), from Monday to Friday. The researchers interviewed the students in May, June, July, August and September. All of the scholars were invited to participate in the research. After approval of the Ethic in Researches Committee (CAEE) # 665110617.0.000.0062 and the ruling number 2.028.619, the researchers got in touch with the Course Coordinators and professors of each area, asking for authorization in order to administer the Identification of individuals, Nordic and Epworth questionnaires. The students who accepted to participate in the research signed a consent term. The Epworth questionnaire aims to evaluate the sleep quality and the Nordic one aims to evaluate the musculoskeletal aspects. To fill out the questionnaires, the students spent between 10 and 15 minutes, in order to not interfere with the classes and the break. After this, an analysis of data was performed aiming to conclude the study. We always emphasized our goals in the evaluation of pain complaints and the sleep quality of

the undergraduates. After carrying out this research, some data about pain, sleepiness, physical activities level, stress perception, work and use of smartphones were discussed.

It is known that most of São Camilo University Center students have a busy life while studying. Many of them work all day long and others live in neighboring towns to Cachoeiro de Itapemirim. This data was collected in the questionnaire of individual identification.

The proposal of this research after achieving this result: consciousness lectures; Inclusion criteria: all the students who are in favor of participating in the research and sign the free and clear consent term (TCLE). Exclusion criterion: non-enrolled students but in the University Campus; Elementary and High school students; postgraduation course students and students who did not sign the TCLE.

For data analysis, descriptive statics was employed (absolute and relative frequencies) for the questionnaire on the population characteristics as well as for Nordic and sleep questionnaires. For all the analyses it was used the SPSS statistic program, version 23.0.

After the sample estimation, a number of 1.594 undergraduates participating in the study were found, taking into consideration the 3.500 students of São Camilo University Center. At the end of the study, 1.603 students were interviewed.

All prevention actions were taken in order to avoid any moral and ethical damages for the participating individuals. It was also taken in account their privacy and confidentiality regarding the collected data. There were not found risks during the research with respect to the students picture themselves ill or with any other problem because of the topic discussed. They were advised they could feel a little uncomfortable in answering the questionnaires. Benefits of the research: learn about the best posture for everyday academic life; learn about the risks of sleep deprivation and its impact on life quality; use the result of the research for healthy habit changes; take new actions to prevent pain development and sleep deprivation.

II. RESULT AND DISCUSSION

Undergraduate Students' Age

The age of the undergraduates who participated in the research varied from 16 to 62 years old. The complaints were most frequent among people between 16 and 20 years old, representing 48.1% and between 21 and 25 years old, representing 36%. The students between 26 and 62 years old represented 16.3%.

The women were 63.8% from the total of interviewees. The prevalence of women in higher education is a worldwide phenomenon, which was found to be a reality in the last decades (10). The male participants were represented by 580 individuals.

Undergraduate Students' Physical Exercises Practice

Concerning physical exercises practice, 877 students (54.7%) are sedentary, in other words, they do not practice any kind of physical activity; 726 student stated they do physical exercises, thus, representing 45.3% of the participants. The exercises most practiced by the students are: weight lifting (403), jogging (241) and walking (197). Other modalities were also cited. They are: cross fit, fight, gymnastics, functional training and sports (soccer, volleyball and handball, for example). For Souza and Borges, and Santana and Peixoto [11, 12], physical activity is of great importance for health, life quality and welfare and also has a preventive effect against several illnesses and contributes to lessen anxiety, stress, the alterations in mild depression, in humor, self-esteem and contributes to positive attitudes. For students, physical activities help them to have a greater willingness and better mood to carry out the activities, which can influence in a positive way, their academic performance.

Undergraduates' Diet

The study shows 30.1% of the students have only two of the most important meals during all the day. This is a significant result, because it is not enough to keep a healthy body. Only t 6.6% has six daily meals, and 0.1% has seven meals. According to Silva and Busnello [13], it is part of the context to promote health in which it is said that the eating habits initiated during childhood go throughout adult life, but these habits can be affected when the individual enters university. It is justified due to the complex change in routine. The eating habits are complex; the life style orientates feeding in terms of local, schedule, number of companions during meals and financial conditions.

Undergraduates' Stress

The research revealed the undergraduates are stressed. From all the participants, 1178 stated to be stressed, which represents 73.5%. Those who said they are not stressed were 425, representing 26.5% of the sample. Santos [14] asserts the students face new challenges when starting college. Such challenges are different from those in the previous academic life. They are going through a new stage in life, when they have to adapt a new life style, becoming responsible for themselves and for their professional future. When these aspects are not well managed it can be harmful and impact their social as well as personal life, even bringing on physical and psychological complications, such as stress. Stress is considered the disease of this century and its index increases more and more in the world population. The university students represent a group with a higher probability to be affected by stress which interferes with the full training of these future professionals [15]. The most influential factors, according to Silva et al [16], are the tests and projects the students have to carry out, the need to balance work and study, the difficulty in finding time for family and leisure, the little professional perspective, uncertainty, the course and work load, the difficulty in getting the resources and study materials, relationship with classmates, lack of someone to share such difficulties, lack of positive feedback concerning what is carried out, relationship with professors and the difficulty in developing techniques. Yet, the evaluation periods demand a lot from the students which is a physical and emotional overload for them; the tension and need to do the best they can.

Undergraduates' Occupation

A number of 1073, or 66.9%, of undergraduates have to split their time between work and study, while 31.3%, a total of 530, assert they only study and do not have to bear the costs of living. For the authors, the long distance between work and college, mainly in large cities, is an exhausting factor for those who work all day and study at night causing the students to become extremely physical and psychological tired and affects their academic performance. The same happens for those who come from neighboring cities to attend college. In addition to this, there is still the traineeship, which is, most of time, in the morning time, interfering with work performance.

Table 1- Undergraduates	' nocturnal S	Sleep hours
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Sleep Time (Hours)	Absolute Frequency (AF)	Relative Frequency (RF)	
4 to 6 hours	790	49.3%	
7 to 9 hours	813	50.7%	
Total	1603	100%	

Source: (The Author, 2017)

In the Table 1 we can note that the most frequent quantity of nocturnal sleep hours presented by the students is that of 6 hours, which corresponds to 29.0% from the participants. Secondly, we have 26.3% for the students who reach 7 hours. Those who sleep 5 hours or less totalize 20.0%. Yet, 107 undergraduates stated they can sleep more than the

essential per night (8 hours). We also considered that a great deal of these individuals use smartphones before sleeping, justifying many disturbs presented by the users. According to Fonseca et al [18], sleep is a vital phenomenon, as necessary to our preservation as eating. Sleeping has a fundamental biological function for memory consolidation, balance of endocrine functions, thermoregulation, to retain and regain energy and to restore brain energetic metabolism. For Lira and Freitas [19,20], its extensively known the importance of an appropriate sleep standard, which includes duration, resulting in good health and physical and metal conditions, as well as it is also known the effects of a restful sleep deprivation, affecting the individual's quality of life, interfering with his academic and professional performance, among others. It also makes the individual to become prone to illnesses and, consequently, to lower life expectancy. The social environmental factors like appropriate nutrition, sedentary lifestyle, school schedule, directly affect sleep. These factors lead the students to go to bed late and, this way, becoming drowsy.

Table 2- Undergraduates' constant use of smartphones

Smartphone Usage	Absolute Frequency (AF)	Relative Frequency (RF)	
No	77	4.8%	
Yes	1526	95.2%	
Total	1603	100%	

Source: (The Author, 2017)

In the Table 2, one can note 1526 (95.2%) of the undergraduates make constant use of their smartphones either for social nets or calls, photos, music, etc. on the other hand, 77 (4.8%) reported they do not use cellphones for a long time during the day, just for the necessary. Yet, others asserted they do not have a cellphone. Due to the technology evolution, the HHD usage has increased worldwide. More and more people acquire smartphones,

tablets, notebooks, and the like. Mobiles have a variety of functions helping people in their everyday life. It is possible to instantly communicate with others in different ways: visually, by audio or texting. It does not matter how distant they are from us. Yet, we can conduct business and bank transactions, access information about the worldwide events in real time and others, besides providing us with entertainment.

 Table 3- Frequency of smartphones usage by undergraduates (hours/ day)

Usage Frequency (hours/ day)	Absolute Frequency (AF)	Relative Frequency (RF)	
Never use	71	4.4%	
Less than 3h/ day	224	14.0%	
3h to 6h/ day	520	32.4%	
6h to 10h/ day	373	23.3%	
10h a 15h/ day	415	25.9%	
Total	1603	100.0%	

Source: (The Author, 2017)

Above, the table shows the duration in hours the undergraduates use smartphones per day. The highest prevalence was between 3h and 6h with 520 users, representing 32.4% of the participants; 788 students asserted they use their HHD between 6h to 10h or 10h to 15h per day, which represents almost half the interviewees, or, 49.2%; 71 students reported they do not use it any moment during the day; and 224 participants, 14.0%, use their smartphones less than 3h/ day. According to Spritzer et al [24], nowadays, for many people it seems impossible to live their lives without facilities it can offer. However, its excessive usage can result in several complaints about physical and emotional alterations. The users can present

anxiety, irritability and sadness when distant from their HHD. On the other hand, the wrong way of using smartphones can be triggered by an attempt to alleviate these symptoms. All of this can alienate the users from real life (social life, physical activities), endangering relationships, work and studies.

The Table 4 shows the probability the students would nap during the situations described like reading or watching TV or nap while sitting. Such situations are Epworth Sleepiness Scale's. The score can be "0"- never would nap; "1"- small probability to nap; "2"- medium probability to nap; and "3"- high probability to nap. The "never and small probability to nap" when mostly marked, it indicates the individual do not suffer from excessive daytime sleepiness. For Pascotto e Santos [25], when the individual largely marks the "medium or high probability", it indicates the individual suffers from excessive daytime sleepiness. To reach the number of students who suffer from sleep disorders such as daytime sleepiness, we had an average for each situation as shown on the following table.

Table 4			
Situations	Never and small probability	Medium and high	
	to nap	probability to nap	
sitting and reading	46.6%	53.4%	
watching TV	38.0%	62.0%	
seated at public place	75.8%	24.2%	
riding on passenger's	50.3%	49.7%	
seat			
sitting after lunch	31.0%	69.0%	
Stuck in traffic for	83.6%	16.4%	
Some minutes			
Table 4 Epworth Sleepiness Q	Questionnaire Result		
Total of each situation 100%	54.2%	45.8%	

Source: (The Author, 2017)

In the Table 4 we can find all the percentages of the situations presented in the Epworth Sleepiness Questionnaire; for each situation the total was 100%. Three from all situations had a higher score: sitting and reading (53.4%), watching TV (62.0%) and sitting after lunch (69.0%). In these situations, the students marked "medium" or "high" probability to nap during daytime. The other three situations had a higher probability for "never" or "small" with respect to nap during daytime: seated at a public place (75.8%), riding on passenger's seat (50.3%) and stuck in traffic for some minutes (83.6%).

After all these data, the percentage rates for never and/or small and medium and/ or high probabilities were added up, reaching a final average of 54.2%, or, approximately, 869 students who, according to Epworth Scale, are not subject to nap, to daytime sleepiness and others sleep disorders. For those undergraduates who present some kind of sleep disorders the score was 45.8%, or, 734 students. Excessive daytime sleepiness is characterized by an increased feeling of sleeping and a decrease in alertness, as asserted by Pereira et al [26]. It is worth pointing out that, in Brazil it is common to have graduation courses offering classes in the morning, afternoon or evening. Thus, the studies reveal the nocturnal period students present shorter sleep duration and more sleep and tiredness complaints. According to Obrecht et al [27], this is because many of them work during the day, increasing their responsibilities and reducing the time for personal matters. The same Epworth daytime sleepiness Questionnaires were employed in a recent and similar study carried out by Moraes et al [28] with a group of 157 Medical students and, according to the scale, 36.3% of the students presented excessive daytime sleepiness. Again, it was proved that the rate of students who suffer from this disorder is high.

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Pains in the last 12 months on	Absolute Frequency (AF)	Relative frequency (RF)
neck	784	49.9%
shoulders	697	43.5%
upper back	861	53.7%
elbow	124	7.7%
wrists/ hands	702	43.8%
lower back	762	47.5%
hip/ thigh	339	21.1%
knees	487	30.4%
ankle/ feet	538	33.5%
Source: (The Author, 2017)		

Table 5- Nordic Questionnaire- Students who, in the last 12 months, presented pains in parts of the body cited below:
The table 5 addresses the musculoskeletal pain complaints on the parts of the body distinguished. This table only accounts for the absolute and relative frequency the students complained about pains in the last 12 months. The parts of the body involved when the students make use of their smartphones at home, work or even, at college present a remarkable number of complaints. A number of 784 students (49.9%) reported some kind of discomfort, pain or tingling in the last 12 months, representing almost half the sample of the research which has a number of 1603 participants. In the shoulders, the complaints came from 697 students (43.5%); upper back was the region with a major number of complaints in the last year: 861 (53.7%); wrists and hands accounted for 702 complaints (43.8%) by being very required to hold the HHD and text; lower back had a significant number of complaints, 762 (47.5%). Yet, some parts of the body which are theoretically less required when using smartphones were also in the Nordic Questionnaire presenting the following rates: hip/ thigh 339 (21.1%), knees 487 (30.4%) and ankle/ feet 538 (33.5%) of the complaints. The undergraduates may not have a good posture when using smartphones whether sitting or lying, damaging lower limbs.

All of these physical health problems related to new technologies usage can be prevented by moderate use of the HHD and a good posture [29, 30]. Guterres et al [29], carried out a study with 100 individuals, with mean age of 25, most of them women (54%) and 97% used HHD. Among the interviewees, 48.0% make use of this device up to 5 hours a day; 52.0% between 5 and 10 hours a day or more. The most frequent musculoskeletal complaints reported were: neck (49.4%), wrist and hands (37.9%), shoulders (28.7%) and lower back (18.4%). Remembering that, the participants could mark more than one option.

It is then understood the importance of using smartphones as transformers and influencers in human relations around the world, generating several opportunities to store, collect and share information at a faster pace (Reischl et al. 2018), having smartphone applications. , designed to improve the consumer's experience of its use (Hambrock, 2019). These electronic devices have invaded society and people's lives and are still increasing in popularity (Chuang, 2018).

Although excessive smartphone use in adolescents is often criticized (Aljomaa, et al. 2016; Toh, 2019), it can nevertheless be effectively used for learning and education. Young students demonstrate а deep appreciation for their multifaceted and highly personalized learning experiences on smartphones (Chan, 2013).

III. FINAL CONSIDERATIONS

Through this study, we conclude that, in the contemporary world, more and more people are frequently using the smartphones, mainly college students. So, due to the use of this device in a poor posture for long periods, many musculoskeletal pathologies and sleep disorders have been developed.

REFERENCES

- Freitas, KL. Spine changes due to the poor postural habits among students in Campina Grande, State of Paraíba. Term paper. Paraíba State University. Campina Grande, 2014.
- [2] Kim MS. Influence of neck pain on cervical movement in the sagittal plane during smartphone use. Journal of Physical Therapy Science, 2015; 27 (1): 15-17.
- [3] Tamura TM. Bertolini SM Marques Gomes. The influence of academic life in undergraduates' sitting posture. In: VI Work Exhibition on Scientific Initiation; Maringá, BR. Paraná: Cesumar, Oct. 2012.
- [4] Borges LF et al. Postural analysis in students aged 10- 12 years old at Américo Antunes State School, in São Luís de Montes Belos, GO. Journal Montes Belos College. 2016; 8(3): 178- 198.
- [5] Aminian O, Banafsheh Alemohammad Z, Sadeghniiat-Haghighi K. Musculoskeletal disorders in female dentists and pharmacists: a cross-sectional study. Acta Med Iran 2012; 50: 635-40.
- [6] Pereira JF, Paschoarelli, LC, Medola, FO, "Evaluation of Smartphone Usage in incidence of Compressive Neuropathy: Carpal Tunnel Syndrome". In: 10 Applied Ergonomy International Congress, 2016; 3(3): 933-942.
- [7] Silva T de Oliveira, Silva LT Gomes. The social, cognitive and emotional impacts on adolescents connected to digital technologies. Journal of Psychopedagogy, 2017; 34(103):87-97.
- [8] Martini M, Louzada FM, Pereira ÉF, Brandalize. Factors related to sleep quality in Physiotherapy students. Physiotherapy Research. 2012, 19 (3): 261-267.
- [9] Castilho CP, Lima LMD; Monteiro ML, Silva PH, TA. Sleep deprivation in health students working at Basic Healthcare Units and its consequences. Journal of Medicine (São Paulo), 2015; 8(2) p 113-119.
- [10] Ricoldi, A. M.; Arts, Amélia Cristina Abreu. Women in Brazilian Upper Education: Guaranteed Place and new challenges. Ex Aequo (Oeiras). 2016; 33(1): 149-161.
- [11] Sousa K Jamile de, Borges G Faccin. Life Style, Physical Activities and Academic Coefficient of College Students from the countryside of Amazonas- Brazil. Health Science Brazilian Journal.
- [12] Santana J de Oliveira Peixoto, S Vianna. Physical inactivity and behavior unfavorable to professors' and students' health. Medicine and Sports Brazilian Journal. 2017;23(2);103-108.

- [13] Silva KM, Busnello MB, Nutrition Students' Eating Habits . Nutrition Course Term Paper. District University of Northtwest of Rio Grande do Sul State. Ijuí, RS- 2013.
- [14] Santos Já de Freitas. Physiotherapy Students' Stress. Health Science Brazilian Journal. 2012; 16(2):89-94.
- [15] Máximo CN, Fortes IG. Undergraduate Students' Stress and Cortisol Levels: Literature Review. Health, Batatais. 2016; 5(2); 67-77.
- [16] Silva V Lúcia dos Santos et al. Stress factors in the last year of Nursing graduation course: Students' perception. Nursing Journal, Uerj, Rio de Janeiro, 2011; 19 (1); 121-126.
- [17] Moreira CA, Lima FM, Silva PN. The hard task for nocturnal college students to balance work and study. Interdisciplinary: Univar e- Journal. 2011; 1(6):51-56.
- [18] Fonseca ALP, Zeni LB, Flügel NY, Sakae TM, Remso KVT, Comparative Study on sleep quality among college students in an educational institute in the South of Santa Catarina State. Arq Catarin Med. 2015; 44(4):21-33.
- [19] Lira JM. Sleep duration and nutritional condition among adolescents in public schools in Campina Grande, PB. 2014. 48f. Term Paper (Nursing Graduation Course)-Paraíba State University, Campina Grande, 2014.
- [20] 20-Freitas CCM, Gozzoli ALDM, Konno JN, Fues VLR. Relation between cellphone use before sleeping and the sleep quality and daytime sleep. J. Med. (São Paulo). 2017 jan- march; 96 (1);14-20.
- [21] Coelho AFM. Undergraduate students' sleep quality evaluation and its relation with temporomandibular muscles (Master' Thesis, Fernando Pessoa University, Porto). 2014.
- [22] Langame AP, Chehuen Neto JA, Melo LNB, castelano ML, Cunha M, Ferreira RE. Undergraduate students' life quality and their academic performance. J. Health Support. 2016; 29(3): 313-325.
- [23] Ribeiro Q, Silva RB. The impacts of hand held devices on people. FATEC Journal, Southern Zone, 2015; 2(1): 1-19.
- [24] Spritzer DT, Restano Aline, Breda Vítor, Picon Felipe. Techonology Addiction; Evaluation and diagnosis. Debates in psychiatry Journal. 2016: 25-29.
- [25] Pascotto ACS, Santos BRM. Sleep quality evaluation in health Science students. Health Science Institute Journal. 2013; 31(3):306-310.
- [26] Pereira ÉF, Barbosa DG, Andrade RD, Claumann GS, Pelegrini A, Louzada FM. Sleep and adolescence; How many hours do the adolescents need to sleep? Psychiatry Journal. 2015; 64(1): 40-44.
- [27] Obrecht A, Collaço I, Valderramas S, Miranda K, Vargas E, Szkudlarek A. Sleep quality analysis of undergraduate students in different study time. Neuroscience Journal. 2013; 21(2); 205-210.
- [28] Moraes C A T, Edelmuth DGL, Novo NF, Hübner CVK. Sleep quality of medicine students in problem-based learning method. Medicine (Ribeirão Preto). 2013; 46(4); 389-97.

- [29] Guterres JL, Smith FS, Oliveira LC, Simon CS, Lopes AR. Main complaints concerning the excessive use of hand held devices. Pleiade Journal. 2017; 11(21): 39-45.
- [30] Panato K Biatech. Evaluation of muscular stress points in smartphone users. Term Paper- Federal University of Santa Catarina. Araranguá, 2017.
- [31] Reischl U, Salinas O, Oberleitner R, Mijovic B. Nursing studentremote performance assessment using a novel smartphoneapplication. In:Proceedings of the international symposium onhuman factors and ergonomics in Health care. Sage India.NewDelhi, India: SAGE Publications; 2018:17-20.
- [32] Hambrock HB, Richter RG. A pedagogical approach towardscurating mobile apps in an educational context. In:Ubiquitousinclusive learning in a digital era. IGI global. 2019:81-106.
- [33] Chuang YH, Lai FC, Chang CC, et al. Effects of a skilldemonstration video delivered by smartphone on facilitatingnursing students'skill competencies and selfconfidence: a ran-domized controlled trial study.Nurse Educ Today.2018;66:63-68.
- [34] Aljomaa SS, Qudah MF, Albursan IS, Bakhiet SF,Abduljabbar AS. Smartphone addiction among university stu-dents in the light of some variables.Comput Hum Behav.2016;61:155-164.
- [35] Toh SH, Howie EK, Coenen P, et al. "From the moment I wakeup I will use it...every day, very hour": a qualitative study on thepatterns of adolescents'mobile touch screen device use fromadolescent and parent perspectives.BMC Pediatr. 2019;19(1):30.
- [36] Chan NN, Walker-Gleaves A, Remedios R.Ubiquitous learning:the lived experience of students learning with smartphones.InProceedings of the Sixth Conference of MIT's Learning In-ternational Networks Consortium (LINC 2013); 2013 Jan 1.

Influence of Some Parameters in Seed Germination of *Acacia mangium* **willd**

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Abstract— The objective of this work was to analyze the influence of pH, amount of water on the substrate and salinity on the germination of Acacia mangium Willd seeds. Three experiments were performed. To verify the pH effect, five treatments corresponding to the levels (3.0, 5.0, 7.0, 9.0 and 11.0) were used. As for the amount of water in the substrate, four treatments were evaluated: T1- water quantity 1.5 times the substrate weight (~ 3 ml); T2 - amount of water 2.0 times the weight of the substrate (~4 ml); T3 - amount of water 2.5 times the weight of the

substrate (~ 5 ml) and T4: amount of water 3.0 times the weight of the substrate (~6 ml). In the analysis of the effects of salinity on germination, three aqueous solutions were evaluated: potassium chloride (KCl), calcium chloride (CaCl2) and sodium chloride (NaCl) in 4 concentrations (25, 50, 75 and 100 million mM). All experiments were conducted on four replicates of 50 seeds for each treatment. The amount of water 2.5 times the weight of the substrate leads to higher germination of the acacia seeds, but with increasing salinity, there is a continuous decrease of germination, IVG, and initial growth, mainly with the salts KCl and CaCl2. The pH where the seeds had the best germination corresponded to pH 3.

Keywords—pH; saline stress; water; physiology; biochemistry.

I. INTRODUCTION

Acacia mangium Willd is a fast growing, rustic and tolerant tree species tolerant to a wide range of soil types and environments GRIFFIN (2014). In Brazil, this species is popularly known as acacia, and its wood is usually used in the production of pulp, paper, particle board, and agglomerates, and also presents great potential for the production of sawn wood, alloys, furniture, firewood and charcoal, according to its calorific value (between 4800-4900 Kcal kg-1) KRISNAWATI et al. (2011).

It is of fundamental importance to know the proper conditions for seed germination since these can interfere in this process CARVALHO and NAKAGAWA (2012). Many studies on seed phenology seek methods for the breakdown of dormancy and the influence of environmental factors and conditions that affect the germination process, such as water quantity, salinity and pH, in a recent paper by the University of California, Los Angeles, California, and colleague NUNES et al. (2009); GONÇALVES et al. (2015).

In addition, it is important to note that germination is the most important factor in the germination process in the germination process STEFANELLO et al. ([date unknown]), REGO et al. (2011). When germination tests are carried out in the laboratory, the moisture of the substrate must be maintained uniformly to supply the seeds with the amount of water necessary for germination and development, however, excess moisture can cause a decrease in germination and increase the incidence of fungi, leading to reduced viability FIGLIOLIA and OLIVEIRA (1993).

Salinity is an important parameter to be analyzed for being a stress factor for plants. The increase in salinity causes the reduction of the water potential of the substrate, reducing the gradient between the substrate and the surface of the seed, causing a restriction in the water absorption by the embryo, which, together with the toxic effects of the salts, directly interferes with the germination process of seeds DEMINICIS et al. (2007).

The pH can be another factor that becomes one of the critical points of the germination test, according to the quality system precepts GADOTTI et al. (2013). Many investigations regarding the use of inorganic acids to overcome dormancy have been carried out, but there are few studies about the interference of acids and bases in the germination process CAVALCANTE and de PEREZ (1996). Assumpção and Perine (2016) ASSUMPÇÃO and PERINI (1993) found that the germination potential of S. occidentallis (L.) Link increased significantly when subjected to chemical scarification with sulfuric acid. For this reason, it is significant to carry out a germination test with several pH levels.

The objective of this study was to analyze the influence of pH, water content on the substrate and salinity on the germination of Acacia mangium Willd seeds, in light of the context and the lack of information on the eucalyptology of acacia seed germination.

II. MATERIAL AND METHODS

The present work was carried out at the Laboratory of Seeds of Ecophysiology and Weed Management of the Federal University of Tocantins (UFT), Campus Universitário de Gurupi, located in the southern region of

the state of the Tocantins, lat. 11 $^\circ$ 43 'S and long. 49 $^\circ$ 04'W, at 280m altitude.

The seeds of Acacia mangium Willd, were collected at the institution (UFT), later transported to the UFT (LSEMPD) of the UFT, Gurupi campus, where they were benefited and manually selected, discarding those that were injurious or deformed.

The number of replicates and number of seeds, the type of substrate, the number of days of evaluation and the overcoming of dormancy was determined according to the instruction manual for analysis of forest species of the Ministry of Agriculture, Livestock and Supply BRASIL (2013).

The seeds were placed to germinate in sterile Petri

dishes on two sheets of germinate paper, weighing 2 g, moistened with the solution according to the treatments of each experiment. Acacia seed dormancy was achieved by

immersing in the water at 100 $^{\circ}$ C for 1 minute.

Three experiments were carried out: the amount of water in the substrate, different levels of pH and saline stress.

Amount of water in the substrate

For this experiment were four treatments: T1 - amount of water 1.5 times the weight of the substrate (\sim 3 ml); T2 - amount of water 2.0 times the weight of the substrate (\sim 4 ml); T3 - amount of water 2.5 times the weight of the substrate (\sim 5 ml) and T4- amount of water 3.0 times the weight of the substrate (\sim 6 ml).

Different pH levels

The influence of pH on the germination of *Acacia* mangium Willd seeds was tested under the values of 3.0; 5.0; 7.0; 9.0; and 11.0. To adjust the pH of the above values, 1N sodium hydroxide (NaOH) and hydrochloric acid (HCl) diluted in distilled water were used in an amount sufficient to raise or lower the pH, and it was measured using a pH meter MAYEUX and SCIFRES (1978).

Saline stress

In the analysis of the effects of saline stress aqueous solutions of sodium chloride (NaCl), potassium chloride (KCl) and calcium chloride (CaCl2) and at the concentrations of 25, 50, 75 and 100 millimolar (mM) were prepared.

In all experiments the plates were placed in a BOD incubator with photoperiod 12/12 hours a day/night at 30

 $^{\circ}$ C. The germination evaluations were daily from the 7th day of incubation until the 21st, where the radical and shoot length were measured. The germination was evaluated daily from the seventh day after the installation of the treatments using as criteria the radius protrusion (2 mm). The germination velocities were calculated by the expression:

At where:

$$IVG = \left(\frac{G1}{N1}\right) + \left(\frac{G2}{N2}\right) + \ldots + \left(\frac{Gn}{Nn}\right) (1)$$

G: number of normal seedlings computed at the first count, at the second count,

at the last count.

N: number of days of sowing to the first, to the second to the last count.

For all the experiments, the experimental design was completely randomized, with four replicates of 50 seeds for each treatment. Each experiment was submitted to regression analysis using Sigmaplot 10.0 software and the regression model chosen was based on the significance of the coefficients of the regression and determination equation at 5% probability.

III. RESULTS AND DISCUSSION

Amount of water in the substrate

The response of the germination percentage of the acacia seeds to the different amounts of water in the substrate (Figure 1) was adjusted to a second-degree regression with a regression coefficient of 0.87. By means of the adjustment curve, it is evident that water levels above 5 ml promote a decrease in the germination of 100 J

Acacia seeds, although they are still above 90% development. According to Gonçalves et al. (2015) FLORES et al. (2013), excess moisture causes a decrease in germination, since it prevents oxygen penetration and reduces the resulting metabolic process. Despite the reduction observed in the germination in the graph, the data demonstrate that the water levels used were not sufficient to promote drastic reductions in the germination of Acacia seeds, either due to the effect of little or excess water.



 $y = 72,5750 + 10,7750^* \times -1,1250^* \times^2 R = 0,87$ Fig.1: Germination (%) of Acacia mangium Willd seeds depending on the amount of water in the substrate.

Gonçalves et al. (2015) FLORES et al. (2013) in their experiment with seeds of *Parkia platycephala Benth*, using the same proportions of water as the present study, concluded that there was no interference of moisture in the percentage of germination. Ramos et al. (2006) RAMOS et al. (2006) verified that the amount of water 1.5 the weight of the substrate showed a lower percentage of germination for the *Schizolobium amazonicum* Huber ex Ducke (Paricá) forest, where the best results were using 2.5 and 3.0 times the weight of the substrate (with 85% germination). For the species *Amburana cearensis* (Allemão) AC Smith the highest germination percentage (94%) was obtained with the volume of water of 3.25 times the weight of the dry substrate, however from this volume, the germination was negatively affected GONÇALVES et al. (2015).

As for IVG (Figure 2), the data were adjusted to a cubic curve with R = 0.98, with an increase in velocity with an increase in the amount of water up to 5 ml, after which there was a strong fall. In spite of the observed, the values of the IVG can be considered good, explained by the already mentioned previously as the water levels used in the treatments are not enough to observe more expressive effects in the reduction of the germination of the Acacia seeds.



y = 32,9715 -13,1866*x +3,2226*x² -0,2497*x³ R = 0,98

Fig.2: Germination velocity Index (GVI) of Acacia mangium Willd seeds depending on the amount of water in the substrate.

Flores et al. (2013) FLORES et al. (2013) for the species Melanoxylon brauna Schott (Braunna) presented lower IVG only in the amount of 3.0 times the substrate and was not affected in amounts of 1.5 times the weight of the substrate. Guedes et al. (2010) GUEDES et al. (2010) verified an increase in the IVG with an increasing amount of water used to moisten the substrate.

The length of the aerial part and radical (Figure 3) presented a quadratic behavior with R = 96 and 93, respectively, and the tendency was different to

germination and IVG for the parameter water quantity in the substrate. It is observed that the length of both the aerial part and the radical decreases when there was an increase in moisture, and in the amount of water 1.5 times the weight of the substrate (3ml) there was a larger value of both the aerial part (2, 65 cm) and the radical (2.77 cm), decreasing to the highest amount of water (6 ml). The lowest values for the shoot (1.46 cm) and radical (1.71) were observed.



Fig.3: Length of aerial part and radical of Acacia mangium Willd seeds depending on the amount of water in the substrate.

Seed of faveira, which like acacia is a legume, presented different results, wherein the length of the aerial part they maintained a uniform characteristic, presenting an average length of 6.85 cm, but for radical the largest length was verified with volumes of water equal to 3.0 and 3.5 times the substrate weight GONÇALVES et al.(2015).

Varela et al. (2005) VARELA et al. (2005) in its study

with angelim-stone, also a leguminous, found results similar to acacia, where there was a reduction in root length with the increase of water in the substrate, is that the amount 1.5 times the weight of the substrate presented larger radical lengths and 3.0 times the weight of the lowest substrate.

Different pH levels

The different pH levels promoted differences, that is,

reductions in the germination of Acacia Mangium Willd seeds. from pH 5 (Figure 4). The polynomial regression

analysis showed a quadratic equation of pH levels at germination with R = 0.94.



y = 154,0652 -30,0729*x +4,0848*x² -0,1771*x³ R = 0,94

Fig.4: Germination (%) of Acacia mangium Willd seeds depending on different pH levels.

The species responded to the different variations in pH levels, presenting germination above 80% at all levels. It was observed that the highest percentage (95.5%) of germination was obtained under pH 3 conditions. Regarding the other pH solutions evaluated, germination of pH 5 (85%), 7 (81%), 9 86.5%) and 11 (81.5%). These data indicate greater plasticity for the seeds of *Acacia magium* Willd. ger in pH environments at different levels. In other words, the results indicate that the species has a favorable

ability and adaptation ability to germinate from soils or acid solutions to alkaline BATRA and KUMAR (1993). The IVG presented from the behavior of the regression curve, for the five pHs used

(Figure 5), was similar to the germination curve. It is observed that at pH 3 there was a higher (15.7) IVG and at the more alkaline pH 11 used in the experiment it was the smaller (13,14) IVG.



Fig.5: Germination velocity Index (GVI) of Acacia mangium Willd seeds depending on different pH levels.

The length of the aerial part and radical of acacia

(Figure 6) were not influenced by the different pH levels.

The largest length of the shoot was verified at pH 5 (2.49 cm) and the lowest at pH 11 (2.20 cm), with no significant differences between them. The radical presented higher lengths at pH 3 (2.99 cm), decreasing at the other pH's.

These values demonstrate that the species tolerates alkaline and acidic pH, and can be planted in the most diverse types of soil with varying pH.



Fig.6: Length of aerial part and radical of Acacia mangium Willd seeds. Depending on different pH levels.

Saline stress

The germination of acacia seeds submitted to different concentrations of salts (Figure 7) was framed in a quadratic equation with R = 0.99. The KCl and CaCl2 showed the same tendency of decrease in the germination (%) with the increase of the concentrations, mainly from 75 mM. The NaCl obtained higher germination in the concentration of 25 mM (98%) and lower in 100 mM (83.5%) as in other salts, but with 50 mM there was a decrease in germination with 88% and in the concentration of 75 mM it increased to 95% germination. The lowest germination salt (%) was potassium chloride (KCl).



Fig.7: Germination (%) of Acacia mangium Willd seeds. in different concentrations of NaCl, KCl, and CaCl₂.

Ferreira et al. (2013) FERREIRA et al. (2013) observed the same trend with the *Cedrela odorata* species, where the NaCl, KCl and CaCl2 concentrations reduced the germination potential of the seeds, the reduction was more drastic in the presence of CaCl2 and KCl, where the most pronounced decrease of germination occurred potentials from 50 mM. Medeiros (2015) MEDEIROS et al. (2015) with Australian scepter seeds submitted to different concentrations of NaCl observed the reduction in the germination potential with the increase of the salt concentration, mainly from 50 mM.

The IVG (Figure 8) presented the same germination

tendency (%) and fit into the cubic equation with R = 0.99. Seed vigor is most affected by the KCl and CaCl2 salts, especially from 75 mM.



Fig.8: Germination velocity Index (GVI) of Acacia mangium Willd seeds. in different concentrations of NaCl, KCl, and CaCl₂.

Fonseca & Perez (1999) FONSECA and PEREZ (1999) indicated that salinity affects the IVG of seeds of Anadenanthera pavonina L. and Ferreira et al. (2013) FER-REIRA et al. (2013) that the seeds of Cedrela odorata germinated progressively slower from the concentration of 25 mM for the three salts.

Effects on shoot length and Acacia mangium root radius caused by the salts are observed in Figure 9. In the aerial

part, size reduction is observed from the 75 mM concentration in all the salts, however, the salt that most affected the initial growth of the part acacia was CaCl2. The length of the radical was affected from 50 mM in all salts, with the exception of NaCl at the concentration of 75 mM. KCl and CaCl 2 more affect the initial growth of acacia roots than NaCl.



Fig.9: Length of aerial part and radical of seeds of Acacia mangium Willd. in different concentrations of NaCl, KCl, and CaCl₂.

Lima & Torres (2009) LIMA and TORRES (2009) also observed that with the increase of the salt concentration there is a decrease in the initial growth of juazeiro seedlings. Oliveira et al. (2007) 526 (2007) found that the increase of salt concentrations caused reduction of aroeira seedlings (Myracrodruon urundeuva FrAll) and Ribeiro et al. (2008) RIBEIRO et al. (2008), observed that the height of sage saplings (Mimosa caesalpiniaefolia Benth.) Decreased when submitted to salinity.

Saline soils can be found in the field, and the seeds will have to be strong to withstand the adverse conditions found in the environment BERTAGNOLLI et al. (2004), because the seeds are very vulnerable to the effects of salinity, with the increase of saline levels there is initially decreasing the water absorption, thus modifying the imbibition process FERREIRA and REBOUÇAS (1992).

When the concentration of salts in the soil increases, there is a decrease in the osmotic potential causing a decrease in water potential, which can affect the kinetics of water absorption by the seeds (osmotic effect) and raise the concentration of ions in the embryo (toxic effect) (1994).

According to Larcher (2004), LARCHER and Rima (2004), initial seedling development processes are sensitive to the effect of the salts so that growth rate and biomass production are good criteria for assessing the degree of stress and the plant's ability to overcome the saline stress.

IV. CONCLUSIONS

The factor that most affected the germination process of *Acacia mangium* Willd seeds. was the salinity, with the increase of the salts concentration, there was a reduction of the germination, germinating less than 70% in 100 mM CaCl2, which together with the KCl were the salts that most affected the germination, IVG, and size.

Regarding the amount of water in the substrate, germination presented above 94% in all treatments, but better results were found in the amount of 2.5 times the substrate weight, being that below that amount and above there is lower germination. In the aerial part and radical, there is decrease with the increase of the amount of water.

Acacia seeds germinate above 80% in all pHs, but the best results are pH 3.

The results showed that the seeds of Acacia mangium Willd. they do not germinate well with high concentrations of salts and nor with excess humidity, causing physiological changes in the seeds, and that they can develop well in extremely acidic soils.

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REFERENCES

- 2007. Salinidade na germinação e desenvolvimento de plântulas de aroeira (Myracroduon urundeuva Fr All). Caatinga, Mossoró. 20(2): 39–42.
- [2] ASSUMPÇÃO CRM, PERINI M. 1993. Superação de dormência de sementes de Senna occidentalis (L.). Natureza on line. The Indian Journal of Agricultural Sciences. 14(1):45–47.
- [3] BATRA L, KUMAR A. 1993. Effects of alkalinity on germination, growth, and nitrogen content of whistling (Casuarina equisetifolia) and bufwood (C. galuca). Ind J Agric Sci. 63(7):412–416.
- [4] BERTAGNOLLI CM, CUNHA C, MENEZES S, MORAES D, LOPES N,
- [5] ABREU C. 2004. Qualidade fisiológica e composição química de sementes de soja submetidas ao estresse salino. Revista Brasileira Agrociência, Pelotas. 10(3):287–291.
- [6] BRASIL. 2013. Ministério da Agricultura, Pecuária e Abastecimento. Instruções para análise de sementes de espécies florestais. Ministério da Agricultura, Pecuária e Abastecimento. Secretaria de Defesa Agropecuária. Acesso.
- [7] Available from: http://www.agricultura.gov.br/assuntos/laboratorios/arquivo
 s- publicacoes-laboratorio/florestal_documento_pdfilovepdf-compressed.pdf.
- [8] CARVALHO NM, NAKAGAWA J. 2012. Sementes: ciência, tecnologia e produção.
- [9] Jaboticabal: FUNEP, 590 p.
- [10] CAVALCANTE AMB, de PEREZ SCJG. 1996. Efeitos da escarificação química, luz e pH na germinação de sementes de Leucocephala. LAM (De Wit) Revista Ceres. 43(248):370–381.
- [11] DEMINICIS BB, ALMEIDA JCC, ARAÚJO SAC, BLUME MC, VIEIRA HD,
- [12] DOBBS LB. 2007. Sementes de leguminosas submetidas a diferentes períodos de estresse salino. Archivos de Zootecnia.
- [13] FERREIRA EGBS, MATOS VP, SENA LHM, OLIVEIRA RG, SALES AGFA. 2013. PROCESSO GERMINATIVO E VIGOR DE SEMENTES DE Cedrela odorata L.
- [14] SOB ESTRESSE SALINO. Ciência Florestal.
- [15] FERREIRA LGR, REBOUÇAS MAA. 1992. Influência da hidratação/desidratação de sementes de algodão na superação de efeitos da salinidade na germinação. Pesquisa Agropecuária Brasileira.
- [16] FIGLIOLIA MB, OLIVEIRA EC. 1993. PINÃ-RODRIGUES, F.C.M.Análise de se-
- [17] mente. Brasília. ABRATES. p. 173-174.
- [18] FLORES AV, ATAIDES GM, BORGES EL, GONÇALVES LES, MANFO CE.
- [19] 2013. Umedecimento do substrato e temperatura na germinação de sementes de Melanoxylon brauna Schott. Revista Brasileira de Ciências Agrárias Recife. 8:3–454.
- [20] FONSECA SCL, PEREZ SCJGA. 1999. Efeito de sais e da temperatura na germi- nação de sementes de olho-de-dragão (Anadenanthera pavonina L.– FABACEAE). Revista

Brasileira de Sementes, Pelotas. 21(2):70–77.

- [21] GADOTTI GI, MENEGHELLO GE, TILLMANN MAA. 2013. Faixa de exigência e
- [22] influência do pH no teste de germinação. Revista de La Facultad de Agronomia. La Plata. 112:1–27.
- [23] GONÇALVES EP, FRANÇA PRC, VIANA JS, ALVES EU, GUEDES RS, LIMA CR. 2015. UMIDECIMENTO DO SUBSTRATO E TEMPERATURA NA
- [24] GERMINAÇÃO DE SEMENTES DE Parkia platycephala BENTH. Ciência Flore- stal.
- [25] GRIFFIN RA. 2014. Sustaining the future of Acacia plantation forestry. IUFRO News. 43:1–2.
- [26] GUEDES RS, ALVES EU, GONÇALVES EP, VIANA JS, FRANÇA PRC, LIMA CR. 2010. cearensis (All.) A.C. UMEDECIMENTO DO SUBSTRATO E TEMPERATURA NA GERMINAÇÃO E VIGOR DE SEMENTES DE Amburana. 32(3):116–122.
- [27] KRISNAWATI H, KALLIO M, KANNINEN M. 2011. Acacia mangium Willd.: ecol- ogy, silviculture and productivity. Jakarta: CIFOR.
- [28] LARCHER WVSC, Rima. 2004.
- [29] LIMA BG, TORRES SB. 2009. ESTRESSES HÍDRICO E SALINO NA
- [30] GERMINAÇÃO DE SEMENTES DE Zizyphus joazeiro Mart. (Rhamnaceae). Re- vista Caatinga.
- [31] MAYEUX HS, SCIFRES CJ. 1978. Germination golden weed seed. J Range Man- agement. 31:371–374.
- [32] MEDEIROS LR, MONTEIRO MA, MIGLIORINI P, LAZAROTTO M, TUNES LM. 2015. STANDARDIZATION OF GERMINATION TEST AND RESPONSE TO
- [33] NACL SALT STRESS IN Toona cliliata SEEDS. 845- 852, out. / dez.
- [34] NUNES AS, LOURENÇÃO ALF, PEZARICO CR, SCALON SPQ,
- [35] GONÇALVES MC. 2009. Fontes e níveis de salinidade na germinação de sementes de Crotalaria juncea L. Ciência e agrotecnologia.
- [36] RAMOS MBP, VARELA VP, MELO MFF. 2006. Influência. EX DUCKE
- [37] LEGUMINOSAE-CAESALPINIOIDEAE) Revista Brasileira de Sementes. 28(1):163–168.
- [38] REGO SS, FERREIRA MM, NOGUEIRA AC, GROSSI F, SOUSA RK, BRON-
- [39] DANI GE, ARAUJO MA, SILVA AL. 2011. Estresse hídrico e salino na ger- minação de sementes de Anadenanthera colubrina (Veloso) Brenan. Journal of Biotechnology and Biodiversity, Gurupi. 2:4–37.
- [40] RIBEIRO MCC, BARROS NMS, JÚNIOR BARROS, AP SILVEIRA, LM. 2008.
- [41] Tolerância do sabiá (Mimosa caesalpiniaefolia Benth) à salinidade durante a ger- minação e o desenvolvimento de plântulas. Revista Caatinga. 21:5–123.
- [42] STEFANELLO R, GARCIA DC, MENEZES NL, MUNIZ MFB, WRASSE CF. [date
- [43] unknown]. Efeito da luz, temperatura e estresse hídrico no potencial fisiológico de sementes de funcho. Revista

Brasileira de Sementes.

[44] VARELA VP, RAMOS MBP, MELO MFF. 2005. Umedecimento do substrato e tem- peratura na germinação de sementes de angelim-pedra (Dinizia excelsa DUCKE). Revista Brasileira de Sementes. 27(2):130–135.

Forays into the Field of Science, Technology and Society in Northeastern Brazil through Systematic Mapping

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Abstract— This scientific work investigates the referrals in educational practices Science-Technology-Society in the context of northeastern Brazil, contemplates the presence of values of interests in the direction given to scientific-technological development and socio-environmental issues. Science has supported the scientific investigation in the field of Education in many countries and Technology Management Systems, an area of lower visibility, usually referred to the domain of Social Sciences and Humanities. In the specific case of Science Education, this discussion also exists, with some authors choosing the term Science Education and other Science Education of the non-specialist citizen or, in the second case, the scientific Education in curricular context. In the case of one or the other, they take as crucial the development of scientific culture as an integral part of democratic citizenship. It is the perspective of the present work, intending to reflect aspects and guidelines for the teaching of Science in an orientation of scientific culture, a concept of polysemy that always includes knowledge of content, development of critical awareness about the potential and limitations of Science and adoption of attitudes and behaviors according to the social role of each one. Thus, we signal the need to assume a new objective in education of public policies for Science-Technology.

Keywords— Science. Technology. Society. Scientific and Socio-environmental Education.

I. INTRODUCTION

This paper aims to analyze the works published in peer-reviewed journals, and the purpose of characterizing environmental education within the perspective of Science, technology and Society, from the point of view of national researchers, from research available at CAPES journals and the SUCUPIRA platform and/or in the repository of dissertations and theses of the analyzed institutions. Accordingly, this objective is guided by the following questions: what are the approaches employed in education in Science, Technology, Society and Environment (CTSA), and how is being addressed the training of teachers for primary education in scientific production in Northeast Brazil.

Therefore, it is necessary to adopt inclusion criteria, viz. availability of consultation through the web, highlighting only articles published between the years 2007 and 2017; complete articles written in Portuguese, Spanish or English; and research available in the portals hereinabove cited.

II. SYSTEMATIC MAPPING METHODOLOGY

The present research of descriptive nature entails systematic mapping that aims to "(...) *provide an overview of a research area, to establish if there is evidence on a topic and provide an indication of the amount of evidence*" (KITCHENHAM; CHARTERS, 2007, p. 44).

The results of an investigation of this nature can contribute to the identification of fields of study that deserve more detailed attention through a systematic review. (KITCHENHAM; BRERETON; BUDGEN, 2012)

Thus, both methods support the development of an investigation regarding the search and extraction of evidence-based data, while remaining distinct to the scope and procedures of analysis. According to Felizardo *et al.* (2017), systematic mapping is characterized by

(...) provide a broad view of a research topic, generic research questions, search process defined by the research topic, full scope, more generic search string, and quality assessment is not mandatory, categorization of primary studies according to classification schemes (FELIZARDO *et al.*, 2017, p. 96).

Therefore, for the systematic mapping that identifies evidence in the literature, we go through a formal process defined through a research protocol, which consists of 1) survey of research questions, 2) conduct the search, 3) analysis of articles, 4) classification of articles, and 5) data extraction and mapping.

This way, we begin by formulating the research question that refers to what are the approaches employed in education in Science, Technology, Society and Environment (CTSA), and how is being approached the training of teachers for primary education in scientific production in Northeast Brazil? For this, we aim to verify how is inserted the socio-environmental education focused on education within the theme Science-Technology-Society; identify which are the teaching modalities, and the themes concentrate on scientific education and investigate which are the educational objectives inherent to socioenvironmental education in the school environment.

From this stage on, the search terms for the search string were gathered, meaning the gathering of descriptors that constitute a standard. The search string forms "(...)*a* set of syntactic characteristics that should be found in a text segment. Those segments that meet the standard specifications are said to 'match' the standard" (YATES; RIBEIRO NETO, 2013, p. 254). Thus, the defined string was:

- *String 1*= ("Science" OR "Technology" OR "Society") AND ("Science Education") OR" (Environmental Education").
- String 2 = ("Teacher Training" OR "ProfessorTraining") AND ("Scientific Training" OR "Technological Education").

The search for articles was based on the string formulated and applied in the search engines, being the bases: CAPES journal portal, and the SUCUPIRA platform and the repository of dissertations and theses of educational institutions.

This way, we have identified the quantity of thirtyfive academic productions on Education in Science-Technology-Society (CTS) found in the Postgraduate Programs (PPG) present in the Northeast region, between 2007 and 2017. We emphasize that in the column on production on Science, Technology, and Society, the highlighted numbers account for the two doctoral theses defended, with the others referring to dissertations.

Chart I: Amount of researches developed about (CTS	in
Northeast Brazil		

State	IES	Program	CTS
Pernambuco	UFPE	PPGE	1
Paraíba	UEPB	PPGECM	5
Sergipe	UFS	PPGECIMA	7
Bahia	UESB	PPGECFP	6
Rio Grande	UFRN	PPGECNM	11
			TOTAL: 35

In this case, we use the search string constructed from keywords derived from the main question and the terms "CTS, CTS, C/T/S, and CT-S, CTSA¹" abbreviated or in full in the titles, abstracts, and keywords of the works.

After the identification of these studies, it was necessary to select the primary studies potentially relevant to this study. Thus, the productions were evaluated, and for this, we indicated some inclusion and exclusion criteria. According to Kitchenham and Charters (2007), these criteria are intended to identify the primary studies that provide direct evidence on the research question.

Accordingly, we have analyzed titles and abstracts and listed as inclusion criteria: studies that consider characteristics and theories of learning in socioenvironmental education; studies that report and describe the development of environmental education in educational environments. Moreover, original articles in the English, Portuguese and Spanish languages; complete articles available for download in full; and primary articles, mapping and/or systematic reviews and theoretical articles.

As exclusion criteria, we have established that duplicate studies; secondary and tertiary studies; and research that does not raise the problems related to environmental education within the context of Science-Technology-Society should be excluded from our selection. After this, we have captured only the most relevant works for this study.

After performing the search, forty articles have been pre-selected according to the criteria presented. Henceforth, the exclusion criteria were applied,

¹ CTSA stands for Science, Technology, Society and Environment in Portuguese.

eliminating five studies that represent 12.5% of the preselected articles, as shown in Graph 1.



In the Brazilian context and especially in the Teaching of Sciences, these discussions started only in the 1990s. In 1992, the first academic research on CTS took place in the field of Chemistry teaching and was developed by Wildson Santos, who began his studies in the area with his master's dissertation, followed by the doctoral thesis of Silvia Trivelato (1993) and the treatise of Antônio Carlos Amorim (1995).

Already in the 2000s, two essential and referenced pieces of research in the first years were published: the scientific paper by Santos and Mortimer (2001) on the theoretical assumptions of the CTS approach in the context of Brazilian education and the doctoral thesis by Auler (2002) on CTS in teacher education. From this period on, several researchers started to understand the assumptions of CTS education as guidelines for a critical and autonomous education, capable of contributing to the process of reflection and development of an integrating consciousness that would enable the unveiling of the world.

We have found the works available on the sites of graduate programs in the SUCUPIRA platform or the repository of dissertations and theses of the educational institutions. We consider ten years (2007-2017) because the first research completed in the Northeast occurred in 2007.

In this sense, we were able to analyze the entire regional panorama of the area. We selected thirty-five defended pieces of research, being thirty-three from master's courses and two from doctorate courses. The master's works were written by Firm (2007), Nunes (2010), Oliveira (2010), Souza (2010), Dantas (2011), Lima Neto (2012), Oliveira (2012), Silva (2012), Bitencourt (2013), Oliveira (2013), Sousa (2013), Andrade (2016), Bezerra (2014), Macedo (2014), Marques (2014), Porto (2014), Rosa (2014), Santana (2014), Silva (2014), Binatto (2015), Costa (2015), Andrade Júnior (2015), Santos, A. (2015), Santos, E. (2015), Almeida (2016),

Gomes (2016), Santana (2016), Santiago (2016), Silva, D. (2016), Silva, M. (2016), Jesus (2017), Santos, M. (2017) and Santos, R. (2017).

On the other hand, the research at the doctoral level was carried out by Firme (2012) and Nunes (2010). Although the second thesis was developed in a PPG that does not belong to the axis of Education and Teaching (the PPG in Chemistry of the Federal University of Rio Grande do Norte), we counted it for the research because it is focused on the theme of Science Teaching and dealing with the CTS education, constituting the second thesis of the Northeast. We have listed five categories of analysis that emerged from our research questions and used the reading of abstracts to categorize each work.

Thus, we located thirty-five pieces of research on the CTS theme in the Northeast PPG. This distribution by state quantifies eight productions in Bahia, five in Paraíba, three in Pernambuco, 12 in Rio Grande do Norte and seven in Sergipe. Graph 2 shows the distribution in percentage (%).

Graph 2 – Quantitative distribution by state of the production of researches on CTS Education in the period of 2007 through 2017



Characterizing trends and perspectives in dissertations and theses

The Northeast region has seventeen PPGs in Education (fifteen entitled for education, one entitled for Professional Education and the other for Education and Teaching) and thirteeprograms for Teaching Science and Mathematics (some of them only for Science, but with evaluation area in Teaching Science and Mathematics in CAPES). We have listed five categories of analysis to describe the trends and perspectives of CTS production in this region. The types include: a) CTS production by state, b) production by the graduate program, c) curriculum perspective addressed, d) context in which the researches are inserted, and e) knowledge area of research in Scientific Education.

In the context that they are inserted the researches on CTS show the trends of this perspective as to its

"implementation" in the different levels of education. We analyzed from the summaries, and sometimes in the methodology, the contexts in which the researches were found. Bringing a quantitative panorama of these characteristics leads us to understand what the regional needs are in the view of northeastern researchers. Table 1 shows the distribution of the specific areas of the research context.

CONTEXT	QUANTITY	%
Primary school	2	6%
Primary and secondary school	1	3%
Secondary school	11	31%
Continuing formation of	7	20%
Continuing formation of teachers and secondary school	2	6%
Initial formation of teachers, technologists and bachelors	12	34%

Chart 2 – Context of development and/or discussion of researches

We have found that the research is divided into two broad lines, i.e. teaching and learning and teacher training. Two surveys included in this last line discuss teacher training and include other subjects in their research, such as bachelor's degree students and technologists. CTS education is also related to discussions on the Science curriculum and provides for its (re)organization. From this table, we note that the highest production rates correspond to initial and continuing teacher education (54%) and secondary education (31%). The training processes focused on CTS Education are also targets of investigations throughout Brazil (PRUDÊNCIO, 2013; SILVA, 2014; MÜNCHEN, 2016; ROSA; ARAÚJO, 2017).

These surveys indicate the need to work on proposals for the training of teachers that aggregate critical references, in the context of CTS education, since there is a lack of discussion on the assumptions of this perspective in teacher training. Many pieces of research still related to teacher education are focused on conversations on the conceptions of Science, Technology, and Society.

Studying the area of knowledge that the CTS perspective is linked is necessary to delimit the spaces in which it gains repercussion. It is evident that many of these

results are related to the area of its origin in the Brazilian context and we know that studies on CTS in Brazil began in the Teaching of Chemistry, followed by the Teaching of Biology and then by the Teaching of Physics. However, researchers in the Teaching of Chemistry and Physics followed the line of research even more intensely at the end of the 1990s and have become references in the area to this day. This process of arrival of the CTS perspective in the Brazilian context and its consequent repercussion in the Teaching of Chemistry generated countless researches in this area.

Today, Chemical Education is the area of knowledge in Sciences that has more materials in the CTS perspective. Wildson Santos, in co-authorship with other researchers, articulated projects that originated chemistry textbooks² based on socio-scientific aspects that enhance dialogical interactions in the classroom, facilitating the emergence of students' experiential situations and the development of attitudes and values in a humanistic perspective (SANTOS; MORTIMER, 2009). With this material, Wildson Santos and Gerson Mortimer, still in the 1990s, sought through the thematic contextualization, to introduce texts that problematize the reality of subjects and contribute to the formation of citizenship (SANTOS, 2007).

III. RESULTS AND DISCUSSIONS

Concerning research approaches, in general, we identified that the works sought, above all, to propose and undertake formative experiences in the field of primary education or teacher training aligned with themes that arise from the reality of the subjects of each investigation.

Besides, despite adopting diverse transversal themes or more specific contents, all with potential for the development of interdisciplinary proposals, the selected researches stopped to present the issues with greater emphasis on the perspective of a single subject.

Based on what was analyzed, it becomes necessary a greater diffusion of the CTS approach in the scope of the Postgraduation Programs in the Northeast due to the low scientific production, a fact observed in the number of productions in this region when compared to other areas of the country, expanding the debate about the need for a scientific and technological development aligned with the desires and the well-being of humanity and the environment.

Analyzing some dissertations published in Graduate Programs in the area of Teaching of Natural Sciences in the Northeast region, based on the areas of knowledge that

²Chemistry on Society (1998), Chemistry and Society (2003), and Chemistry Citizen Science (2010, 2013, 2016).

each research took as focus, we achieved the following results: the investigations that opted for various themes, had as focus the treatment of cross-cutting issues, addressing the theme water for elaboration and application of didactic sequences. The dissertations focused on discussing problems emerging from the context of the research participants, such as: the process of degradation of the river Apodi-RN (NUNES, 2010), the quality of water supplied in the municipality of Cuité-PB (MARQUES, 2014), and the relationships between the theme evaporation and the constant scarcity of water in the city of Santa Cruz-RN (BEZERRA, 2014).

Dantas Filho, Silva e Silva (2015) point out that the theme water can be well explored and contextualized in the Teaching of Chemistry, because it is possible to work with conceptual and socio-scientific aspects, through contents such as the law of conservation of masses, chemical bonds, physical states of matter, energy involved in the relationships, solutions, chemical reactions, speed of responses, concentration, etc.. In addition, the approach to this topic in the classroom universe, and in particular in the Teaching of Sciences, is related to the fact of making approximations between the chemical concepts and the situations of the student's daily life.

The dissertations that developed proposals focusing on several simultaneous contents used Information and Communication Technologies (ICT) as educational resources. Developing activities focused on content: hydrostatic and gravitation, like Dantas (2015) who used films as a strategy for the teaching of physics. Concerning the CTS subcategory in education, the classified works aimed to provide experiences in the area of teacher training as a contribution of Science, Technology and Society and their relations with the Teaching of Natural Sciences and Mathematics. In Firme's research (2007), the focus was to analyze the conceptions of teachers about CTS and the use of this perspective by teachers during their classes.

In this sense, Santos et al. (2015) state that it is essential to develop teaching proposals that can work on themes that generate from scientific concepts, seeking to bring problematizing situations that are within the context of students' lives so that scientific literacy occurs of these subjects.

In Silva (2012), the idea was to analyze the contributions of a formative proposal on the CTS approach in the training of teachers of mathematics. In this context, Silva et al. (2014) state that teacher training should offer an education for the exercise of citizenship and is a primary function of public educational policies, as established by the Brazilian constitution and the teaching legislation.

This function has been defended by several teachers researchers of primary education, attributing to the disciplines of Science of Nature the role of providing a critical, participatory, reflective and human education (SANTIAGO, 2016). The only research that opted to work with a specific content was that of Lima Neto (2012) which aimed to develop an educational experience about the concept of energy, taking as thematic axis the sustainable theme development. According to the author (2012), the didactic sections developed sought to work beyond the concept of energy, "(...) understand its transformations and conservation law, as well as its production, distribution and consumption processes in the context of the laws of physics in which it is involved" (LIMA NETO, 2012, p. 6).

IV. FINAL CONSIDERATIONS AND SUGGESTIONS FOR FUTURE WORK

We understand that analyzing the conceptions of teachers in practice is the starting point to discuss CTS Education in teacher training, but we know that research needs to advance in order to promote training processes or moments of dialogue for greater engagement of teachers with this perspective of making available working conditions to teachers that enable a broad discussion on social and environmental education within a theme that favors Science, technology and social aspects.

The concerns for the discussion of a work like this will always be expanding our readings. This is because we understand that, although there is still much to be defined in CTS education, it is necessary to advance in the discussion so that the interrelationships in CTS are introduced in research not only as a field of study but as an essential and emerging field for human formation from the attendance of our regional needs. This survey also brings us apprehension about the states of the Northeast region that do not debate widely on the CTS perspective. Simultaneously, we are disturbed by the fact that in the countries where studies on this topic are found, most of them, even though finalized, have not yet been published in journals in the area of Science Education.

The weaknesses on the publications scenario evidenced in this systematic mapping may subsidize future investigations that broaden the scope of the search and address other issues that permeate the knowledge on teacher training for education in Science, Technology, and Society.

REFERENCES

[1] AMORIM, A. C. R. **O ensino de biologia e as relações** entre ciência/tecnologia/sociedade: o que dizemosprofessores e o currículo do ensinomédio? Dissertação (mestrado) –State University of Campinas, School of Education, Campinas – SP, 1995. Available at <http://www.repositorio.unicamp.br/handle/REPOSIP/2538 41>. Accessed on 20th July, 2018.

- [2] ANDRADE JÚNIOR, J. A. Episódioshistóricos no contexto do ensino de ciências: aenergia nuclear e suautilização. Dissertação– State University of Paraíba, Campina Grande, 2015.
- [3] AULER, D. Interações entre ciência-tecnologiasociedade no contexto da formação de professores de ciências. Tese de DoutoradoemEducação– Federal University of Santa Catarina, Florianópolis: CED/UFSC, 2002.
- BEZERRA, M. E. B. Um estudosobre o ensino de evaporação no contextociência, tecnologia e sociedade. Dissertação (mestrado) –Federal University of Rio Grande do Norte, 2014. Available at https://repositorio.ufrn.br/jspui/handle/123456789/19488. Accessed on 20th September, 2018.
- [5] BINATTO, P. F. EnfoqueCiência, Tecnologia e SociedadenaFormaçãoReflexiva de FuturosProfessores de Biologia: Possibilidades, Desafios e Contribuições. Dissertação – State University of Southwest Bahia, Jéquié, 2015.
- [6] DANTAS FILHO, F. F.; SILVA G. N.AND SILVA, H. C. Entendimento da abordagemetsa no ensino de química e as dificuldadesapontadas por professores de escolas da cidade Campina Grande de **PB**eminseriresseenfoquenassuas aulas In· RevistaScientiaAmazonia. 2015. Available v.4. athttp://scientia-amazonia.org/wpcontent/uploads/2016/06/v4-n2-100-106-2015.pdf. Accessed on 14th June, 2018.
- [7] FELIZARDO, K. R. *et al.* Systematic Mapping On The Use Of Visual Data Mining To Support The Conduct Of Systematic Literature Reviews. Journal of Software, 2017, p. 450-461.
- [8] FIRME, R. N. Aabordagemciência-tecnologia-sociedade (CTS) no ensino da termoquímica: análise da construçãodiscursiva de umaprofessorasobreconceitoscientíficos. Tese (doutorado)
 – Federal University of Pernambuco, 2012. Available athttps://repositorio.ufpe.br/handle/123456789/13025. Accessed on 20th July, 2018.
- [9] FIRME, R. N. Aimplementação de umaabordagem CTS (Ciência-Tecnologia-Sociedade) no ensino da química: um olharsobre a práticapedagógica. Dissertação (mestrado) –Federal Rural University of Pernambuco, Recife, 2007.
- [10] KITCHENHAM, B.; CHARTERS, S. Guidelines for performing Systematic Literature Reviews in Software Engineering. 2.3 ed. Durham, 2007.
- [11] KITCHENHAM, B; BRERETON, P; BUDGEN, D. Mapping study completeness and reliability – acase study, IET, 2012.
- [12] LIMA NETO, J. A. O uso da abordagem CTSA no ensino de energiatendo o desenvolvimentosustentávelcomoeixotemático.

Dissertação (mestrado) – Federal University of Rio Grande do Norte, Natal, 2012.

- [13] MARQUES, A. M. Açude do Cais: umaproposta de aplicação de umasequência de atividadesdidáticasem um contexto real. Dissertação- Mestradoem Ensino de CiênciasNaturais e Matemática-Federal University of Rio Grande do Norte, Natal, 2014.
- [14] MÜNCHEN, S. A inserção da perspectivaCiência-Tecnologia-Sociedadenaformaçãoinicial de professores de Química. Tese (DoutoradoemEducação) – Federal University of Santa Maria, Rio Grande do Sul, 2016.
- [15] MÜNCHEN, S. As pesquisassobreCiência, Tecnologia e Sociedade no Nordeste: um retrato das dissertaçõesnaárea de ensino de ciênciasnaturais e matemática. Conexões: Ciência e Tecnologia, v. 10, n. 4, 2016, p. 42 – 50.
- [16] NUNES, A. O. Abordando as relações CTSA no ensino da química a partir das crenças e atitudes de licenciandos: umaexperiênciaformativa no SertãoNordestino. Dissertação – Federal University of Rio Grande do Norte, Natal, 2010.
- [17] OLIVEIRA, T. B. Ensino de ciênciasnaperspectiva CTS: concepções e práticasescolares. Dissertação – Federal University of Sergipe, 2013.
- [18] PRUDENCIO, C. A. V. Perspectiva CTS emestágioscurricularesemespaços de divulgaçãocientífica: contributos para a formaçãoinicial de professores de Ciências e Biologia. Tese (doutorado) – Federal University of São Carlos, São Carlos, 2013.
- [19] ROSA, S. E.; ARAÚJO, W. S. ProcessosFormativos no ContextoBrasileiro: umaarticulação dos pressupostos de Freire e aEducação CTS. In: XI Encontro Nacional de PesquisaemEducaçãoemCiências. Anais... Atas do XI ENPEC, 2017. Available athttp://www.abrapecnet.org.br/enpec/xi-

enpec/anais/resumos/R1454-1.pdf. Accessed on 6th August, 2018.

- [20] SANTIAGO, J. F. A. O uso de textos de divulgaçãocientíficacomorecursodidáticoem aulas de biologia: concepções e relações com aabordagem CTS de ensino. Dissertação (mestrado) – Federal University of Rio Grande do Norte, Natal, 2016.
- [21] SANTOS, D. G.; *et al.* A Química do Lixo: utilizando a contextualização no ensino de conceitosquímicos. *In:* RevistaBrasileira de Pós-graduação, 2012. Available athttp://ojs.rbpg.capes.gov.br/index.php/rbpg/article/view/2 41/233. Accessed on 15th July, 2018.
- [22] SANTOS, W. L. P. **Educaçãocientíficahumanísticaemumaperspectivafreire ana**: resgatando a função do ensino de CTS. *In*: Alexandria: Revista de EducaçãoemCiência e Tecnologia, 2007. Available athttps://periodicos.ufsc.br/index.php/alexandria/article/vie w/37426. Accessed on 10th September, 2018.
- [23] SANTOS, W. L. P.; MORTIMER, E.F..Tomada de decisão para ação social responsável no ensino de ciências. *In*: Ciência&Educação, Bauru, 2001. Available

at<u>http://www.scielo.br/scielo.php?script=sci_arttext&pid=S</u> 1516-73132001000100007.Acessed on 10th July, 2018.

- [24] SILVA, D. J. R. Abordagem CTS e ensino de matemáticacrítica: um olharsobre a formaçãoinicial dos futurosdocentes. Dissertação(mestrado) –Federal University of Paraíba, Campina Grande, 2012.
- [25] SILVA,etal.Práticasavaliativaseaprendizagenssignificativasemdiferentesáreasdocurrículo.EditoraMediação, 2014.
- [26] TRIVELATO, S.L.F. Ciência, Tecnologia e Sociedade: mudançascurriculares e formação de professores. Tese (doutorado) – School of Education, University of São Paulo, 1993.
- [27] YATES, R. B; RIBEIRO NETO, B. Recuperação de Informação: Conceitos e Tecnologia das Máquinas de Busca, Ed. Bookman, 2013.

Cash Holding and Value of Indonesia Manufacturing Companies Listed in Indonesia Stock Exchange

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Abstract— The research aims at testing the association between cash holding and firm value. Population of research is manufacturing companies listed at Indonesian Stock Exchanges during period 2015-2018. Sample of research consist of 63 companies selected by using purposive sampling and using annual data. Data analyzed using simple linear regression model and using SPSS 20. The research result indicates that cash holding significantly has a negative effect on firm value.

Keywords— cash holding, firm value, manufacturing companies, and Indonesian Stock Exchanges.

I. INTRODUCTION

Public companies in general are companies that have good management (corporate management) and corporate governance. These companies listed their shares and traded in the Stock Exchange. In Indonesia, public companies are listed in Indonesian Stock Exchange.

Manufacturing industry in Indonesia is the driver of economic growth, occupies a strategic position to continuously improve its performance. But in recent years there have been various problems. In addition, research on manufacturing companies in Indonesian Stock Exchange is relevant considering that the Indonesian capital market is included in the emerging market category whose characteristics are different from the capital markets in developed countries.

In 2015, there were 521 companies listed on the Indonesia Stock Exchange, 142 of them are manufacturing companies. These companies can be categorized into three industrial sectors. First, the basic industrial and chemical sectors consisting of the cement industry sub-sector; ceramics, porcelain and glass; metal and the like; chemistry; plastic and packaging; animal feed; wood and its processing; and paper pulp. Second, various industrial sectors consisting of machinery and heavy equipment industry sub-sectors; automotive and its components; textiles and garments; footwear; cable; and electronics. Third, the consumer goods industry sector consisting of the food and beverage industry sub-sector; cigarettes; pharmacy; cosmetics and household use; and household appliances.

The urgency of firm value encourages academics and practitioners to determine the determinants (factors that determine) the value of the company. So far, based on the results of the study, there are many factors that affect the value of the company. The most important factor is the size and profitability of the company (Sri Hermuningsih, 2013). In addition to these two variables, corporate governance is a main factor affecting the value of the company. Corporate governance is proxied with board size, CEO duality, board independence (Amarjit S. Gill and Nahum Biger, 2012), board intensity, audit committee, and foreign board membership (Choi, 2012

Other variables that influence firm value are: ownership structure, cash holding, financial risk, dividends, investment opportunities, capital structure (Sri Hermuningsih, 2013) working capital management (Bana Abuzayed, 2012), cash level (Azmat, 2014) , CEO compensation, and customer satisfaction (Basuroy, et.al., 2014).

Cash management is an important part of working capital management which can affect the value of the company. Corporate cash holdings are an interesting area of research when a number of large companies such as Microsoft Corporation and Exxon Mobil had more than 30 billion dollars in cash at the end of 2006. Apple and Google Inc. has more than 10 billion dollars in cash. This situation invites a question mark considering that cash is not considered productive by investors (Azmat, 2014).

Agency theory can explain why corporate cash holdings are not at a level that maximizes shareholder wealth. Agency theory can also help identify companies that might hold too much cash (Opler, et.al., 1999).

According to agency theory, managers have a greater preference for cash because it can reduce company risk and increase managerial discretion. This preference can lead managers to put too much emphasis on the precautionary motive by holding large amounts of cash in excess of the amount needed to maximize shareholder wealth or company value (Opler et.al, 1999).

Although cash management is so important, financial researchers have ignored this issue for quite a long time (Azmat, 2014). Most researchers pay more attention in working capital management which is broader in scope (cash management is part of working capital management).

This study will examine whether cash holdings affect the value of manufacturing companies in Indonesian Stock Exchange. This research can be theoretically useful and help managers in making policy.

II. LITERATURE REVIEW

The agency cost literature includes two opposing positions regarding cash balances (Sola et.al., 2013). Myers and Majluf (1984) argue that companies optimally provide large amounts of cash balances to avoid outside funding because cash balances provide flexibility benefits and do not cause agency costs. Meanwhile Jensen (1986) argues that the company optimally provides a minimum cash balance because excess cash balances cause agency costs and do not provide flexibility benefits. Therefore, DeAngelo and DeAngelo (2007) state that cash balances require agency costs and bring flexibility benefits. Cash accumulation is no longer useful and investors will pressure the company to limit cash balances to avoid agency costs, and encourage managers to provide sufficient cash balances to fund capital needs that can appear suddenly.

Based on transaction and precautionary motives, cash is beneficial to the company. This means that high cash holdings can increase company value. Because, companies need cash to carry out business activities normally and take advantage of profitable investment opportunities in the future. Conversely, based on the theory of free cash flow, high cash ownership can reduce the value of the company. Because cash ownership requires agency costs. The manager holds a large amount of cash and is under his control so that it can make expenses for his interests which decrease the value of the company. The company's cash ownership is one of the factors that influences the company's value (Sola et.al: 2013

III. RESEARCH METHODS

A. Research Design

This research is an explanatory research. Population of research is manufacturing companies listed at Indonesian Stock Exchanges during period 2015-2018. Sample of research consist of 63 companies selected by using purposive sampling and using annual data.

B. Data Analysis Techniques

This study uses simple linear regression analysis using SPSS 20. The simple regression is based on the functional or causal relationship of one independent variable with one dependent variable. The equation is Y = a + bX (Sugiyono, 2016)

IV. DISCUSSION

A. Research result

Model Summary							
Model	R	R Square	Adjusted R	Std. Error of the			
			Square	Estimate			
1	.167ª	.028	.024	.2148396			

a. Predictors: (Constant), Kas

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	.361	1	.361	7.826	.006 ^b
1	Residual	12.554	272	.046		
	Total	12.916	273			

- a. Dependent Variable: Nilai Perusahaan
- b. Predictors: (Constant), Kas

Coefficients^a

Model		Unstandardized	Coefficients	Standardized	lardized t Sig.	
				Coefficients		
		В	Std. Error	Beta		
1	(Constant)	.711	.062		11.440	.000
1	Kas	-1.240	.443	167	-2.798	.006

a. Dependent Variable: Nilai Perusahaan

Based on the results of data processing using SPSS 20 obtained R square value (coefficient of determination) of 0.028. this shows that 2.8 percent of changes in the dependent variable are explained by changes in the independent variable. While 97.2 percent is caused by other variables not mentioned in the model.

The significance value of 0.006 which is smaller than 0.05 means that the independent variable significantly influences the dependent variable. The coefficient value is -1.240 means that the effect is negative. If the level of cash holdings increases by 1 point, the company's value will decrease by 1.240 point. Conversely, if cash holdings decrease by 1 point, the company's value will increase by 1.240 units.

B. The influence of cash holdings on firm value

Based on the results of the research data, it was found that cash ownership has a negative effect on firm value. Changes in the level of cash holdings result in changes in the value of manufacturing companies listed in Indonesian Stock Exchange. This means that there is an association between the two variables and the association is negative.

The finding of this study support the theory of free cash flow which states that high cash holding can reduce firm value. Because cash ownership requires agency costs. If company managers hold large amounts of cash, this can lead them to spend on their behalf and will decrease the value of the company (Sola et al: 2013).

V. CONCLUSIONS

In accordance with the results of the study discussed earlier, it was found that cash holding has a significant negative effect on firm value. This means that if cash holding level increases, the value of the company will decrease, conversely if cash holding level decreases, the company's value will increase.

RECOMMENDATIONS

Based on the results of this study it is recommended that companies should maintain the level of cash holding in order to increase the firm value. And for investors to prefer investing in companies that implement a good cash management.

REFERENCES

- Abuzayed, Bana. 2012. "Working capital management and firms' performance in emerging markets: the case of Jordan", *International Journal of Managerial Finance*, Vol. 8 Iss 2 pp. 155 – 179
- [2] Al-Kayed, Lama Tarek, dkk. 2014. "The relationship between capital structure and performance of Islamic banks", *Journal* of Islamic Accounting and Business Research, Vol. 5 Iss 2 pp. 158 – 181
- [3] Aminu, Yusuf, dan Zainuddin, Nasruddin. 2012. "An Analysis of Proposed Framework on Impact of Working Capital Management on the Profitability of Selected Manufacturing Companies Listed on the Nigerian Stock Exchange". *Journal of Economics and Behavioral Studies*, Vol. 4, No. 12, pp. 730-736.
- [4] Aras, Guler dan Yobas, Banu. 2013. "Governance in Capital Market Institutions". *The Governance of Risk*. Vol. 5; 111-142
- [5] Awad, Ibrahim, dan Jayyar, Fahema. 2013. "Working Capital Management, Liquidity and Profitability of the Manufacturing Sector in Palestine: Panel Co-Integration and Causality". *Modern Economy*, 4, 662-671
- [6] Azinfar, dan Shiraseb. 2016. "An investigation into the impact of ownership structure on the level of cash holdings in the companies accepted in Tehran Stock Exchange Market." *Marketing and Branding Research* 3 hal. 194-205

- [7] Azmat, Qurat-ul-ann. 2014. "Firm value and optimal cash level: evidence from Pakistan". *International Journal of Emerging Markets*, Vol. 9 Iss 4 pp. 488 – 504
- [8] Bagchi, B dan Khamru, B. 2012. "Relationship between Working Capital Management and Profitability: A Study of Selected FMCG Companies in India". *Business and Economics Journal.*
- [9] Basuroy, Suman, Gleason, Kimberly C. dan Kannan, Yezen H. 2014. "CEO compensation, customer satisfaction, and firm value". *Review of Accounting and Finance*, Vol. 13 Iss 4 pp. 326–352
- [10] Bellouma, Meryem . 2011. "Effects of capital investment on working capitalmanagement: Evidence on Tunisian export small and medium enterprises (SMEs)". *African Journal of Business Management* Vol.5 (30), pp. 12133-12137.
- [11] Brigham, E.F. and L.C. Gapenski. 2006. Intermediate Financial Management. 7th edition. SeaHarbor Drive: The Dryden Press.
- [12] Bryman, Alan, dan Bell, Emma. 2007. Business Research Methods. New York: Oxford University Press.
- [13] Colpan, Asli M., dkk. 2007. "Japanese Corporate Governance: Structural Change and Financial Performance". Asian Business & Management, 6, 89–113.
- [14] Damodaran, Aswath, 1997. Corporate Finance, Theory and Practice, New York : JohnWilley & Sons.
- [15] Deshpande, Shreesh dan Jog, Vijay. 2014. "Non-public contracts, cash flows and firm value: the case of Lockheed". *Review of Accounting and Finance*, Vol. 13 Iss 3 pp. 274 – 290
- [16] Dittmar, Amy; Mahrt-Smith, Jan; dan Servaes, Henri. 2003.
 "International corporate governance and corporate cash holdings". *Journal of Financial and Quantitative Analysis*; 38, 1; pg. 111
- [17] Gill, Amarjit S. dan Biger, Nahum. 2013. "The impact of corporate governance on working capital management efficiency of American manufacturing firms". *Managerial Finance*, Vol. 39 No. 2, pp. 116-132.
- [18] Gill, Amarjit S. and Shah, C. (2012), "Determinants of corporate cash holdings: evidence from Canada", *International Journal of Economics and Finance*, Vol. 4 No. 1, pp. 70-9.
- [19] Hermuningsih, Sri.2013. Pengaruh Profitabilitas, Growth Opportunity, Sruktur Modal Terhadap NilaiPerusahaan Pada PerusahaanPublik di Indonesia. Buletin Ekonomi Moneter dan Perbankan, edisi Oktober h. 127-148
- [20] Hoque, Monzurul dan Rakow, KC. 2016. "Do voluntary cash flow disclosures and forecasts matter to value of the firms?", *Managerial Finance*, Vol. 42 Iss 1 pp. 3 – 12
- [21] Ji, Yueh-Er et.al.2012. "Ownership Structure, Excess Cash Holdings, and Corporate Performance." *Global Economy and Finance Journal* Vol. 5. No. 2. Pp. 1 – 25
- [22] Kajananthan, Rajendran. 2012. "Effect of corporate governance on capital structure: case of the srilankan listed

manufacturing companies". Journal of arts, science & commerce vol.iii, issue 4

- [23] Kandpal, Vinay dan Kavidayal, P.C. 2013. "Implication of Working Capital Management on the Profitability: a Case of Ongc Ltd, India". *Indian Journal of Commerce & Management Studies*.
- [24] Krause, Andreas. 2006. "Risk, capital requirements, and the asset structure of companies". *Managerial Finance*, Vol. 32 No. 9, pp. 774-785.
- [25] La Rocca, Maurizio. 2007. "The influence of corporate governance on the relation between capital structure and value". *Corporate Governance*. Vol. 7 No. 3, pp. 312-325
- [26] Lemma, Tesfaye T. dan Negash, Minga. 2014,"Determinants of the adjustment speed of capital structure", *Journal of Applied Accounting Research*, Vol. 15 Iss 1 pp. 64 – 99
- [27] Leng, Allan Chang Aik. 2004. "The Impact of Corporate Governance Practices on Firms' Financial Performance Evidence from Malaysian Companies". ASEAN Economic Bulletin; 21, 3; pg. 308.
- [28] Mohamad, Nor Edi Azhar Binti. 2010. "Working Capital Management: The Effect of Market Valuation and Profitability in Malaysia". *International Journal of Business* and Management, Vol. 5, No. 11.
- [29] Opler, Tim et.al. 1999. "The determinants and implications of corporate cash holdings". *Journal of Financial Economics* 52 h. 3-46
- [30] Qandhari, Ali et.al. 2016. "The relationship between cash flow and capital expenditure in the sugar industry of Pakistan." *The Journal of Developing Areas* Volume 50 No.6
- [31] Sekaran, Uma, dan Bougie, Roger. 2013. *Research Methods for Business*. Chichester: John Wiley & Sons Ltd.
- [32] Shah, Attaullah. 2011. "The corporate cash holdings: Determinants and Implications". *African Journal of Business Management* Vol. 5(34), pp. 12939-12950.
- [33] Siagian, Ferdinand, Siregar, Sylvia V. dan Rahadian, Yan. 2013. "Corporate governance, reporting quality, and firm value: evidence from Indonesia". *Journal of Accounting in Emerging Economies*, Vol. 3 Iss 1 pp. 4 – 20
- [34] Sola, Martinez et.al. 2013. "Corporate cash holding and firm value." *Applied Economics*, 45, 161–170
- [35] Sudiyatno, Bambang, Puspitasari, Elen, dan Kartika, Andi. 2012. "TheCompany's Policy, Firm Performance, and Firm Value: An Empirical Research on Indonesia Stock Exchange". *American International Journal of Contemporary Research* Vol. 2 No. 12. Pp. 30-40.
- [36] Sugiyono. 2016. *Statistika untuk Penelitian*. Bandung: Alfabeta.
- [37] Sunday, Kehinde James. 2011. "Effective Working Capital Management in Small and Medium Scale Enterprises (SMEs)". *International Journal of Business and Management*, Vol. 6, No. 9; h. 271-279.
- [38] Uzliawati, Lia, dan Djati, Kartika. 2015. "Intellectual capital disclosure, corporate governance structure and firm value in

Indonesian banking industry". *International Journal of Monetary Economics and Finance*, Vol. 8, No. 2

- [39] Wang, Yanchao et.al.2014. "Inflation, operating cycle, and cash holdings." *China Journal of Accounting Research* 7 hal. 263–276
- [40] Wasiuzzaman,Shaista. 2015. "Working capital and firm value in an emerging market". *International Journal of Managerial Finance*, Vol. 11 Iss 1 pp. 60 – 79

Research on Analytic Algorithm of Building Structure Appearance Based on Improved Learning Grammar KASSA Anani Thierry¹, Gao Bao Lu²

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Abstract—Semantic segmentation is one of the biggest and most important concerns of computer vision in order to synthesize novel designs and reconstruct buildings. Traditionally, a human expert was required to write grammars for specific building styles, which limited the scope of method applicability. The main purpose of this paper is to improve learning grammar used for building's façade segmentation. To deal with that, we propose a framework with two layers: in the first layer, we provide a reinforcement learning (RL) techniques to make the segmentation allowing the user to brush strokes on the input image through Gaussian Mixture Models (GMM). Still in this layer, the segmentation can be also make based on shape grammars. Note that for both segmentation, we get as output a ground-truth segmentations generated in previous layer, in particular the one generated by RL techniques, we perform clustering techniques to make an improvement of the grammar learned. We evaluate our model on two different datasets and compare in the state-of-the-art our learned-grammar. It show that the proposed outperformed performance gain compared to other learned grammar methods in all the two dataset. **Keywords—Computer vision, Clustering techniques, Gaussian Mixture Models (GMM), learned-grammar, Reinforcement Learning (RL).**

I. INTRODUCTION

How building facades are segmented is great of interest in computer vision due to the number of applications and associated issues such as building information models (BIM). Knowing the regularities in facade layout can be used in video games and movies to generate plausible urban landscapes with realistic rendering [16]. Existing approaches for facade analysis, i.e., the segmentation of facade images into semantic classes, use either conventional segmentation methods or rely on grammar-driven recognition methods [13, 5, 9]. Conventional segmentation methods treat the problem as a pixel labeling task, with the possible addition of local regularity constraints related to building elements, but ignoring the global structural information in the architecture as shown in [26]. On the contrary, methods based on shape grammars impose strong structural consistencies by considering only segments that follow a hierarchical decomposition corresponding to a combination of grammar rules [17, 18].

For a better understanding of our topic, a definition of the term "learning grammars" is essential. There are at least two forms of grammar parsing: the first one is refer to string grammar parsing which consists of an optimal analysis that provides information on the nature of different words and groups of words in the sentence (verbs, nouns, subjects, complements, etc.), it is widely used in Natural Language Processing (NLP) [7]. The second one is called shape grammar parsing that manipulate shapes and their relationships through semantic-geometric rules defined on template shapes (called basic shapes) [7]. It turns out that the groups of words "learning grammar" is nothing more than an automatic learning semantic-geometric rules from images (shapes).

Although Conventional segmentation methods obtain very good pixel-wise scores, these techniques are not appropriate for a number of applications because they frequently produce segments that are inconsistent with basic architectural rules, e.g., irregular window sizes or alignments, or balconies shifted from associated windows. Moreover, as they label only what is visible, ordinary segmentation methods are sensitive to occlusions, e.g., due to potted plants on windows and balconies, or to pervasive foreground objects in the street: trees, vehicles, pedestrians, street signs, lampposts, etc. As a result, important elements can be partially or totally missing from the produced segments, e.g., portions of wall or even complete windows.

In this work, we focus on structural segmentation, i.e., with global regularities and strict constraints as opposed to just local pixel labeling. More clearly, we propose a new model that combine buildings segmentations and learning grammar. The proposed model consists of two parts: (1) perform a segmentation of a façade building through reinforcement learning techniques and show how shape grammars achieve it too, (2) used clustering algorithm to improve the grammar learned through RL techniques.

This paper is organized as follow: Section 2 gives a brief review of related work. Section 3 details on our approach. The performance of the proposed method is compared with state-of-the-art methods in Section 4. Section 5 summarizes the contributions of this work.

II. RELATED WORK

Combining Computational Geometry with the ideas of Formal Grammars as defined in 1956 by Noam Chomsky in [10], procedural geometry appears first with the definition of L-systems and then with shape grammars. The idea of representing the image contents in a hierarchical and semantized manner can be traced back to the work of Kanade and Ohta [23, 25]. However, the practical applications of grammars to image interpretation or segmentation are attributed to more recent works [4, 21, 24, 11].

In many works, the hierarchical and regular structure of man-made objects is explored to improve segmentation or detection results [21, 24, 11, 19]. In these works, researchers are focused on conventional segmentation techniques.

Conventional segmentation techniques rely on grouping together consistent visual characteristics while imposing piecewise smoothness. Popular methods are based on active contours [15, 6], clustering techniques such as mean-shift [3] and SLIC [1], and graph cuts [2, 7]. Although they obtain very good pixel-wise scores, these techniques are not appropriate for a number of applications because they frequently produce segments that are inconsistent with basic architectural rules. On the contrary, grammar-based methods can infer invisible or hardly visible objects thanks to architecture-level regularity. The use of grammar-based facade parsing has been inspired by the successful application of split grammars for generating virtual urban environments [16]. The key to success is to encode in the grammar basic constraints on the generated objects: the principles of adjacency, non-overlap and snaplines. A number of research works has been aimed at applying the grammar principles for retrieving building models from images [12, 13, 8, 24]. In their work, Teboul et al. present an application of a 2D binary split grammar for parsing rectified facade images [12]. The two kinds of approaches are thus complementary: a better low-level classification or segmentation naturally leads to a better parsing and better overall accuracy (assuming the observed facade follows the architecture style modeled in the grammar).

Although grammatical inference is common in natural language processing (NLP), it is rare in computer vision. Recently, a couple of methods have been proposed to automatically learn shape grammars from ground-truth image annotations [9, 22]. Both operating on split grammars. It seems however this approach does not scale well as the authors have to reduce the size of the training set to keep the induction time practicable. Weissenberg et al. [22] present an alternative technique to learn split grammars from images with ground-truth annotations showing the performance of grammar compression, an experiment in facade image retrieval and examples of virtual façade synthesis.

Previous approaches for shape grammar learning involve a first stage of tree hypothesis generation to produce ground-truth parse trees from the ground-truth segmentation, based on heuristics [9, 22]. In order to get more similar trees in which patterns can be found, Gadde et al. [17, 18] propose to generate these ground-truth parse trees differently, using a small generic handwritten grammar.

III. APPROACH

The proposed model consists of two parts: the first one is to perform a segmentation of façade building through reinforcement learning techniques. This segmentation is formulated in term of Markov Decision process (MDP) using shape grammar convention. Still in this stage, we allow user to brush strokes on the input image for each terminal symbol of the binary split grammar (BSG) with Gaussian Mixture Models (GMM). Through these techniques, we get ground-truth segmentations at this first stage. The output of the first stage become an input for the second stage where we performed hierarchical clustering algorithm to improve the learning grammar. Note that for each architecture image parsed in previous stage it corresponds a ground-truth segmentation thus a binary tree. A set of these binary trees is then parse through the split grammars formalism in 2D. It is then realized a rule compression on these trees by finding and freezing repeated subtrees. Furthermore, it is performed clustering on compressed rules to merge inferred rules (learning grammars). These rules are automatically generated by our model and supersedes manual expert work and cuts the time required to build a procedural model of a facade from

several days to a few milliseconds. Moreover, thank to inferred rules, it could be designed new buildings, making comparison between two facades architecture, etc. A pipeline of our model is provided in Fig.1.

In the following sections, we will first describe the formalism of shape grammar used in our model (Section 3.1), then will present how we used Markov Decision Process to formulate buildings segmentation through reinforcement learning (Section 3.2) and finally we will describe the clustering techniques used to inferred grammar (Section 3.3).



Fig. 1: Overview of our architecture

3.1 Formalism of Shape Grammars

The basic concept of a shape grammar is a labeled rectangle, namely a 5-tuple (c, x, y, w, h), where c is a label or symbol and $(c, x, y, w, h) \in \mathbb{N}^4$ defines the position and dimensions of an axis-aligned rectangle; for notational convenience we may denote a labeled rectangle as c (x, y, w, h). A shape S is a set of labeled rectangles: $S = \{s_1, \dots, s_n\}$; we will consider these rectangles disjoint. A grammar rule modifies a shape by replacing a labeled rectangle $s_i \in S$ by a set of labeled rectangles (s_i^1, \dots, s_i^k) . In our work we consider only binary split rules (k = 2) that split a labeled rectangle in two along either the horizontal or vertical directions. We denote a rule to break symbol A along axis ' h_0 ' (for horizontal) into symbols B and C as:

$$A(x, y, w, h) \to h_{o:\alpha} \{ B(x, y, \alpha, h), C(x + \alpha, y, w - \alpha, h) \}$$
(1)

The dimensions of B and C are uniquely determined given A, the split direction h_0 , and size α , where $\alpha \ge w$; if $\alpha = w$, C is the empty symbol. For brevity we introduce the shorthand notation:

$$A \to B(\alpha)C \tag{2}$$

which indicates that shape A is split horizontally (\uparrow means vertically) into a shape of width α and the remainder.

A Binary Split Grammar *G* is a 4-tuple $(\mathcal{N}, \mathcal{T}, \mathcal{R}, \omega)$, where \mathcal{N} is a set of non-terminals, \mathcal{T} is a set of terminals, ω is a special non-terminal called the axiom and \mathcal{R} a finite set of binary split rules. A labeled rectangle c(x, y, w, h) is terminal if it cannot be further expanded by a rule. To generate a shape S according to a BSG G we start from the axiom { ω }. At each step of the generation a non-terminal element $s_i \in S$ is selected and a rule $r \in S$ applicable to s_i is chosen. After applying r the labeled rectangle s_i is removed from S and replaced by its offspring. This process is called a derivation process and stops when S only contains terminal elements. We call such a shape a segmentation. If the axiom ω corresponds to the image domain, a shape made of terminal elements is an image partition that associates every rectangular region with a label. We can equivalently represent S in terms of a parse tree rooted at ω . During the derivation, the offsprings of s_i are added as its children to the tree. At the end of the process the leaves of the parse tree are terminal elements while its internal nodes represent non-terminal labeled rectangles. The language L(G) is the set of all the possible derivations of the grammar G; in our case this amounts to all possible image segmentations.

3.2 Shape parsing via Reinforcement Learning

In this section, we will introduce in the first time the principles of reinforcement learning and in second time show how we fit these principles to the façade parsing.

Principles of Reinforcement Learning

In reinforcement learning (RL) [20], an agent interacts with an unknown environment while choosing actions that maximize its cumulative reward. The unknown environment is modeled as a Markov Decision Process (MDP), described by a finite set of states S, a set of actions A, transition probabilities P, and expected rewards R consecutive to actions. At time t, the agent in state s_t , takes action $a_t \in \mathcal{A}(s_t)$ leading the agent to a new state s_{t+1} with an immediate reward of r_{t+1} . The transition from state s to s' due to an agent action is subject to the probability $P_{ss'}^a$:

$$p_{ss}^{a} = P(s_{t+1} = s' | s_t = s, a_t = a)$$
 (3)

and the reward r_{t+1} received for selecting action *a* in state *s* and arriving in state *s'* is denote by its expectation $R_{ss'}^a$:

$$R_{ss'}^a = E[r_{t+1}|s_t = s, a_t = a, s_{t+1} = s'] \quad (4)$$

The goal of the reinforcement learning agent is to maximize its long term reward which is:

$$R_t = \sum_{k=0}^{\infty} \gamma^k r_{t+k+1} \tag{5}$$

The parameter γ is a discount factor and represents how much weight we give to the rewards that we will come across in the future. Such a behavior is governed by the agent's policy $\pi(s, a)$, the probability of choosing action *a* while in state *s*. This leads to the following state-value function $V^{\pi}(s)$ and action-value function $Q^{\pi}(s, a)$:

$$V^{\pi}(s) = \sum_{a} \pi(s, a) \, Q^{\pi}(s, a) \tag{6}$$

$$Q^{\pi}(s,a) = \sum_{s'} P^{a}_{ss'}(R^{a}_{ss'} + \gamma V^{\pi}(s'))$$
(7)

For the most optimal policy π^* , the above two equations lead to the following non-linear Bellman optimality equations:

$$V^{*}(s) = \max_{a} \sum_{s'} P^{a}_{ss'}(R^{a}_{ss'} + \gamma V^{*}(s'))$$
(8)

$$Q^{*}(s,a) = \sum_{s'} P^{a}_{ss'} [R^{a}_{ss'} + \gamma \max_{a'} Q^{*}(s',a')]$$
(9)

The optimal policy is related to Q^* : to maximize cumulative reward, at every state *s*, the agent must choose action $a^* = \arg \max_a Q^*(s, a)$. An optimal policy is therefore deterministic and derived from Q^* .

Reinforcement Learning for façade parsing

In order to get a better parsing for façade, our approach is to combine the most techniques used for façade parsing such as: state aggregation, Q-learning and some merits functions. In the following sentences, we describe how each technique is performed and converge to a better parsing.

State aggregation: The first advantage of state aggregation consists in reducing the number of possible states, the second one consists in ensuring consistency along the facade. Instead of such computationally intractable alternatives, we propose to use a common policy over all non-terminals which should be split in a common way. For instance, when splitting floors, the learned policy will depend exclusively on the horizontal coordinate, and not on the height of the floor. This enforces symmetry constraints implicitly, aligning windows across floors, or balconies inside of floors. These advantages come at the price of stochasticity in the decision process. The agent can obtain different rewards, while performing the same action on the same aggregated state. This is why the ability of Reinforcement Learning to cope with stochastic rewards becomes indispensable in our problem setting.

Q-learning: we use a Q-learning agent that iteratively segments facades until converging to an optimal policy. In each episode the agent sequentially builds the segmentation by selecting one rule (action) at a time based on a local information (state). By applying a rule, it may create a terminal symbol, a subtask or a cyclic symbol. Then it receives a reward and reaches a new state where it faces a new decision. The value function is iteratively learned by Q-learning updates. After convergence, reached after around 10³ episodes, we deterministically parse the facade by following the greedy policy with respect to the estimate of $Q^*(s, a)$. By virtue of being deterministic, and using a

policy defined on aggregated states, the delivered parse satisfies symmetry constraints. Moreover, despite the large dimensionality of the original space of states and actions, state aggregation allows us to compactly store the actionvalue function in a few Mbs of RAM.

Merits functions: The merit functions are defined on the terminals and are involved in the computation of the rewards. If training data is available in the form of segmentation annotations we can obtain supervised merit functions such as Random Forest (RF) and Gaussian Mixture Models (GMM) which is based on the RGB values of individual pixels selected by the user through brush strokes on the image for each terminal symbol of the BSG. Both RF and GMM merits are making use of some training examples and therefore require some amount of user interaction. To accommodate also the common case where training data is not available we consider the learning of unsupervised merit functions. In particular for simpler cases where the BSG has only two terminal windows, wall and window, we can separate the two classes based on the heuristic introduced by [14]: the hue value distinguishes the walls from the windows.

3.3 Clustering to Learning Grammars

This part of our work is linked to previous one, which generated as output the ground-truth labeled images. Based on these outputs, we provide two steps instead of three steps used in previous works [9, 18], leading to generate the learning grammars.

Ground-truth parse trees: a parse tree generation encodes a facade as a binary split tree whose nodes correspond to facade regions, operations and parameters. The parser tries to produce a tree which associate label image matching as much as possible the ground-truth label image. We used generic grammar (Table 1) to generate parse trees. Although it cannot parse real images (in a reasonable time), it is able to successfully parse the groundtruth label images. One advantage of this technique is there are less decisions to make and good choices are tried first [18]. Another advantage is that the generated ground-truth parse trees can be easily understood, as they reuse the same "concepts" and terms as the generic grammar. This translates as well to the specialized grammars that we infer. While generating parse trees using a generic grammar, the number of meta-rules present in the trees and thus in ground-truth grammar is bounded by the number of metarules in the generic grammar.

Clustering rule patterns: once generated the groundtruth parse tree, the problem we have to deal with here is to define the pattern search as a clustering. The idea is that each given tree or subtree is considered as an object to be grouped with other similar trees or subtrees into clusters. More precisely, given a parse trees $T_1,...,T_n$ covering all the learning set, we want to identify similar subtrees and group them. To deal with that, we use hierarchical clustering algorithm as opposed to LP-based clustering used by [18]. *Table 1. Example of generic grammar*

Simple generic grammar \mathcal{G}_{sgen}					
V	Grour	ndFloorFloorsRoofFloorsky			
GroundFloor \xrightarrow{h} shop door shop					
V		wall (Floorwall)+			
<u>h</u>		wall (BalcWinswall)+			
V	→	balconyWinFloor			
h		wall (windowswall)+			
V		balconywindow			
V		roof (window roof)+			
	Simple $v \rightarrow h$ r - h v h v h v v v v	Simple gener			

Hierarchical clustering technique is divided into two approaches: bottom-up approach which use first to identify all repeated subtress in individual parse trees separately. The second one is top-down approach used to cluster and merge all parse trees at root level. An example of such a rule merging is shown on Fig.2.



Fig. 2: An example of merging rules.

IV. EVALUATION

In this section, we evaluate our approach based on Reinforcement Learning segmentation in one hand, and in the second hand we evaluate the learning grammar based on hierarchical clustering algorithms. These two approaches are evaluated on two benchmark datasets and compare with state-of-the-art.

4.1 Datasets

We test our model on two benchmarks datasets: ENPC2014 [Raghudeep 2017] with 79 images of Art-deco buildings in Paris and ECP2011 [Teboul2011b] which contain 104 annotated images of Haussmannian buildings in Paris.

4.2 Evaluation based on Reinforcement Learning segmentation

In this section we will show examples of parsing facades using our reinforcement model with specifically rewards as Gaussian Mixture Model (GMM), Random Forest and Hue.



Fig.3: Parsing facades with a 4-color BSG. From left to right: original image, user's brush strokes to train a GMM classifier, pixel-wise segmentation using the GMMs, optimal parse with our algorithm.



Fig. 4: Parsing facades with Hue reward. On the left the original image, on the right the optimal parse.



Fig. 5: Parsing facades with Randomized Forest. On the left the original image, on the right the optimal parse.

4.3 Evaluation based on hierarchical segmentation

To do this evaluation, our data are follow some parameters such as: G_{gt} (grammar inferred directly from the ground-truth parse trees), G_{hcl} (grammar inferred directly from hierarchical clustering), in order to show the accuracy of parsing using our learned grammars (Table 2): we report classwise accuracy: average class accuracy, overall pixel accuracy and average intersection-over-union score (IoU). Both datasets ECP2011 and ENPC2014 are segmented and annotated into seven classes: *door, shop, balcony, window, wall, sky and roof.*

	[Teboul2 011b]	[Raghudeep 2017]	${\cal G}_{ m gt}$	Ours
Door	49	53	41	61
Shop	78	84	78	89
Balcony	49	57	46	65
Window	51	59	46	68
Wall	72	79	78	88
Sky	97	96	95	95
Roof	52	54	49	62
Average	64.1	68.9	61.8	74.5
Overall	68.4	74.3	69.5	79.8
IoU	48.0	57.8	48.2	60.4

Table 2. Segmentation results on the ENPC2014 datasets.

Furthermore we show few visual segmentations using our learned grammar with number of episodes for convergence and segmentation accuracy.



Fig. 6: Qualitative results on ECP2011 dataset. Image (left) and segmentation using learned grammar G_{hcl} (right) are shown here along with number of episodes for convergence and segmentation accuracy.



(040, 80.1%) Fig. 7: Qualitative results on ENPC2014 dataset. Image (left) and segmentation using learned grammar G_{hcl} (right)

convergence and segmentation accuracy.

V. CONCLUSION

are shown here along with number of episodes for

In this paper, we improve the learning grammar through a hierarchical clustering algorithm. We demonstrated that hierarchical clustering technique outperform façade segmentation through bottom-up approach which use first to identify all repeated subtress in individual parse trees separately and the top-down approach used to cluster and merge all parse trees at root level. We achieved state-of-theart performance on a challenging benchmark, and showed the potential of the method to deal with a wide variety of buildings.

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VII. REFERENCES

- Achanta, R., Shaji, A., Smith, K., Lucchi, A., Fua, P., Susstrunk, S.: SLIC superpixels compared to state-of-the-art superpixel methods. Pattern Analysis and Machine Intelligence, IEEE Transactions on 34(11), 2274{2282 (2012)
- [2] Berg, A.C., Grabler, F., Malik, J.: Parsing images of architectural scenes. In: Computer Vision, 2007. ICCV 2007. IEEE 11th International Conference on, pp. 1{8. IEEE (2007)
- [3] Comaniciu, D., Meer, P.: Mean shift: A robust approach toward feature space analysis. Pattern Analysis and Machine Intelligence, IEEE Transactions on 24(5), 603 (619 (2002)
- [4] F. Han and S.-C. Zhu. Bottom-up/top-down image parsing with attribute graph grammar. IEEE Transactions on Pattern Analysis and Machine Intelligence, 31(1):59–73, 2009.
- [5] H. Riemenschneider, U. Krispel, W. Thaller, M. Donoser, S. Havemann, D. Fellner, and H. Bischof. Irregular lattices for complex shape grammar facade parsing. In CVPR, 2012.
- [6] Kass, M., Witkin, A., Terzopoulos, D.: Snakes: Active contour models. International journal of computer vision 1(4), 321{331 (1988)

- [7] Kolmogorov, V., Zabin, R.: What energy functions can be minimized via graph cuts? Pattern Analysis and Machine Intelligence, IEEE Transactions on 26(2), 147{159 (2004)
- [8] M. Mathias, A. Martinovic, J. Weissenberg, and L. V. Gool. Procedural 3D building reconstruction using shape grammars and detectors. In 3DIMPVT, 2011.
- [9] Martinovic, A., Van Gool, L.: Bayesian grammar learning for inverse procedural modeling. In: Computer Vision and Pattern Recognition (CVPR), 2013 IEEE Conference on, pp. 201 [208. IEEE (2013)
- [10] Noam Chomsky. Three Models for the description of Language. In IRE Transactions on information theory, 1956.
- [11] N. Ahuja and S. Todorovic. Connected Segmentation Tree -A Joint Representation of Region Layout and Hierarchy. In CVPR, 2008.
- [12] O. Teboul, L. Simon, P. Koutsourakis, and N. Paragios. Segmentation of building facades using procedural shape priors. In CVPR, pages 3105–3112, 2010.
- [13] O. Teboul, I. Kokkinos, L. Simon, P. Koutsourakis, and N. Paragios. Shape grammar parsing via reinforcement learning. In CVPR, pages 2273–2280, 2011.
- [14] O. Teboul, I. Kokkinos, L. Simon, P. Koutsourakisand N. Paragios. Parsing facades with shape grammars and reinforcementlearning. IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 35, no. 7, pages 1744–1756, 2013.
- [15] Osher, S., Paragios, N.: Geometric level set methods in imaging, vision, and graphics. Springer (2003)
- [16] P. Muller, P. Wonka, S. Haegler, A. Ulmer, and L. Van Gool. Procedural modeling of buildings. ACM Transations on Graphics, 25(3):614–623, 2006.
- [17] Raghudeep Gadde, Renaud Marlet and Nikos Paragios. Learning Grammars for Architecture-Specific Facade Parsing. International Journal of Computer Vision, pages 1– 27, 2016.
- [18] Raghu Deep Gadde. Semantic Segmentation of Highly Structured and Weakly Structured Images. Signal and Image Processing. Université Paris-Est, 2017.
- [19] Riemenschneider, H., Krispel, U., Thaller, W., Donoser, M., Havemann, S., Fellner, D., Bischof, H.: Irregular lattices for complex shape grammar facade parsing. In: Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on, pp. 1640{1647. IEEE (2012)
- [20] Sutton R.S. and A.G. Barto. Introduction to reinforcement learning. MIT Press, 1998.
- [21] W. Wang, I. Pollak, T.-S. Wong, C. A. Bouman, and M. P. Harper. Hierarchical stochastic image grammars for classification and segmentation. IEEE Transactions on Image Processing, 15:3033–3052, 2006.
- [22] Weissenberg, J., Riemenschneider, H., Prasad, M., Van Gool, L.: Is there a procedural logic to architecture? In: Computer Vision and Pattern Recognition (CVPR), 2013 IEEE Conference on, pp. 185{192. IEEE (2013)
- [23] Y. Ohta, T. Kanade, and T. Sakai. A production system for region analysis. In Proceedings of the Sixth International Joint Conference on Artificial Intelligence, pages 684 – 686, 1979.

- [24] Y. Jin and S. Geman. Context and hierarchy in a probabilistic image model. In CVPR (2), pages 2145–2152, 2006.
- [25] Y. Ohta, T. Kanade, and T. Sakai. An analysis system for scenes containing objects with substructures. In Proceedings of the Fourth International Joint Conference on Pattern Recognitions, pages 752–754, 1978.
- [26] David Ok, Mateusz Koziński, Renaud Marlet, Nikos Paragios. High-Level Bottom-Up Cues for Top-Down Parsing of Facade Images. 3DIMPVT, Oct 2012, Zürich, Switzerland. pp.N/A, 2012.

Epidemiological Study of Suicide Cases between Youth and Adults from 2010 to 2018 in Cacoal City, Rondonia, Brazil

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Abstract— Suicide is considered a universal human phenomenon and represents a huge public health problem worldwide. Suicide has been characterized by self-directed behavior ranging from suicidal idealization to fatal aggression, that is, where the victim decides to take his own life to relieve a psychological pain that is often considered unbearable. The objective of this research is to verify the incidence of suicide cases in young people and adults in the city of Cacoal-RO from 2010 to 2018. The methodology used was a form developed by the researchers to collect data, containing 10 questions, based on In the notification form, the research is a retrospective, cross-sectional, documentary, descriptive study with a quantitative approach. In the municipality of Cacoal-RO, 41 cases were reported being male (75.6%) and female (24.4%) in the age group 19-54 corresponding to 70.7%, the race with 53.65% brown, having completed elementary school 39.0% and belonging to the urban area 78.05%, being used in 78.05% of victims hanging as a means of aggression. It is concluded that the incidence of suicide within the municipality of Cacoal-RO can be considered high generating a rate of 0.521 / 1000 / inhabitants with an average annual rate of 4.55 / year (2010-2018). Of great concern, therefore, most deaths occurred among males aged 19-54, thus it is observed that prevention is still the best alternative, however there is no other way to talk and guide the population from which suicide can be prevented, so the mortality rate (0.521 / 1000 / inhabitants) may decrease. As mentioned, the secretary of education, social care, and municipal health secretary must partner with strategies to prevent and bring information to schools, the community, the university, churches, so that they both join the life preservation campaign. Keywords— Public Health. Suicide. Prevention.

I. INTRODUCTION

Suicide is considered a universal human phenomenon and represents a huge public health problem worldwide. Deaths caused by suicide have been in third place in frequent deaths with ages ranging from 15 to 34 years (BERTOLOTE *et al.*, 2010; VIDAL *et al.*, 2012).

Suicide has been characterized by self-directed behavior ranging from suicidal idealization to fatal aggression, that is, where the victim decides to take his own life to relieve a psychological pain that is often considered unbearable (SCHLÖSSER, 2014; FARIA *et al.*, 2019).

According to Guerreiro (2013) and Coleman (2011) adolescence is a stage of life that body development occurs from maturity from childhood to adulthood, where also occurs hormonal changes, physical development, mood change, identity, consciousness and cognitive decisions.

According to the World Health Organization (WHO), the worldwide death rate caused by suicide is around 16 per 100,000 inhabitants, which represents one death every forty seconds. This number is estimated to increase by 2020 and may reach around one and a half million suicidal people (BERTOLOTE *et al.*, 2010).

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With each passing year, mortality among suicide sufferers becomes higher. What is observed in the midst of scientific work on suicide, few are carried out, those that exist focus a lot on the mortality rate, without seeking the associated factors, diagnosis, psychiatric disorder, family affairs and drug use (KARASOULI *et al.*, 2011; BERNARDES *et al.*, 2010).

Rim Chae (2016) In most western countries, including Europe and the United States United States, the main cause of suicide can be explained by psychic disorders like depression.

Suicide is, in most countries, among the top ten causes of mortality, being more common among adolescents and young adults, consisting of a serious public health problem (OLIVEIRA *et al.*, 2016). Brazil is the fourth fastest growing country of suicide cases in Latin America (WHO, 2014; ARAUJO, PINTO-COELHO & LOPES, 2016). Of concern is the Northern Region, where suicides increased considerably: from 390 to 693, an increase of 77.7% between 1980 and 2012, with the states of Amazonas, Roraima, Acre and Tocantins doubling. their numbers (FARIA *et al.*, 2019).

According to Sá *et al.*, (2010) research indicates that with each passing day it is becoming very common in emergency services of hospitals and emergency units throughout Brazil to encounter situations of victims who committed suicide. Given the reality the objective of this work is to verify the incidence of suicide cases in youth and adults in the city of Cacoal-RO from 2010 to 2018.

II. MATERIAL METHODOLOGY

The instrument used was a semi-structured questionnaire of 10 questions prepared by the researchers and advisor. The research project was evaluated by the CEP - Ethics and Research Committee of the Cacoal Education Institution - FACIMED - Cacoal Faculty of Biomedical Sciences and after its approval received the opinion number 2.064.193. Then, the researchers contacted the municipal health department of the municipality of Cacoal -RO which directed us to the Health Surveillance sector of the municipality of Cacoal-RO through the letter of consent requesting their authorization by signature, and only After this, data tabulation was started.

III. RESULTS

Based on the tabulation results, they are informed in the search results in the form of tables which are informed all the processing of the data acquired during the search.

Based on Graph 1 below, the incidence of death from suicide between 2010 and 2018 was 4.88% (n = 2) in 2010, 2011 and 2013 with 2.45% (n = 1). , in 2012 with 9.75% (n = 4), 2014 and 2017 with 12.19% (n = 5), 2015 with 14.63% (n = 6), 2016 with 21.95% (n = 9) and 2018 with 19.51% (n = 8).





Source: Carvalho, Romanha, Faria e Lima (2019)

Table 1 reports the results regarding sociodemographic data, related to age, gender, race, education, and area of occurrence. Based on the table below, it is observed that among the 41 patients who committed suicide, 75.6% are male and 24.4% female. The age range of both male and female patients ranged from <18 years with 4.90% of cases, 19 to 59 years with 70.7% of cases,> 60 years with 24.4% of cases. Regarding race, only three options contained in the notification form were registered, 36.6% corresponding to white and 53.65% corresponding to brown and 9.75% black. The education of these patients was verified that 36.6% have incomplete 5th to 8th grade, 39.0% have completed elementary school, 9.80% have incomplete high school and 14.6% were ignored. Most of the patients who were notified correspond to urban population with 78.05% and rural area with 21.95%.

	Cacoai-KO,	2019.	
	VARIABLE	Ν	%
Sex	Male	31	75,6
	Feminine	10	24.4
			, .
	ΤΟΤΑΙ	41	100
	TOTAL	71	100
Age	<18	2	49
iige	18 - 59	29	70.7
	>60	10	70,7 24 4
	200	10	27,7
	ΤΟΤΑΙ	<i>/</i> 1	100
	TOTAL	71	100
	White	15	36.6
Breed	vv nite	15	50,0
Diccu	Black	4	9.75
	Brown	7),15
	DIOWII	22	53 65
		22	55,05
	TOTAL	41	100
Schooling	5th to 8th grade incomplete		
		15	36,6
	Complete primary education		
		16	39,0
	Incomplete high school		
		4	9,8
	Ignored	6	14,6
	TOTAL	41	100
Zone			
occurrence			
	Urban	32	78,05
	Rural	9	21,95
	TOTAL	41	100

Table 1: Relative and absolute distribution of suicide cases in the municipality of Cacoal-RO from 2010 to 2018, according to the variables gender, age, race, education and area of occurrence.

Source: SINAN/SEMUSA/MS, 2010-2018, Cacoal - RO

Table 2 represents the means of aggression used by victims who committed suicide between 2010 and 2018 in the municipality of Cacoal –RO. Among the means used were hanging (78.05%) and residential use poisoning (17.05%) and farm use poisoning (4.9%).

Table 2 - Mea	ns used for suic	de in the municipality	of Cacoal-RO betw	veen the years 2010	- 2018. Cacoal-RO, 2019
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	Ν	%	
	Hanging	32	78,05
	Intentional Exposure Poisoning - Residential Poison	7	17,05
CAUSES	Intentional Exposure Poisoning - Farm Poison	2	4,9
	TOTAL	41	100

Source: SINAN/SEMUSA/MS, 2010-2018, Cacoal - RO

IV. DISCUSSION

The municipality of Cacoal-RO is made up of 78,574 people according to the last IBGE census of 2010 (IBGE, 2019). They were informed by the secretary of health of the municipality of Cacoal-RO that between the estimated period of 2010 to 2018 were reported 41 deaths from suicide (SEMUSA, 2019).

Compared to graph 1, it is noted that the highest incidence occurred in 2016 (n = 9) followed by 2018 (n = 8). According to the Ministry of Health in 2016, in Brazil there was a large number of cases that reached an incidence rate of 5.8 / 100,000 inhabitants (n = 11,433 deaths). In 2017, the incidence rate increased fivefold. reaching 36,279 deaths (BRAZIL, 2018).

In the analysis of the obtained data, 75.6% of the cases of death by suicide corresponded to males and 24.4% to females (Table 1). According to Vidal et al., (2012) male gender is a risk factor that has a high probability of death due to it is closer to more harmful methods. According to Faria et al. (2019) he conducted a survey between the period 2015 and 2016 and obtained the information that among the period the female gender was the one with the highest incidence.

According to Machado & Santos (2015), women are more likely to attempt suicide several times, but men are able to commit suicide more often, ie research shows that Brazil has more occurrences of male suicide reaching to be three times higher due to the more lethal methods.

Regarding the age group, it is noted that 70.7% of notifications occurred between 19-54 years and 24.4% in those over 60 years (Table 1). Compared to data from Vidal et al. (2012), suicide is common in males over 60 years of age. Suicide in the elderly occurs because they feel incapable and do not realize the basic activities due to age, thus feeding the death wish not to be a hindrance in someone's life (KRÜGER, 2010).

Regarding the research conducted in Cacoal-RO, the incidence regarding race occurred in 53.65% in brown

followed by 36.6% in white and 9.75% in black (Table 1). According to Machado & Santos (2015) in their study the incidences occur in most cases of brown color suicides. According to the Ministry of Health (2018) the proportion of suicide has been happening in the black population (55.4%) and quite exorbitant compared to other races.

Regarding education 39.0% of people who committed suicide in Cacoal-RO had completed elementary school (Table 1). According to Stevović et al. (2011) to a correlation between suicide rate and low level of education, ie, educational level can influence interaction with other people. According to Durkheim (2003) apud Gonçalves *et al.* (2011) it is shown that for males, the higher the educational level, the more susceptible to suicide. According to Mitra and Shroff (2006) the rise of highly educated people become the increase in stress, triggering mental disorders, and having the individual commit suicide.

According to Ficher & Vansan (2008); It is believed that preventive measures can be taken within the school space. The teacher is the educator responsible for passing on knowledge to the students, so it is essential to identify early the first symptoms that may lead a teenager or young person to attempt or complete suicide. Education, social care and health must be united based on prevention.

The survey conducted in the municipality shows that most cases occurred within the urban area of Cacoal-RO, corresponding to 78.05% of the notifications (table 1). According to the research by Machado & Santos (2015); Grubits *et al.*, (2011) when the person has no space in society this can lead him to a psychological disorder, where he can develop thoughts and feelings of worthlessness, belonging, devaluation, decrease, selfesteem and many others. what happens within urban society.

According to Lovisi *et al.* (2009); The high rate of suicide among adolescents, young people and adults within the Brazilian territory is largely associated with

unemployment, increased competitiveness in the labor market, insufficient training, drinking and other drugs causing psychiatric suffering and leading to suicide.

According to Braga & Dell'Aglio (2013); Toro et al. (2009); It is stated that within the American continent, several studies indicate that the higher incidence of suicide is correlated with the population living in urban areas, becoming a large population group at risk of suicide.

Various forms are used to cause pain relief, such as poisons, pesticides, firearms, bladed weapons, ropes, medicines and many others. In this research the ways used and that took the lives of 41 people from 2010 to 2018 were hanging (78.05%) and the use of residential poisons (17.05%) and farm poison (4.9%) (Table 2) (SEMUSA / CACOAL / RO).

According to Stack, (2000) apud., Levisi et al., (2009); Women use suicide methods that are not as violent as men's. Females generally use the high dosage of medication because it may be considered socially accepted. Thus as mentioned the method used by men is more fatal, being used firearms, or faster acting farm poisons.

According to Souza *et al.*, (2002) apud., Levisi *et al* (2009); It is believed that the use of firearms may be related to the desire of the urban population to protect their families against violence, as well as to the fact that guns are now easily traded within Brazilian territory.

According to Ministry of Health (2018); The use of exogenous poisoning by Paraquati is considered to be the second cause with the highest incidence (18%), ranking first in deaths from hanging that reached 60%.

V. CONCLUSION

It is concluded that the incidence of suicide within the municipality of Cacoal-RO can be considered high generating a rate of 0.521 / 1000 / inhabitants with an average annual rate of 4.55 / year (2010-2018).

Of great concern, therefore, most deaths occurred among males aged 19-54, thus it is observed that prevention is still the best alternative, however there is no other way to talk and guide the population from which suicide can be prevented, so the mortality rate (0.521 / 1000 / inhabitants) may decrease. As mentioned, the secretary of education, social care, and municipal health secretary must partner with strategies to prevent and bring information to schools, the community, the university, churches, so that they both join the life preservation campaign.

The teacher has a fundamental role, because it is he who daily lives with the one who can be a victim. The human mind is very malicious, very often the victim may be on his side, needing help, but we are unable to diagnose the symptoms, and when we realize it is too late.

It is observed that daily in the yellow september campaigns, however prevention is still a challenge, as many of the victims do not let the symptoms show, being able to live easily in the midst of society, but we are not able to imagine how these people are feeling mentally , and the size of the pain that is going through. However, despite the difficulty, it is a very important step to understand and acknowledge the warning signs in yourself or someone else, offer help, guide people to seek help, and call the life center at 188.

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REFERENCES

- Bertolote JM, Mello-Santos C, Botega NJ. Detection of suicide risk in psychiatric emergency services. Rev Bras Psychiatry 2010; 32 Suppl 2: S87-95.
- [2] 2. Vidal, CEL; Gontijo, ECDM; Lima, LA Suicide Attempts: Prognostic Factors and Estimation of Excess Mortality- Belo Horizonte-MG - 2012- [Cited 10/09/2019]
 Available at: https://www.scielosp.org/article/csp /2013.v29n1/175-187/en/
- [3] SCHLOSSER, A.; ROSA, G. F. C.; MORE, C. L. O. -The field. Review: suicidal behavior throughout the life cycle. - Ribeirão Preto –SP, 2014 - [Internet] - Available at <http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pi d=S1413-389X2014000100011&lng=en&nrm=iso>., V. 22, no. 1, p. 133-145, abr. 2014. Hits on 10 nov. 2017
- [4] Faria, G; Luz, GS; Betin, TA Suicide between young people and adults in Brazil: a theme focused on the population of Cacoal-RO municipality in 2015 and 2016-Cacoal-RO 2019- [Cited on 12/19/2019] - Available at:
- [5] GUERREIRO, D.F., SAMPAIO D.-Self-harm behaviors in adolescents: a literature review focusing on Portuguese language research. Rev Port Public Health. 2013; 31 (2): 204-213. doi: 10.1016/j.rpsp.2013.05.001.
- [6] COLEMAN J.C. The Nature of Adolescence, 4th Edition, 2011- [Internet]. Available from: http://books.google.com/books/about/The_Nature_of_Adol escence_4th_Edition.html?id= Sb_qF0zbA4AC & pgis = 1 Login on 11/18/2017
- [7] KARASOULI E, Owens D, Abbott RL, Hurst KM, Dennis M. All-cause mortality after non-fatal self-poisoning: a cohort study. Soc Psychiatry Psychiatr Epidemiol 2011; 46:455-62.
- [8] BERNARDES SS, TURINI CA, MATSUO T. Profile of suicide attempts by intentional overdose of drugs attended by a Poison Control Center of Paraná, Brazil. Cad Public Health 2010; 26: 1366-72.
- [9] RIM CHAE, —Joint family suicide in South Korea, International Research Journal of Advanced Engineering

and Science, Volume 1, Issue 4, pp. 5-8, 2016.

- [10] OLIVEIRA, EN et al., Epidemiological aspects and nursing care in suicide attempt- 2016 - Available https://www5.bahiana.edu.br/index.php/enfermagem/article /view/967- DOI: http : //dx.doi.org/10.17267/2317-3378rec.v5i2.967Modern Nursing Journal | ISSN: 2317-3378- accessed 10/10/2017
- [11] WHO World Health Organization. (2014). Country reports and charts available. Recovered [internet] -Available at: <www.who.int/mental_health / prevention / suicide / country_reports / en / index. html> - - Access 12/12/2017
- [12] WHO. World Health Organization. First report on suicide prevention [Internet]. Geneva: WHO; 2014 - Available from: Available at: - Access 12/12/2017">http://www.who.int/mediacentre/news/releases/2014/suicidepreventionreport/en/>- Access 12/12/2017
- [13] ARAUJO, R; PINTO- COELHO, Z; LOPES, F. Media reporting and coverage of suicide in Portuguese media. [citado 27 out. 2019]. Revista Portuguesa de Saúde Pública Volume 34, Issue 2, May–August 2016, Pages 173-185. Disponível: https://doi.org/10.1016/j.rpsp.2016.05.001
- [14] SA NNB, Oliveira MGC, Mascarenhas MDM, Yokota RTC, Silva MMA, Malta DC. Emergency calls for suicide attempts, Brazil, 2007. Rev Méd Minas Gerais 2010; 20: 145-52.
- [15] Brazilian Institute of Geography and Statistics (IBGE) -Cacoal-RO - 2019 [cited 20 Oct 2019]. Available at: http://cidades.ibge.gov.br/brasil/ro/cacoal
- [16] SEMUSA, Municipal Secretariat of Health. Epidemiological data suicide in Cacoal-RO. Cacoal-RO. 2019.
- [17] BRAZIL. Ministry of Health New data reinforce the importance of suicide prevention. Brasilia: Ministry of Health. 2018. [Cited Oct 10, 2019]. Available: http://www.saude.gov.br/noticias/agencia-saude/44404novos-dados-reforcam-a-importancia-da-prevencao-dosuicidio
- [18] Daiane Borges, Santos Darci Neves of the. Suicide in Brazil, from 2000 to 2012. J. bras. psychiatrist. [Internet]. 2015 Mar [cited 2019 Sep 11]; 64 (1): 45-54. Available from:

http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0 047-20852015000100045&lng=en.

http://dx.doi.org/10.1590/0047-2085000000056.

- [19] KRÜGER, L. L., Werlang, B. S. G. Family dynamics in the context of suicidal crisis. Psycho-USF, v. 15, no. 1, p. 59-70, 2010 [quoted on October 15, 2019]. Available: http://www.scielo.br/pdf/pusf/v15n1/07.pdf
- [20] BRAZIL, Ministry of Health. Partnership to reduce suicide rate in black population. Brasilia: Ministry of Health 2018.
 [Cited on 10 September. 2019]. Available: https://www.mdh.gov.br/todas-asnoticias/2018/setembro/parceria-para-reduir-indice-desuicidio-na-populacao-negra
- [21] GONÇALVES, Ludmilla R. C., Gonçalves, Eduardo, & Oliveira Júnior, Lourival Batista de. (2011). Spatial and

socioeconomic determinants of suicide in Brazil: a regional approach. New Economy, 21 (2), 281-316. https://dx.doi.org/10.1590/S0103-63512011000200005

- [22] DURKHEIM, E. The Suicide. Sao Paulo: Martin Claret, 2003
- [23] MITRA, S.; SHROFF, S. Determinants of suicide rates in developing countries: an econometric investigation of the Indian case. Jadavpur University: India, 2006. (Working Paper).
- [24] STEVOVIĆ, LI; JAŠOVIĆ-GAŠIĆ, M; VUKOVIĆ, O; PEKOVIĆ, M; TERZIĆ, N; Gender differences in relation to suicides committed in the capital of montenegro (Podgorica) in the period 2000-2006- Psychiatria Danubina, 2011; Vol. 23, No. 1, pp 45-52 Original paper © Medicinska naklada - Zagreb, Croatia. 2011 [Citado em 20 out 2019]. Disponível:https://pdfs.semanticscholar.org/0eb7/965827da 1197389260cfe752ad625afdcd83.pdf?_ga=2.203622230.77 8361666.1568213838-557839573.1568213838
- [25] FICHER, AMFT .; VANSAN, G.A. Suicide attempts in young people: epidemiological aspects of cases treated in the psychiatric emergency department of a university general hospital between 1988 and 2004. Estud. psychol (Campinas), Campinas, v. 25, no. 3, p. 361-374, Sept. 2008 Available from <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S 0103-166X2008000300005&lng=en&nrm=iso>. access on 11 Apr. 2019. http://dx.doi.org/10.1590/S0103-166X2008000300005.
- [26] GRUBITS S, FREIRE HBG, NORWAY JAV. Young Suicides Guarani / Kaiowá from Mato Grosso do Sul, Brazil. Psicol Cienc Prof. 2011; 31 (3): 504-17.
- [27] LEVISI, GM; SANTOS, SA; LEGAY, L; BEE, L;
 VALENCIA, E; Epidemiological analysis of suicide in Brazil between 1980 and 2006. Rev Bras Psiquiatr. 2009;
 31 (Suppl II): S86-94 [Quoted 21 Oct 2019]. Available: http://www.scielo.br/pdf/rbp/v31s2/v31s2a07.pdf
- [28] BRAGA, Luiza de Lima, & DELL'AGLIO, Debora Dalbosco. (2013). Adolescent suicide: risk factors, depression and gender. Clinical Contexts, 6 (1), 2-14. https://dx.doi.org/10.4013/ctc.2013.61.01
- [29] STACK S. Suicide: A 15-Year Review of the Sociological Literature. Part I: cultural and economic factors. Suicide Life Threat Behav. 2000; 30 (2): 145-62
- [30] SOUZA ER, MINAYO MC, MALAYSIA JV. Suicide among young people in selected Brazilian State capitals. Cad Public Health. 2002; 18 (3): 673-83.
- [31] TORO, D.C.; PANIAGUA, R.E.; GONZÁLEZ, C.M.; MONTOYA, B. 2009. Characterization of schooled adolescents with risk of suicide, Medellín, 2006. Journal of the National Public Health Faculty, 27 (3): 302-308.
Utilization of solar energy for processing sea water into fresh water by the distillation method

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Abstract— Coastal areas and small islands in the middle of the high seas are areas that have very few sources of fresh water. resulting in problems meeting the need for drinking water. Water resources in the area are generally of poor quality, for example brackish or salty groundwater. Source of water that is not limited in quantity is sea water, although the quality is very bad because many contain very high levels of salt. One way to overcome this problem is by applying water treatment technology that is in accordance with the social, cultural, economic and HR (Human Resources) conditions, in addition to the condition of the raw water sources themselves. The process of treating sea water into fresh water is known as the distillation process From the results obtained from the distillation process, the highest tube discharge = 1.9 cm on the first day, high distillation water 0.0307 m3 and the collector temperature 33° C, on the third day the highest tube discharge = 1.8 cm, distillation water 0.0287 m3 and the collector temperature of 40° C, on the fourth day the highest tube discharge = 2.0 cm, high distillation water 0, 0319 m3 and the temperature of the 36° C collector and on the fifth day the highest tube discharge = 2.2 cm, high distillation water = 0.0351 and the collector temperature 38° C.

Keywords—Sea water, Fresh water, Distillation, Temperature, Collector

I. INTRODUCTION

Coastal areas and small islands in the middle of the high seas are areas that have very few sources of fresh water. resulting in problems meeting the need for drinking water. Water resources in the area are generally of poor quality, for example brackish or salty groundwater. Source of water that is not limited in quantity is sea water, although the quality is very bad because many contain very high levels of salt. One way to overcome this problem is by applying water treatment technology that is in accordance with the social, cultural, economic and HR (Human Resources) conditions, in addition to the condition of the raw water sources themselves. The process of treating sea water into fresh water is known as а desalination process. To answer this challenge, the team tried to design a sea water treatment system into fresh water, this treatment system utilizes solar energy as a natural source of heat.

II. STUDY OF LITERATURE a. Literature Review

In this theoretical study, several basic theories relating to the research object described include water definition, water treatment systems, distillation and solar energy.

b. Previous Research Review

Water is a compound of two hydrogen atoms and one oxygen atom to become H2O which is very important for human life (SitanalaArysad). The function of water for life cannot be replaced by other compounds. The main use of water and very vital for life is as drinking water because the absolute substances that make up the human body consist of 70% water. According to Government Regulation No. 121 of 2015 concerning Water Resources Management, states that "Water is all water that is on, above or below the surface of the land, including sea water that is on land".

1. Sea water

Sea water has a salty taste because it contains NaCl compounds which are quite high. According to some research sources, the salt content they have is 3.5%, which means that in 1 liter (1000 ml) of sea water there are 35 grams of mineral salt. Data from the National Oceanic and Atmospheric Administration explains that more than 70% of the earth's surface is covered by water and the rest consists of islands with many lakes and other water sources. Of the total percentage of water that meets the earth recorded 97% consists of sea water and is not good for consumption. To be utilized, the seawater needs to be processed first into fresh water / clean water / raw water.

2. Clean water

Clean water is healthy water that is used for human activities and must be free of germs that cause disease, free of chemicals that can pollute clean water. Water is an absolute substance for every living thing and cleanliness of water is the main condition for ensuring health. According to the Regulation of the Minister of Health of the Republic of Indonesia Number: 41 6 / Minister Of Health/Per / IX / 1990 concerning requirements for water quality control, clean water is water used for daily needs whose quality meets health requirements and can be drunk if cooked.

Distillation

According to the Big Indonesian language, distillation is the process of heating a liquid or solid object until it turns into steam which is channeled into a separate vessel. Where this process is carried out by removing salt and minerals that are dissolved in seawater to get water that is suitable for community use, especially for people in coastal areas who have minimal water supply. An additional result of this process is salt which when seawater is brought to a boil.



Fig. 2.1. The process of distillation sea water

a. By Linsey et al (1995) in his book explained that distillation is a water distillation technology to get fresh water from dirty water or sea water whose principle is to evaporate sea water by heating, which then the water vapor is condensed so that fresh water is obtained. The heat source that is used comes from diverse energy, one of which is solar energy. Utilization of solar energy for the distillation of sea water is one of the simplest ways to do, where sea water is heated so that it occurs evaporation and separation of mineral elements contained therein with fresh water (**fig 2.2**).



Fig. 2.2.The process of refining sea water by utilizing solar energy

Previous Research Review

Research on processing sea water into salt water several times has been done by previous researchers, including:

1. Mulyanef., Et al (2014) with the research title "Processing Seawater Into Clean Water and Salt with Solar Distillation". In this study the instrument used was a flat plate collector with an area of 1.6 m2 and the volume of sea water in the basin was 10 liters (**fig** 2.2).



Fig.2.3. Flat Plate Solar Collector

The results obtained with the sun's intensity of 542 W / m2 are clean water as much as 1360 ml / day and it takes 7 days to produce 642 grams of salt. In conclusion, the authors say that the productivity of the resulting salt can increase if the area of the collector is enlarged and the heating time can be shortened if the intensity of the sun increases. Salt productivity is determined by the process of evaporation from seawater in a solar collector's chamber and the condensation process that occurs in the cover glass. The evaporation process will be better if the temperature of sea water in the solar collector room is getting higher. The lower the temperature of the cover glass, the condensation process will be faster. This results in higher condensate productivity and will accelerate salt production in solar collectors.

2. Mulyanef., Et al (2006) with the research title "Solar Water Seawater Distillation System Using Flat Plate Collectors With Tilting Cover Glass Type". The study was conducted on several alternative types of cover glass used including type one tilted glass surface, type two tilted glass surface and type four tilted glass surface. The results explained that of the three types of glass, the most clean water produced the most was type two sloping glass surface.

Concept Framework

The evaporation process will be better if the temperature of sea water in the temperature collector chamber is getting higher. The lower the temperature of the cover glass, the condensation process will be faster.



Fig. 2.4. Solar distillation type two sloping the surface of



Fig 2.5 Research flow chart

III. METHODOLOGY

a. Types of research

There are various types of research, can be adjusted with the perspective and scientific basis. Judging from the method approach, this study is a type of experimental research that aims to investigate the causal relationship by controlling.

b. Research sites

The research location is a place or region where the research was conducted. For this research took place in the yard of Civil Engineering Workshop.

c. Research time

This research was conducted for three months from April and is planned until July 2019.

d. Research Data Types

The type of data taken is primary data that is data obtained by researchers collecting directly at the study site. The data obtained include measurements of the ambient temperature, control of the heat produced in the collector's room and the percentage of raw water obtained.

e. Population, Sample and Research Unit

This research is an experimental study, so the research sample here is sea water. With the distillation method, sea water with a certain volume is processed into fresh water. For this process, a tool for processing sea water is designed using solar energy. The design of the processing system can be seen in **Fig 3.1**.



Fig. 3.1.Details in front of the collector

f. Method of collecting data

One important component in research is the process of researchers in collecting data can be done to obtain the information needed in order to achieve research objectives. In this study the method of data collection in the form of observation. Where researchers directly observe the work process, phenomena that occur during the testing process and measure the primary data obtained.

g. Analysis Method

Measurements were made of the ambient temperature and the temperature in the collector's chamber. Calculations of the temperature of the sun's heat and displayed with a graph of the relationship between the intensity of solar heat, the addition of sea water and temperature.

h. Operational Definition

In this study used several variables that are defined operationally so that they can be used as a guide in conducting research as well as instructions for those who read. Some important variables related to the process of seawater distillation are as follows:

1. The independent variable is the volume of sea water. In this study the number of samples used varies in this case is the treatment of sea water by the distillation process.

2. The dependent variable is the sun's heat energy that is produced and penetrated in the collector's chamber causing the room temperature to rise.

3. Control variables are the temperature / temperature in the collector's chamber and the heating time

- Temperature or temperature is a physical quantity stated to measure the degree of heat of a substance. The temperature measured at the time of testing is the temperature / ambient temperature and the temperature / temperature produced in the collector's chamber.

- The time needed to state the duration of the warm-up.

IV. RESULTS AND DISCUSSION

a. General description and characteristics of place / location / object / research unit

The distillation process is the process of filtering seawater into raw water through a heating process. The heat source that is utilized can consist of artificial heat sources such as heating using fuel oil, gas, electricity and natural heat sources in the form of utilization of solar energy or solar energy. This processing system has been widely introduced ranging from simple to modern. The simple method is carried out by heating the seawater until it boils and takes its steam and at the lowest temperature turns into fresh water. While the modern method is to filter sea water through high pressure pipes. However, this method is not suitable to be applied in low-income coastal communities such as coastal areas in Maluku.

b. Description of research variables

Temperature / air temperature greatly affect and water clarity and meet clean water requirements such as not containing harmful substances, colorless, odorless and others

c. Testing and analyzing research data

Materials and Equipment consisting of

- 1. Heat-absorbing collector tube
- 2. Collecting water in the water
- 3. Collector cover glass
- 4. Water storage steel plate

No	Table 4.1. Observation of any 1 to any 5								The water
INO	Date	tube	of water	height	collector	temperature	time	of water	The water
		tube	distillation	of water	concetor	temperature	tille	of water	
			(Raw)	collector					
		Cm	m3	m ³	°C	°C	Jam	Cm	Salt/Fresh
1	22/07/2019	0	0.00	0,036	38	30	10	8	Fresh
		0,5	0,0079	0,036	41	30	11	8	Fresh
		0,9	0,0143	0,036	45	31	12	8	Fresh
		1,3	0,0207	0,036	45	31	13	8	Fresh
		1,5	0,0239	0,036	50	31	14	8	Fresh
		1,7	0,0271	0,036	45	30	15	8	Fresh
		1,9	0,0307	0,036	38	30	16	8	Fresh
	Rata -rata	1.3	0,0178		43,14		6		
2	24/07/2019	0	0.00	0,036	40	29	10	8	Fresh
		0,5	0,0079	0,036	48	29	11	8	Fresh
		0,7	0,0111	0,036	51	30	12	8	Fresh
		1,4	0,0223	0,036	52	30	13	8	Fresh
		1,6	0,0255	0,036	50	30	14	8	Fresh
		1,7	0,0271	0,036	40	30	15	8	Fresh
		1,8	0,0287	0,036	40	29	16	8	Fresh
	Rata -rata	1,18	0,0175		45,85		6		
3	26/07/2019	0	0.00	0,036	39	29	10	8	Fresh
		0,3	0,0047	0,036	43	29	11	8	Fresh
		0,6	0,0095	0,036	46	29	12	8	Fresh
		1,2	0,0191	0,036	48	30	13	8	Fresh
		1,5	0,0239	0,036	47	30	14	8	Fresh
		1,6	0,0255	0,036	47	30	15	8	Fresh
		1,8	0,0287	0,036	33	29	16	8	Fresh
	Rata -rata	1,16	0,0159		43,28		6		
4	29/07/2019	0	0.00	0,036	42	29	11	8	Fresh
		0,5	0,0079	0,036	50	30	12	8	Fresh
		0,9	0,0143	0,036	54	31	13	8	Fresh
		1,3	0,0207	0,036	52	31	14	8	Fresh
		1,8	0,0287	0,036	50	31	15	8	Fresh
		2,0	0,0319	0,036	36	29	16	8	Fresh
	Rata –rata	1,3	0,0172		47,33		5		Fresh
5	30/07/2019	0	0.00	0,036	41	29	10	8	Fresh
		0.4	0,0063	0,036	45	30	11	8	Fresh
		0.7	0,0112	0,036	48	30	12	8	Fresh
		1.3	0.0207	0.036	48	31	13	8	Fresh
		1.8	0.0287	0.036	50	31	13	8	Fresh
		2.0	0.0319	0.036	45	31	15	8	Fresh
		2,0	0.0351	0.036	38	29	15	8	Fresh
	Rata rate	1.4	0,0331	0,030	45	2)	6	0	11031
	Rata –rata	1,4	0,0191		43		U		

Table 4.1 Observation of day 1 to day 5



Fig. 4.1. Chart Relationship between distillation time and water height date 22 July 2019

From graph 4.1 above it can be seen that the height of distilled water on July 22, 2019 is 0.0307 m^3 at 16.00 WIT for the initial reading at 11.00 high distillation water 0.0079 m^3



Fig. 4.2. Chart Relationship between distillation time and water height date 24 July 2019

From graph 4.2 above it can be seen that the height of distilled water on July 24, 2019 is 0.0287 m³ at 16.00 WIT for the initial reading at 11.00 WIT high distillation water 0.0079 m³



Fig. 4.3. Chart Relationship between distillation time and water height date 26 July 2019

From graph 4.3 above it can be seen that the height of distilled water on July 26, 2019 is 0.0287 m³ at 16.00 WIT for the initial reading at 11.00 WIT high distillation water 0.0047 m³



Fig. 4.4. Chart Relationship between distillation time and water height date 29 July 2019

From graph 4.2 above it can be seen that the height of distilled water on July 29, 2019 is 0.0319 m^3 at 16.00 WIT for the initial reading at 12.00 WIT high distillation water 0.0079 m³



Fig. 4.5. Chart Relationship between distillation time and water height date 30 July 2019

From graph 4.5 above it can be seen that the height of distilled water on July 30, 2019 is 0.0351 m³ at 16.00 WIT for the initial reading at 11.00 WIT high distillation water 0.0063 m³



Fig. 4.6. Chart Relationship between time and tube discharge date 22 July 2019

From graph 4.6 above it can be seen that the discharge of the tube on July 22, 2019 was 1.9 cm at 16.00 WIT for the beginning of the initial reading at 11.00 WIT 0.5 cm tube discharge



Fig. 4.7. Chart Relationship between time and tube discharge date 24 July 2019

From graph 4.7 above it can be seen that the discharge of the tube on July 24, 2019 was 1.8 cm at 16.00 WIT for the beginning of the initial reading at 11.00 WIT 0.5 cm tube discharge



Fig. 4.8. Chart Relationship between time and tube discharge date 26 July 2019

From graph 4.8 above it can be seen that the discharge of the tube on July 26, 2019 was 1.8 cm at 16.00 WIT for the beginning of the initial reading at 11.00 WIT 0.3 cm tube discharge



Fig. 4.9. Chart Relationship between time and tube discharge date 29 July 2019

From graph 4.9 above it can be seen that the discharge of the tube on July 29, 2019 was 2,0 cm at 16.00 WIT for the beginning of the initial reading at 12.00 WIT 0.5 cm tube discharge



Fig .4.10. Chart Relationship between time and tube discharge date 30 July 2019

From graph 4.10 above it can be seen that the discharge of the tube on July 30, 2019 was 2,2 cm at 16.00 WIT for the beginning of the initial reading at 11.00 WIT 0.4 cm tube discharge

d. Discussion

Based on the results of tests in the field by using sea water as a basic material for the process of changing sea water into raw water using a distillation system through daylight heat irradiation by conducting through 5 trials in 5 days where the implementation time consists of 5 to 6 hours of observation this is due to the current conditions of the rainy season so that the temperature is not constant so the implementation of the trial is limited to hot time, as attached in the observation table 4.1. and graph 4.1 until the graph 4.10

V. CONCLUSION AND SUGGESTIONS

A. Conclusion

The results of this study can be summarized as follows:

1. For the temperature of utilizing solar energy with an average of 0.36 m^2 collector area with a water level in the collector is 0.036 m^3 distillation occurs with an average temperature of 29.94°C by producing raw water for an average of 6 hours and 5 times the experiment is 0.02 m^2 or 20 liters due to dependence on the utilization of solar energy, the area of the collector cover glass and the area of the collector.

2. Based on the results of previous studies, the area of 1.6 m^2 wide, 10 liters of sea water volume and 136 liters of raw water require 7 days of experiment with the distillation method shows that the results obtained by utilizing solar energy and air temperature with solar intensity 542 W / m².

Thus the volume of raw water is determined by the area of the collector, the area of the collector glass, the temperature in the collector and utilizing solar energy

B. Suggestions

1. For further research with the deslilation method, it can increase the observation time and can predict the utilization of solar energy.

2. Going forward so that subsequent research can create a renewable collector model and the extent of the collector's variety.

REFERENCES

- [1] Linsey, R.K and Fransini, J.N, 1995, Water Resources Engineering, Erlangga, Jakarta
- [2] Mulyanef., Et al, 2014, Processing Sea Water Into Clean Water and Salt With Solar Distillation, Journal of Mechanical Engineering Volume 4 Number 1, April 2014: 25-29.
- [3] Mulyanef., Et al, 2006, Solar Desalination System to Produce Clean Water for Coastal Communities in Padang Beach, Proceedings of the National Seminar on SNMI Tarumanegara University, Jakarta
- [4] Goverment Regulation Number 121 Year 2015 concerning Water Resources Business, Jakarta
- [5] GovermentRegulation of the Minister of Health Number: 416 / MEN.KES / PER / IX / 1990 Concerning Requirements and Supervision of Water Quality, Jakarta
- [6] Pabiban., Et al., 2016, Design and Build of a Parabolic Type Solar Distillation System to Reduce Sea Salinitation Levels, FLASH Volume 2 Scientific Journal No. 2 December 2016.
- [7] Tirtoadmojo. H, 1999, Performance of a Flat Plate Type Solar Water Heater Collector with One and Two Glass Covers, Journal of Engineering Volume 1 Number 2 October 1999, 115-121

Agroecology, the Interaction between Agriculture and Environment: An Example from Cuba

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Abstract— Living in the Amazon it was unavoidable to observe the problem emerged from the high level of burnings in the rain forest this year of 2019: the tension that exists between agriculture and environmental conservation was on focus every day. Some farmers, very much interested in profiting with the plantation of soybean revealed no care for the preservation of the forest. On the hand, many small farmers just thought the opposite: the need to preserve the forest and keep producing food. In fact, many Amazonian people, not only Amerindians, believe that it is possible to balance the needs of rural people to utilise natural resources to eat and earn an income and at the same time to protect the forest or the environment in general So, environmental cost may be minimized, not increased, with agricultural activity. Future generations depend on the continent's vast forests and watersheds remaining intact in the Amazon as in the whole world. In this study we address the benefit of thinking on Agroecology. The city of Havana, Cuba is an example which we will explorehere, regarding its benefits relating to Agroecology, production and distribution after the 1989 socialist crisis and the economic blockade. The crisis resulting from the embargo imposed by the United States was aggravated by the socialist crisis in Eurasia, a context in which the social movement of urban agriculture emerged, with Havana being the main locus. We can understand urban and peri-urban agriculture as the social agricultural movement developed in urban and peri-urban spaces by small farmers, aiming at subsistence and/or commercialization. Through sustainable practices, production demonstrates success in generating jobs and income, food security and sovereignty. The production, technical assistance and sales outlets are growing steadily – which corroborates the urban agriculture movement, supported by the government via an ecological and efficient lowcost agricultural policy and combining traditional knowledge with cutting-edge technology as the key to success. Keywords— Peri-urban and Urban Agriculture. Havana, Cuba. Agroecology.

I. INTRODUCTION

Besides being a range of agriculture technique, we believe that Agroecology is also a way of thinking or rethinking our relationship with nature. In this sense, agroecology means to accept and embrace the complexity of nature, the consequence of our actions towards nature, not in the fores, but also in the city, as is the "urban agriculture". Urban and peri-urban agriculture is a phenomenon in expansion, especially in developing countries, where urban food supply systems are not accessible to the whole population. Urban dwellers are increasingly supplementing their daily diets and strengthening their household budgets by growing their own food (according to information available on the CEPAGRO website apud SANTOLIN, 2010). The practice of urban agriculture occurs in or around cities or metropolises, corresponding to a survival strategy of urban

dwellers for food subsistence or for commercialization and generation of family income.

As Olivier de Schutter argues in his preface to the book Agroecology: A transdisciplinary Participatory and and action-oriented Approcah (,2016), agroecology contributes to the preservation of the soil, favours better nutrition and helps to balance the competition between the large-sized farms and the small farms. However it is still marginalized mainly because the economic interest of agrobusiness. In peripheral and semi-peripheral countries, the case of Cuba excels in terms of the development of agro-ecological and sustainable agriculture. The province of La Ciudad de Habana stands out for its production, the engagement of urban dwellers and the use of sustainable agricultural practices. It is worth remembering that the practice of urban agriculture was an alternative to face food shortages resulting from the economic blockade imposed by the United States and the socialist crisis in

Eastern Europe and the Soviet Union. Meanwhile, in recent years, a strong agricultural movement in cities and settlements has been developed in Cuba, which is called Urban Agriculture (COMPANIONI *et al.* 2001), whose success is related to political and economic issues.

Given the importance demonstrated towards urban agriculture, Cubans have come to be respected for their mobilized knowledge and ability to cultivate and produce in areas that are so tiny and have little potential. The executive secretary of the urban and peri-urban agriculture program, Nelson Campanioni, considers that this agriculture allows "taking advantage of all the available land, through sustainable methods such as agroecology, vermicomposting, among other techniques. [...] In this program the production is intended to obtain meat, grains, vegetables, fruits and roots, animal breeding and dairy products as well as to develop forestry." (*website* Cuba liberdade, 2011).

The popular initiative observed in urban agriculture mobilizes sustainable methods combined with the rational use of the territory, which, depending on government support, is the key to Cuban success – which has made Havanathe leading city in urban agriculture in Latin America, according to FAO. In order to assess the performance of Latin cities, the Foundation considered three challenges that should be faced when constructing its urban vegetable gardens: lack of space in cities, soil quality and unreliable water supply (GAETE, 2014).

The capital city of Cuba is the largest center of urban agriculture as regards popular initiative, agricultural production in tons and number of urban farmers. Theorganoponic production, corresponding to the cultivation of vegetables in the water, in places with poor and small soils was crucial to reach this achievement. Given what was exposed above, the problem to be debated is evident: How has Havana been able to solve the food shortage produced by the American economic blockade since 1962 and aggravated by the socialist crisis of the late 1980s?

II. THE POLITICAL AND ECONOMIC SITUATION OF CUBA: A BRIEF HISTORY

As already evidenced, the city of *La Habana* represents a sustainable urban agriculture model, supported by Agroecology, combining traditional knowledge and cutting-edge technology, with low cost and high income, as well as generating employment, income and solving the issue of food security. The city and the country faced the impact of the Economic Blockade and Socialist Crisis in Cuba by making strategic use of Urban Agriculture.

The economic and political blockade imposed by the United States on Cuba, in 1962, was a consequence of the Cuban Revolution, which trod the independence of the American domination. This blockade prevented the commercialization of primary and industrial products in the country, by trading partners and politicians linked to the United States. Recently, the Netherlands was fined by the United States for trading with Cuba and breaking the trade agreement established with the Americans, which meant not trading with the Caribbean country.

During the first years of 1990s, due to the disintegration of the socialist bloc in eastern Europe, Cuba lost its main trading partners and, at the same time, the United States intensified the economic blockade against the island. Consequently, the black market flourished and product prices soared. Many edibles were "diverted" from state distribution chains to supply this black market, causing shortages in the rationing system. Fresh fruits and vegetables, even when produced in sufficient quantities, often rotted in the fields or in the storerooms because the transportation system was also in crisis (BOURQUE & CAÑIZARES, 2005).

The impact of the disintegration of socialist Eastern Europe and the intensification of the American economic blockade on the Cuban economy motivatedCuban agricultural investments, as there was an increase in the price of products and food shortages, as well as the rotting of vegetables and fruits due to the transport crisis, caused by the lack of fuel. (BOURQUE & CAÑIZARES, 2005). Thus,

> With the fall of the socialist bloc and the loss of these preferential markets, the Cuban economy suffered a severe blow that resulted in a decline in production due to the interruption of import supply. In 1989, 57% of the proteins and more than 50% of the calories consumed by the population arrived in the country as imported products, as well as 97% of the animal feed. (CRUZ, 2005 apud SORZANO, 2009) [Translated from Spanish].

Considering that the country imported more than 50% of protein and caloric foods consumed by the population, the negative effects of the fall of the socialist bloc, the loss of the main markets, the reduction of production and the interruption of imports were very large

(CRUZ, 2005 *apud* SORZANO, 2009). From these effects came others, according to Sorzano:

The impact of the crisis began to be seen in a series of transformations in the economic, technological and social aspects that cause differentiated regularities to be registered in the agricultural sector such as those experienced at the beginning of the Revolution (1959) and those that occur since 1989, a time that will mark a new era in the evolution of Cuban agriculture. (SORZANO, 2009)[Translated] from Spanish].

As a result of the economic crisis, there were social, economic, and technological changes that reflected in the development of urban agriculture, so that, "The effects of the fall of the socialist camp and the implications that it had on trade, in an open economy like ours, are observed in the behavior of the laundering of GDP growth between 1988 and 2005"(SORZANO, 2009) (Translated from Spanish). Besides,

> Between 1975 and 1985 the average annual growth of the economy was of the order of 7%, based on a model supported by the international economic relations of the socialist countries that provided credits, technological assistance and market for products.The agricultural effects of the crisis that is unleashed in the early 1990s put an end to this economic growth with a marked sign of spatial and social equity and, introduces us to a stage of reforms in an international context characterized by the consolidation of world capitalist unipolarity. (SORZANO, 2009) [Translated from Spanish].

With the fall of the Soviet Union, the United States became the only world superpower and center of power. Cuba lost its largest trading partner in the export and import of products, especially human and animal food, as well as fuel. Faced with the adversities exposed above, the Cuban population and government reacted through economic reforms in different spheres. In this context, there has been a reform in food production through urban agriculture since 1990.

In the food issue, Cuba and Havana had the Cuban government's support to make the claims and initiatives of the popular urban agriculture movement viable, through support and infrastructure measures to farmers, such as technical assistance, land distribution, sales outlets, agricultural technologies, seed shops and agricultural orientation, vegetarian restaurants, organic fertilizer centers, among others.

It is also worth mentioning the investments in agroecological agriculture based on the organic earthworm humus and on the principles of sustainability of rational use of resources and local potentiality. According to PEÑA et al. (2002) 1 t of earthworm humus is equivalent to 10 tons of manure, probably because the technology used in Cuba is more efficient than that used in Brazil (AQUINO, 2002). The country's largest worm farm is located in the province Pina Del Río. According to Aquino (2002), Cuba's largest earthworm center is located in Pinar Del Río and produces 100,000 tons per year of earthworm humus from "cachaça" (a sugarcane plant byproduct).Agricultural technology is constantly being renewed and researched at an existing agricultural research center in Havana, which is also the headquarters of the Ministry of urban agriculture.

III. URBAN AGRICULTURE IN CUBA AND IN THE CITY OF HAVANA

In 1989, more than 57% of Cuba's caloric consumption was imported from the Soviet Union. With the collapse, Cuba suddenly became solely responsible for feeding its population, including Havana's 2.2 million inhabitants (WARWICK apudMARQUEZ, 2013). The population and the Cuban government resisted the situation of unemployment crisis, lack of transport, energy and the fall of access to food. One of the innovations coming from the crisis was the urban agriculture movement that emerged in the nineties from the initiative of the population to overcome food shortages in the country. Having embraced the idea, the Cuban government provided support to popular urban agriculture by creating infrastructure for the small agricultural production, aiming at subsistence and commercialization. The government complied with the popular initiative and, instead of inhibiting it, directed policies to foster it, so that in 1994 the newly created Department of Urban Agriculture

carried out some key actions: adapted the regulations by incorporating Usufruct planning, making it not only legal, but also free to adapt unused and public land to the disposal and potential productive territory; trained a network of extension agents, community members who monitor, educate and encourage the building of community vegetable gardens in the neighborhoods; created seed houses to provide resources/information; and established a direct selling infrastructure for Agricultural Markets to make these gardens profitable(WARWICK, MURPHY, PINDERHUGHES *apud* MARQUEZ). In the following photo, we can observe a vegetable garden in the capital of Cuba. Thus, the Cuban agricultural policy generated food for subsistence and income generation, as with the socialist crisis there was great unemployment. Urban agriculture has generated more than 8000 jobs. Meanwhile, Gaete (2014) points out "that 90,000 residents of Havana (...) produce food". One of *La Havana*'s most significant achievements in urban agriculture is the development of organoponics, a technology developed in 1987 that allows you to grow vegetables in the water, an alternative to small and low-quality soil locations such as regions around roads and steep slopes(GAETE, 2014).



Vegetable gardens in Havana. Photo by BOURQUE & CAÑIZARES, 2005.

Gaete (2014) also draws attention to the expansion experienced by urban agriculture, driven by the creation of the Provincial Delegation of Agriculture and of two national programs for the development of agriculture in the city and the periphery.Government support for the establishment of two national urban and peri-urban agriculture programs was important to leverage this type of agricultural production with regards to technical assistance, financing, etc. In addition, the city's Strategic Plan also targets non-urbanized spaces that are mainly cultivated by women and youth. It should also be noted that at the end of last year, Havana had 97 urban gardens occupying 39,500 hectares, that is, half of its surface. In addition, it is estimated that three are 89,000 patios and

5,100 lands (less than 800 m²) devoted to domestic consumption to which 90,000 inhabitants are related. These facts are reflected in surprising figures: in 2013, 58,000 tons of products were commercialized, of which 6,770 were delivered to schools, hospitals and other services. (GAETE, 2014).

As it can be inferred, urban agriculture in Havana takes many forms and horticulturists use different methods depending on the size, location and quality of the land. Existing forms can be divided according to the methods used and the type of social organization (BOURQUE & CAÑIZARES, 2005). The different types of methods are intensive vegetable and flower gardens, organoponic gardens, and small diversified farms. In densely populated urban areas, where vegetable gardens are smaller (less than two hectares), Cubans use the intensive cultivation method or the organoponics method. Intensive gardening is chosen when the existing soil is healthy and provides adequate drainage, and seeds and seedlings can be grown directly on the existing soil. Elevated raised beds, built on supporting structures, are often used to protect plants from torrential rain and to ensure more efficient use of organic fertilizers.

In turn, in areas where the soil is poorer, rocky, compacted, contaminated, or simply where it does not exist, especially when it is not possible to drain, or in paved spaces, the organoponic method, which uses raised beds, where soil and compost are placed "imported" from another location, is adopted. Raised beds are usually built with any material at hand, including old tiles and rocks, or broken concrete blocks. The soil is taken from another part of the region and mixed with equal amounts of organic material to fill the beds. Both systems are extremely intensive. Horticulturists seek to prevent any flowerbed from being empty for more than 48 hours, without plants or without being sown, and they all use very high proportions of compost and other organic soil conditioners (González, 2000; MINAGRI, 1999; Murphy, 1999 apud BOURQUE & CAÑIZARES, 2005).

Outside the cities, where more land is available, suburban farms exceed two hectares. Due to their larger size, these farms may associate more livestock and fruit and forest trees with the vegetable production, typical of smaller gardens. These farms are also highly diverse and can produce longer cycle crops, which in smaller areas would represent inefficient use of the limited space available. These peri-urban farms produce a large amount of starchy and grain tubers. There are many different forms of urban farm organization, and two main types of land tenure regime. Farmers who have traditional private plots in both urban and suburban areas are called "parcels" and are usually organized into credit and service cooperatives (CCSs). Since 1993, when the government began handing over land to people for the free and permanent right to use them, a new category of farmer was created: the "usufructuary". Today, more and more usufructuaries are joining CCSs (BOURQUE & CAÑIZARES, 2005).

When several farmers come together, form a cooperative, and apply for land and loans as a group, they establish a Basic Cooperative Production Unit (BCPU). The State gives them land (larger than what would be offered to people in isolation) and provides the infrastructure such as fences, sales outlets, tool shelters, irrigation systems and early production loans, which the cooperative will pay off little by little. Interest rates are

low and land is free as long as they repay their loans before the due date (BOURQUE & CAÑIZARES, 2005). Many state-owned agricultural companies have been experimenting with a new scheme whereby they divide the state land surrounding the city and hand over the plots (up to 20 hectares) to new farmers. In many ways, these farmers are like the usufructuaries, but they must continue producing what the company traditionally cultivated and selling to that company. Contracts are based on production quotas and prices are set before sowing, so that the production above the established quota gets a higher value or can be sold directly to consumers for even better prices. A good example is the orchards of the national fruit and vegetable production company, *CultivosVarios*.

About 400 farmers spread around Havana grow vegetables, flowers, grains and medicinal plants under mango and other trees that have been sown 20 years ago. This experience in the Havana area transformed CultivosVarios, which just five years ago lost 10 million pesos annually, and today generates more than one million pesos a year. In the past three years, all land located around various Cuban cities has been converted to this system, which is now being experimented with in other sectors, such as livestock and dairy production(BOURQUE & CAÑIZARES, 2005).

As a result of adopted policies, of the resources employed, of land use regulatory reforms, and of the strong market demand, and also due to the actions of the government and community members, the urban agriculture movement is flourishing vigorously in Havana and all over Cuba. The figures for the number of vegetable gardens, cultivated areas, total production, and yield of intensive production farms using raised beds, and their percentage in the total production of food consumed demonstrate the vigor of this trend(BOURQUE & CAÑIZARES, 2005).

According to Medina (2001), urban agriculture in Havana is expressed in the form of "family vegetable gardens, state self-consumption, popular organoponics, agricultural offices" (translated from Spanish). The predominant form is organoponics, it can be used in many places regardless of soil quality and availability of large spaces. Aquino (2002) states that "organoponics constitutes a closed system for the production of vegetables and condiments that are not directly linked to the soil. They are built in unproductive, flat areas near the recipient of the final production. (MINAG, 2000). [...] The substrate used in organoponics consists of a mixture of organic matter and soil". In general, the period 1989-1994 can be said to mark subsistence urban agriculture in the city of Havana, at the beginning of the economic crisis in the country, produced by the economic embargo and socialist crisis. The subsequent period (from 1994 to the present) marks the permanence of self-consumption and commercialization of urban agricultural production. The urban agriculture developed in Havana stands out for social inclusion through job and income generation, food security, access to healthy food of better nutritional quality and agroecology through the use of sustainable agricultural techniques.

IV. FINAL REMARKS

Despite the economic embargo imposed by the United States on Cuba since 1962, the socialist crisis of the European countries and the Soviet Union, its main trading partner, the country has managed to rebuild itself, especially with regards to agriculture, in particular urban agriculture, which provides food supplies, improves the health of city dwellers through the consumption of healthy and fresh organic foods and generates income for 90000 residents of the city of Havana.

The national urban agriculture movement emerged from the people as a food alternative to the problems created by the economic crisis. The initiative and invention of the urban dwellers of this agriculture had state support, regarding the financing infrastructure, public land distribution, food distribution at fairs, sales outlets, restaurants, vegetarian restaurants, schools, hospitals, among others. The involvement and dedication of urban farmers and of the State is the main success factor of this type of agriculture.

Sustainable and ecological agriculture, based on Agroecology with the production of organic earthworm humus, composting, the reuse of water, organic food and cow grafts and others are the hallmark of this agriculture. Allied to ecological agriculture, both low cost and high generation of income consolidate the relevance of urban agriculture to the peripheral countries that need to combat hunger, poverty, unemployment and human indulgence.

In this way, Cuba and the city of Havana show that it is possible to overcome the issue of hunger and of ecological urban agricultural production, simply by having political will through agricultural policies that support the development of urban agriculture by city dwellers.

REFERENCES

- Aquino, Adriana Maria de, (December 2002).. Agricultura urbana em Cuba: análise dos aspectos técnicos. Seropédica, RJ. EMBRAPA Agrobiologia (EMBRAPA Agrobiologia. Documento, 160).
- [2] Bourque, Martin & CAÑIZARES, Kristina. (2005.) Agricultura Urbana em Havana:Produção de alimentos na

comunidade, pela comunidade e para a comunidade. Revista de Agricultura Urbana. Habana, Cuba. N.1.

- [3] CULTIVATE GREENER CITIES IN LATIN AMERICAN AND THE CARRIBBEAN APRIL 2014). <u>https://www.fao.org.br/ccmvALC.asp</u>.. Access onOct. 2014.
- [4] Gaete, ConstanzaM.(Oct 2014) As 10 cidades latinoamericanas líderes em agricultura urbana, segundo a FAO, 2014. <u>www.archdaily.com.br</u>.
- [5] Galanti, G.(Dec 2005) integrando práticas ecológicas no manejo da agricultura urbana nos países subdesenvolvidos. Revista de Agricultura Urbana. N. 6,.
- [6] Má, Leonardo. (2014) Agricultura urbana: o que Cuba pode nos ensinar.Available at<<u>http://www.archdaily.com.br/78672/agricultura-urbanao-que-cuba-pode-nos-ensinar</u>>, acesso(Oct 2014)
- [7] Medina A, Roberto Sanchez. (2001)Agricultura Urbana En La Ciudad De La Habana, Cuba. Canadá. City Farmer Canada's Office of Urban Agriculture..
- [8] Mendez, Ernesto (2016) et alii. Agroecology: A transdisciplinary, participatory and action oriented approach. Boca Raton, FL: CRC Press.
- [9] Pessoa, Cristiane Cardozo.(2005)Agricultura urbana e pobreza: um estudo no município de Santa Maria – Rio Grande do Sul. Dissertação de Mestrado. Santa Maria, RS. Pós-graduação em Extensão rural. Universidade Federal de Santa Maria.
- [10] Sorzano, Angelina Herrera(Year5, no. 9. 2009.). Impacto de la agricultura urbana em Cuba. Revista Novedades en población. Habana, Cuba. CEDEM, Universidad de la Habana, Cuba
- [11] <u>http://cubaliberdade.blogspot.com.br//2011/10/fao-destaca-programa-cubano-de-agricultura-urbana</u>. Acesso em 8 de outubro de 2014.

Characterization of the commercialization establishments of Açaí (*Euterpe Oleracea Mart.*) at the Neighborhood Fair do 40 Horas, municipality of Ananindeua, Pará, Brazil

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Abstract— The objective of this work was to verify the sanitary hygienic conditions of açaí beaters in the neighborhood of 40 Hours, municipality of Ananindeua, Pará, Brazil. Study descriptive, exploratory of probability for convenience, like case studies, performed in April 2017, at the fair, in the neighborhood of 40 hours, municipality of Ananindeua-PA. The data were collected at four points of acai berry referred to point A, B, C and D. of the four visited 50% points were with licensing that allows the sale of the product; 75% was with INMETRO seal on Acai Scout machine; 50% owned exclusive freezer for storage and no handlers made use of 100% of the personal protective Equipment required. The main failure verified was in solid waste disposal. The study showed inadequate conditions of packaging, preparation and final destination of the product leading to the finding of a serious public health problem.

Keywords—Acai; Chagas disease; Environmental health.

I. INTRODUCTION

The *Euterpe oleracea Mart*. Known as açaí, is a fruit produced in a palm tree popularly called Açaizeiro found in the state of Pará, in the Amazon region, is part of the vegetation of Terra firme forests, Várzea and Igapó (BRAZIL, 2017).

Pará is the largest national producer of açaí, according to data from the Brazilian Institute of Geography and Statistics (IBGE, 2016). The Secretary of State for Agriculture (SAGRI) says that in Belém there are about 2,700 açaí beaters registered in the association of the artisan sellers of Açaí of Belém; And of these, less than 10% are able to sell the product within the hygiene standards established by the State sanitary legislation. According to SEFA's tax control data in 2014, only in the municipality of Ananindeua, the production of pulp and mix of açaí reached 5,562,848 kilos (TAVARES, 2015).

Being so popular, there is a concern about the handling of the fruit until reaching the final consumer in order to avoid food poisoning and contamination by parasites, which ends up being crushed along with the purplish fruit or the sweet buds, Especially in places without proper hygiene.

In 2010, the relationship between the consumption of açaí and the incidence of Chagas disease was confirmed, after 430 cases of the disease were registered in the state of Pará, in 2006. Chagas disease is caused by a protozoan, *Trypanosoma Cruzi*, able to survive in the pulp of the fruit both at room temperature, as at 4 $^{\circ}$ C, average temperature of a refrigerator, and up to-20°c, in frozen açaí, being

transmitted by the ingestion of feces of Triatomine insects, popularly known in Brazil as "Barber". Tests performed showed that the protozoan causing Chagas ' disease is (BRAZIL 2010; DOCTORS WITHOUT BORDERS, 2018).

Thus, this work aimed to verify the hygiene conditions of the physical space; Hygiene conditions and the proper use of personal protective equipment (PPE) by the handlers and disposal of the waste generated, from the stores of commercialization of açaí in the neighborhood of 40 Horas, municipality of Ananindeua, Pará.

II. METHODOLOGY

Descriptive study, exploratory probability of convenience, of the type of experience report. It was held in April 2017, in the morning, at the fair of the neighborhood of 40 hours, municipality of Ananindeua, Pará, Brazil.

The local owners and merchants who were present at the time of data collection were included in the study and agreed to participate in the research. Initially, the objective and meaning of the research was explained to traders and subsequently their authorization, the survey was initiated.

The data were collected through an elaborate checklist, based on Ordinance No. 368, of September 04, 1997, technical regulation on hygienic-sanitary conditions and good manufacturing practices for elaborating establishments/ Food industrializers; ANVISA resolution N ° RDC 216/2004-provides technical regulation of good practices for food services; Federal Ordinance N ° 2914/2011-provides on the control and monitoring procedures for the quality of water for human consumption and its potability pattern. Data from the scientific literature on the processing of açaí were also used.

The survey was carried out in four points of açaí, called Point A, B, C and D. The check-list guided the items: a) physical space and hygiene conditions;

b) Hygiene conditions and proper use of personal protective equipment (PPE) by the handlers;

c) Disposal conditions of the waste generated.

The people responsible for the research were adequately equipped according to the biosafety standards, without risks to those involved in the work. Participants were informed that at any time they could abandon the study, because their participation was voluntary.

III. RESULTS AND DISCUSSIONS

The Acai berry is the daily food for many people of the northern population and, at the affordable price and high nutritional value, often the only meal of the day. In this region the marketing and consumption are carried out immediately after their processing, without any Heat Treatment (FERREIRA, 2014).

We visited 4 points (A, B, C and D) at the fair in the neighborhood of 40 hours, municipality of Ananindeua, Pará, in the morning, because it is the time of greatest movement of local workers, the points were all located close to one another.

Of the four points visited, 50% (2/4) were licensed to allow the legal sale of the product; None of the handlers made use of all mandatory Ppe according to biosafety; 75% (3/4) had INMETRO seal on the machine used to beat the Acai berry, among these, only 50% (2/4) had a freezer exclusively for the storage of the fruit, as illustrated in graph 1.

Graph 1: açaí beaters visited and the main flaws found



Source: Evaluation form, 2017.

After investigating the beaters points it was evidenced that point A was deactivated, the trader resated the Acai berry, that is, it was not it that produced the juice. We found some flaws such as: dirty environment, with presence of vectors, freezer was in degradation state with rust and oxidation at the edges, used to store other foods besides Acai, in the sink there were unnecessary objects like a tub of Child, as illustrated in Figure 1.

It is observed that there is a danger of contamination related to the lack of hygiene in the places visited, mainly in the sinks and balconies, as evidenced in the study of Lima., 2014 conducted in the neighborhood in the crowned in Manaus, state of Amazonas, which demonstrated that the Hose used to supply the storage tank is in an inadequate place and totally out of the proper hygiene standards.

Point B in turn was more organized and functioning with the licensing that allows the sale of the product, the manipulator was using some of the mandatory Ppe (except the CAP), it was observed that it performed the processing technique correctly. The establishment was glazed and with adequate lighting, free of vectors, the equipment and crockery were sanitized and in the Machine Scout there was seal of Inmetro, the freezer is well maintained and hooded, was used exclusively for the storage of Juice, the packages were well conserved and packaged, and the sink equipped with hygiene products, as shown in Figure 2.



Fig.1: Hygienic Situation of Point A Source: Field Search, 2017.



Fig.2: Hygienic situation of Point B Source: Field Search, 2017.

In point C there were numerous errors, the site lacked licensing that allows the sale of the product, the equipment used to beat the fruit had the seal of INMETRO and was sanitized; The preservation of the juice was adequate, there was a freezer and good conservation state well-caught and clean, however, we identified other foods stored together with the juice, the handlers wore only a cap, the sink next to it was in a precarious state, with A lot of dirty dishes, plastic bottle, along with detergent and solid waste, the acai seed bags were stacked on the trade floor near the sink and trash, without any hygienic storage, as shown in Figure 3.



Fig.3: Hygienic situation of Point C Source: Field Search, 2017 Source: Field Search, 2017.

The Municipal Health Secretariat (SESMA) and the Department of Sanitary Vigilance (DEVISA) have interdicted an establishment in the Cremação neighborhood of Belém. In the space was found remnants of cassava flour in the despolpar machine, showing that there is mixture in the manipulation of the fruit, and disfulfilled the hygiene standards. In addition, it identified a counterfeit seal (GLOBO, 2016).

Upon arriving at Point D, the handlers had already finished handling the Acai berry, the employees were cleaning the environment and washing the equipment materials that were used. The license for the sale of the juice was identified, the employees stated that they do the bleaching technique correctly, according to the step-bystep illustrated on the wall of the site. It can be verified that the machine had INMETRO seal, the freezer was relatively well preserved and stored only the juice, the lighting was adequate, but the employees did not use EPIs for cleaning, as illustrated in Figure 4.



Fig.4: Hygienic Situation of Point D Source: Field Search, 2017.

In addition to the danger in the consumption of juice, there is a serious public health problem with regard to environmental health with the irregular disposal of solid residues of the fruit, as identified in the study by Menezes.,2018 that identified the irregular disposal of residues in the Public areas of the cities, as is the case in the municipality of Ananindeua belonging to the metropolitan region of Belém.

The disposal of garbage and rubble in public and canals is an environmental offense and provides imprisonment without bail, based on article 54 of law 9,605, which defines a penalty of imprisonment of up to five years to those responsible for illegal practice (Brazil, 1998). The Municipal plan for integrated solid Waste Management (PMGIRS) was elaborated in 2015, however still is pending approval and sanction (MENEZES, 2018).

The main flaw was in the disposal of solid wastes. Traders of all points stated that the surplus seeds of the juice production were placed in bags known popularly of straw and dumped in front of their points, where the presence of vectors is emphasized (Figure 5). According to information collected, this material would be collected by local Carters and dumped in open-pit dumps or nearby streams.



Fig.5: Situation of solid waste dumped in front of the points visited. Source: Field Search, 2017.

For the waste generator the penalty is provided in law 12,305, which deals with the national solid waste policy and determines that the appropriate disposal for rubble and construction remains is the responsibility of those who produce this type of material (BRAZIL, 2010). The public power has been establishing partnerships in the implementation of the 476 governance system for shared management of the collection and appropriate disposal of açaí pits in the municipality of Ananindeua (MENEZES, 2018).

It was not possible to visit other points, because there was resistance on the part of traders, which attributed the lack of knowledge about the importance of the survey and the mistrust of possible denunciations.

IV. CONCLUSION

The charge of the public power to make the correct disposal of the lumps constitutes an important indicator of local progression, for this is necessary to the approval of the Municipal plan for integrated solid Waste Management (PMGIRS) in the municipality of Ananindeua, which is a tool that regulates the proper management of urban solid waste.

It is also possible to affirm that, from this study, new researches related to the thematic axis can be carried out, in order to broaden not only the evaluation for other points of beaters, but also its dissemination in the scientific area and in order to alert the Society On the dangers of consuming an acai berry produced in inadequate conditions, especially in the municipality where the work was done.

REFERENCES

- [1] AMBIENTE BRASIL (Brasil). O Açaí, fruto típico de uma palmeira amazônica, ganhou o mundo. 2017. Disponível em: http://ambientes.ambientebrasil. com.br/amazonia/floresta_amazonica/o_acai%2C_fruto_tip ico_de_uma_palmeira_amazonica%2C_ganhou_o_mundo. html>. Acesso em: 07 set. 2018.
- BRASIL (Estado). Constituição (2010). Lei nº 12.305, de 02 de agosto de 2010. Lei 12.305, de 2 de Agosto de 2010. Brasília, Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/112305.htm. Acesso em: 03 mar. 2017.
- [3] BRASIL. Constituição (1998). : Legislação federal. 4. ed. Brasília, GO: Presidência da República, 12 nov. 1998. v. 1, n. 4, Seção 6, p. 25-2. Crimes ambientais. Disponível em: https://www.jusbrasil.com.br/topicos/11332714/artigo-54da-lei-n-9605-de-12-de-fevereiro-de-1998. Acesso em: 21 ago. 2018
- [4] BRASIL. Constituição (1997). Portaria nº 368, de 4 de setembro de 1997. Regulamento Técnico Sobre As Condições Higiênico-sanitárias e de Boas Práticas de Fabricação Para Estabelecimentos Elaboradores/industrializadores de Alimentos. Brasília, DF, 08 set. 1997. p. 1-12. Disponível em: http://www.cidasc.sc.gov.br/ inspecao/files/2012/08/PORTARIA-368.pdf>. Acesso em: 27 set. 2017.
- [5] BRASIL. FIOCRUZ. . Açaí contaminado com parasito pode transmitir doença de Chagas! 2010. Disponível em:<http://www.fiocruz.br/portalchagas/cgi/cgilua.exe/sys/ start.htm?infoid=2&sid=1>. Acesso em: 13 out. 2016.
- [6] BRASIL. Ministério da Saúde. Secretaria de Vigilância Sanitária. Portaria MS nº 2914 DE 12 de dezembro de 2011. Dispõe sobre os procedimentos de controle e de vigilância da qualidade da água para consumo humano e seu padrão de potabilidade.
- [7] FERREIRA, Renata Trotta Barroso et al. Transmissão oral da doença de Chagas pelo consumo de açaí: um desafio para a Vigilância Sanitária. 2014.
- [8] G1PA. Globo. Ponto de venda de açaí é flagrado com selo 'Açaí Bom' falso, em Belém. Belém, 23 jun. 2016. Disponível em: http://g1.globo.com/pa/para/noticia /2016/06/ponto-de-venda-de-acai-e-flagrado-com-seloacai-bom-falso-em-belem.html
- [9] IBGE. Pevs 2016: produção da silvicultura e da extração vegetal alcança R\$ 18,5 bilhões. 2017. AGENCIA DE NOTICIAS. Disponível em: https://agenciadenoticias.ibge.gov.br/agencianoticias/2013-agencia-denoticias

2016-producao-da-silvicultura-e-da-extracao-vegetalalcanca-r-18-5-bilhoes.html>. Acesso em: 28 set. 2017.

- [10] LIMA, Maria Francisca de et al. Situação higiênicosanitária dos manipuladores de açaí no bairro do Coroado em Manaus, AM. Anais Programa Ciência na Escola, v. 2, n. 1, 2014.
- [11] (MSF), Médicos Sem Fronteiras. Doença de Chagas. 2018. Disponível em: https://www.msf.org.br/oque-fazemos/atividades-medicas/doencadechagas?gclid=EAIaIQobChMI8eO5t dvS1wIVyQmRCh3cXwysEAAYASAAEgLOZvD_BwE> . Acesso em: 19 nov. 2017.
- [12] MENEZES, Grece Kelly Alencar; DO COUTO, Luciano Louzada; FLORES, Maria do Socorro Almeida. GESTÃO DOS RESÍDUOS DE CAROÇOS DE AÇAÍ COMO INSTRUMENTO DE DESENVOLVIMENTO LOCAL: O CASO DO MUNICÍPIO DE ANANINDEUA-PA. In: IX Colóquio Organizações, Desenvolvimento e Sustentabilidade-CODS e II Congresso Brasileiro de Gestão. 2018. p. 468-477.
- [13] Resolução ANVISA Nº RDC 216/2004 Dispõe sobre Regulamento Técnico de Boas Práticas para Serviços de Alimentação, Pub D.O.U. - Diário Oficial da União; Poder Executivo (16 de Setembro de 2004).
- [14] TAVARES, Geraldo dos Santos; HOMMA, Alfredo Kingoyama. COMERCIALIZAÇÃO DO AÇAÍ NO ESTADO DO PARÁ: ALGUNS COMENTÁRIOS. 2015. Disponível em: <https://www.alice.cnptia.embrapa.br/bitstream/doc/10314 86/1/acaipara.pdf>. Acesso em: 10 abr. 2018.

Anaerobic biodegradation of atrazine under different redox conditions

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Abstract— The indiscriminate use of atrazine herbicide in Brazil and worldwide has several adverse effects on human health and ecosystems, and can be found in soil, ground and surface water, in the air and also in living beings. The biodegradation of this compound can occur through different redox conditions, with the participation of aerobic and anaerobic microbial consortia, generating different degradation metabolites intermediates. However, due to its leaching potential, it is more commonly found in deep soil layers under anaerobic conditions, which highlights the importance of studies in these conditions. This research was carried out with the enrichment of denitrifying microorganisms, sulfate reducing bacteria and methanogenic arches, in anaerobic reactors under different redox conditions (denitrifying, sulfetogenic and methanogenic). Our experimental procedure consisted of two distinct tests, the first being called pure anaerobic reactors (PAR) and the second called composite anaerobic reactors (CAR). The two assays differ in the inoculum used and the carbon sources available in the reactors. We made 6 reactors for each different redox condition, 3 biotic, 2 abiotic, and 1 blank (control). We observed in this study that the removal of atrazine depends on biotic and abiotic factors, which may occur in both ways, and that physicochemical factors such as adsorption and chemical hydrolysis may have significant effects on this process. The results of the tests indicate that there was no variation in atrazine removal between different redox media, $87\% (\pm 7\%)$ for the denitrifying condition, 88% $(\pm 7\%)$ for the sulfetogenic and 92% $(\pm 7\%)$. for methanogenesis, in biotic reactors with atrazine and soil organic content as the only carbon sources for bacteria in the reactors. However, the variation in the results found in RCA supplemented with complementary sources of acetate carbon for denitrifying reactors, lactate for sulfetogens and acetate and formate for methanogens, and reactors without this supplementation (RPA), indicates that high atrazine removal (100%) within 70 days of analysis for supplemented reactors should be done in shorter time periods.

Keywords— Herbicides, Microbiology, Agriculture, Bioremediation.

I. INTRODUCTION

The use of pesticides is justified in agricultural improvement, being atrazine a herbicide widely used in several countries around the world. In the last 50 years of use of this pesticide, it has stood out for its effective results in controlling weeds in the crop. (CAMPANARI, 2017). However, pesticides can have harmful characteristics to living beings and the environment, such as atrazine, a herbicide widely used in Brazil since mid-1958, which has toxicity and other adverse effects on human health and ecosystems (MA et al. al., 2017; VAIL et al., 2014).

According to the National Bulletin of Commercialization of Pesticides made by Ibama in 2016, from 2014 to 2016 the consumption of atrazine in Brazil doubled, from 13,911.37 tons to 28,615.70 tons of active ingredient. With this large amount of application in crops, atrazine has already been detected in degraded areas corresponding to places of intense agricultural activity, in the central and southern regions of the state of Goiás, Mato Grosso and the Paraíba do Sul River (RJ) near areas of sugarcane crop (DELLAMATRICE; MONTEIRO, 2014). In 2017, atrazine occupied 6th place in the ranking of best selling active ingredients in Brazil, with 24730.90 tons of active ingredient.

In the Bacia do Paraná 3, the presence of atrazine is a matter of social concern and the impacts of this herbicide on human health through the ingestion of contaminated waters was discussed in the Plan of the Paraná Basin 3 made in 2014, when 250 deaths Infants associated with

fetal malformation were raised in the region. Although there is no evidence of a direct link between death and contamination of local water with atrazine, the presence of this compound in accessible kinds of water should be treated carefully.

The presence of this product in groundwater and other water bodies is justified by its application in high concentrations (above those indicated for each type of cultivation), the intense rainfall regime, the types of soils, topography, slope of the land, and its organic properties. Thus, information on the degradation of atrazine herbicide is important to deal with the problem involving this compound (DELLAMATRICE; MONTEIRO, 2014).

Microbial degradation of atrazine is well known in aerobic conditions whose degradation occurs upon the presence of molecular oxygen as an electron receptor using atrazine as an electron donor in sequential biochemical reaction processes (KABRA et al., 2014; KOLEKAR; PHUGARE; JADHAV, 2014). However, depending on the environmental characteristics of the region where this pollutant is present, this compound can be leached into deeper soil and groundwater areas, where the potential for oxireduction is characteristic of anaerobic conditions (TOMASSONI et al., 2014).

The few studies reporting anaerobic degradation of atrazine (CECILIA; MAGGI 2016; DOUGLASS; RADOSEVICH; TUOVINEN 2014; TUOVINEN et al. 2015;) highlight the difficulty of anaerobic microorganisms in degrading this compound, thus remaining a gap in the knowledge needed to the advance in the treatment of anaerobic environments impacted with this herbicide.

Therefore, due to the risks of environmental impacts and potential health hazards, measures aimed at the elimination, mineralization or degradation of atrazine in byproducts with negligible impacts are of utmost importance in environments contaminated with this compound (TOMASSONI et al., 2014).

Given this, considering the use of atrazine in agriculture and its potential to contaminate deep soils and groundwater, our objective was to evaluate atrazine biodegradation under different redox conditions (Denitriication, Sulfetogenesis and Methanogenesis).

II. MATERIALS AND METHODS

2.1 Description of the study area

The study area corresponds to the Bacia Hidrográfica do Paraná (BP3), and we chose that due to the intense use of pesticides in the region, especially atrazine due to the extension of corn and soybean planting in the region, which presents a high rate. of agricultural occupation from 80% to 90% (PBHP3,2014).

BP3 is located in the western Paraná mesoregion, between latitudes 24° 01 'S and 25° 35' S and longitudes 53° 26 'O and 54° 37' O, with an area of approximately 8000 km² encompassing 28 municipalities, delimited to the north by the Bacia do Rio Piquiri and to the south by the Bacia do Rio Iguaçu (PBHP3,2014).

BP3 has intense agricultural activity, humid subtropical climate, annual average rainfall from 1600 to 2000 mm and average annual evapotranspiration rates are between 1000 to 1200 mm, Semideciduous Seasonal Forest and geology formed by fissural volcanic basaltic rocks defined as general saw formation. Basaltic waters show a strong acid tendency (pH between 5.5 and 6.5) and total mineralization below 300 mg/L, are typically calcium and calcium magnesian, sulfated or chlorinated sodium (PBHP3,2014).

2.2 Sample Collection

We collected the samples under humid atmospheric conditions, in sunny day, with temperatures above 20°C, in layers of 1.65; 1.75; 1.85 and 1.95m deep soil.

The soil was loamy in the layers just below 20cm, and in the upper layers it was drier in appearance with small aggregates with little cohesion.

2.3 Inoculum

We inoculated from a homogeneous mixture of soils at the different points collected. We made this mixture in a Duran® (1L) flask under nitrogen gas flow applied to the soil in the mixing process in order to maintain anaerobiosis. Then we close the bottle, pack it in foil and store it under refrigeration. All material used to prepare the inoculum was previously sterilized.

2.4 Anaerobic Reactors and Enrichment

For each of the 3 redox conditions (denitrifying, sulfetogenic and methanogenic) we made 7 reactors, 3 biotic, with atrazine and soil organic content being the only carbon sources of the reactors; 2 abiotics, with 1 M azide (NaN₃) and 1 M mercury chloride (HgCl₂) for microbial inactivation, and 1 "white" without atrazine. Figure 1 exhibit the experimental arrangement of anaerobic reactors, which were divided into Pure Anaerobic Reactors (PAR) and Composite Anaerobic Reactors (CAR).

We prepared the biotic reactors to evaluate microbial activity (atrazine growth and degradation), the abiotics to verify atrazine degradation without microbial participation, and the blank to observe if the microorganisms involved in the atrazine degradation process are developing (or not) from another carbon sources.

We also made 3 biotic enrichment reactors under the different conditions tested, containing larger volume Atrazine (1.0 mg / L) (300mL), with their respective carbon sources, to be used as CAR inoculum.



Fig. 1: Experimental Arrangement of Anaerobic Reactor Enrichment

The CAR differ from PAR by carbon source supplementation (sodium acetate for denitrifying agents, sodium lactate for sulfetogens and sodium acetate + formate for methanogens at 3.6 mM) and use of the inoculum already enriched from larger biological reactors.

We prepared the reactors based on the protocol of Deursen (2016), with specific macro and micro nutrient solutions, that are essential for the growth of each microbial group studied (Denitrification, Sulphetogenesis and Methanogenesis).

2.5 Reactor Monitoring

For the monitoring of denitrifying reactors, we evaluated nitrate consumption (NO₃⁻) according to the methodology of Cataldo (1975). We collected 0.2 mL of sample from each reactor and diluted in a 10 mL volumetric flask (1:50 dilution). Reading on a spectrophotometer (410 nm), the results were recorded and calculated according to the calibration curve.

Monitoring of sulfetogenic reactors consists of sulfate and sulfide analyzes. For the sulfate quantifications we followed the 4500-SO₄²⁻ E (turbidimetric) method and for the sulfide (S²⁻) determination we used the colorimetric spectrophotometer method with the hach kit applied for this type of analysis. We Monitoring the methanogenic reactors by quantifying methane production in the last test using the Shimadzu GC-2014 Gas Chromatograph with Technical Conductivity Detector (TCD) and HP-PLOT / Q column (30 mx 0.53 mm x 40). μ m film thickness).

2.6 Hazard detection by high efficiency liquid spectrometry (hplc / uv)

For the detection analysis of atrazine and for the metabolic intermediates desisopropylatrazine (DIA) and adhesetylatrazine (DEA) we used high performance liquid chromatography (HPLC / UV) according to the Thermo Ultimate 3000 HPLC chromatographic method, ACN Mobile Phase: H2O 60:40, Isocratic Elution Mode, 8 Min Run Time, Retention Time: DAY: 3.03 AED: 3.38 ATZ: 5.38, DAD detection, Wavelength: 220 nm

Atrazine detection limits were 0.05 to 1.0 mg / L and for its metabolic intermediates DIA and DEA were 0.025 to 1.0 mg / L.

III. RESULTS

3.1 Pure Anaerobic Reactors (PAR) 3.1.1 Pure denitrifying reactors

We monitored denitrifying reactor activity through nitrate reduction analysis, and are expressed in Figure 2. The presence of atrazine (ATZ) in the reactors throughout the operation is shown in Figure 3.



Fig. 2: Monitoring of denitrifying pure anaerobic reactors



Fig. 3: Atrazine detection in denitrifying pure anaerobic reactors

We can observe that over 130 days of operation, average nitrate consumption $(61 \pm 2\%)$ in biotic reactors, higher than in abiotic reactors $(25 \pm 9\%)$, which indicates that there was biological activity.

Nitrate consumption in abiotic reactors may occur due to physicochemical factors such as high pH ammonia stripping, ion exchange, adsorption, reverse osmosis, chlorine oxidation, electrical dialysis, and chemical precipitation (DUARTE, 2018). Further studies on atrazine degradation under abiotic conditions may provide a fuller explanation of the subject.

In the control, which differs from the other biotic reactors only in that atrazine was not added to this reactor, nitrate consumption was higher (81%), which may be an indicator that the absence of atrazine in this biological reactor was favorable to the development of denitrifying microorganisms.

We can also observe that it was not possible to detect atrazine until the thirty-fifth day, however after 71 days it was detected only in the abiotic reactors and in the control.

3.1.2 Pure sulfetogenic reactors

Through analyzes of sulfide production and sulfate consumption we evaluated the microbial activity in sulfetogenic reactors. Figures 4 and 5 show sulfide production and sulfate consumption in these reactors, while the presence of atrazine is shown in Figure 6.



Fig. 4: Sulfide production in sulfetogenic reactors



Fig. 5: Sulphate Consumption in Sulphetogenic Reactors



Fig. 6: Atrazine detection in sulfetogenic reactors

By analyzing the sulfide production $(0.110 \pm 0.016 \text{ mg} / \text{L})$ and sulfate consumption $(61 \pm 1\%)$ in biotic reactors, it was possible to infer the occurrence of sulfetogenic microbial activity, since in abiotic reactors the values were much lower for sulfide production $(0.015 \pm 0.002 \text{ mg} / \text{L})$ and sulfate consumption $(12 \pm 3\%)$.

We observed that the control reactor presented the same values as the biotic reactors, which shows that the microbial activity in the biotic reactors was not compromised with the presence of atrazine 1.0 mg / L.

The opposite was observed in the pure denitrifying reactors, higher nitrate consumption in the control reactor. This result suggests that sulphate-reducing bacteria (BRS) are less sensitive to atrazine than denitrifying bacteria.

Denitrifying and sulfetogenic bacteria may be more or less sensitive to certain substances, and there may be a dominance of one population over another, according to the environmental conditions under which they are submitted (BARBOSA, 2017).

Analyzing the atrazine detection plot during 140 days of analysis, it can be observed that herbicide detection only occurred after 72 days in the biotic reactors 1 and 3 (0.103 and 0.123 mg / L, respectively). However, after this period, we detected a subtle increase in atrazine in all biotic reactors, whereas in the control nothing was observed, as expected, as atrazine was not added in this reactor. In abiotic reactors we did not detect atrazine.

3.1.3 Pure methanogenic reactors

Methane production in the pure methanogenic reactors is shown in Figure 7, where we noticed an increase in biotic reactors only. The average production of these reactors was $1 \pm 0.16 \mu$ mol at the end of the assay, which indicates the methanogenic activity. Figure 8 shows the detection of atrazine in these reactors.



Fig. 7: Methane production in pure methanogenic reactors



Fig. 8: Atrazine detection in pure methanogenic reactors

We observed a rapid decay in atrazine concentration under all conditions at the beginning of the assay except for control. As observed in the previous conditions (denitrifying and sulfetogenic), in methanogens we also verified the detection of atrazine after 71 days of operation, and its dynamics in the graph suggests that, once detected, atrazine suffered few variations in its concentration and may be related. simultaneous processes of degradation, adsorption and desorption (MAURO; CAMPOS; LANGENBACH, 2007; YUE et al., 2016).

3.1.4 General discussion about pure anaerobic reactors (PAR)

Regarding the initial concentration of atrazine (1 mg / L) added to the PAR, we observed high atrazine removal in the biotic reactors, and total removal in the abiotic reactors. However, in all PAR, we detect atrazine only after 70 days. It is likely that the atrazine applied to the reactors was initially adsorbed to the soil, underwent chemical hydrolysis or other chemical reactions or rapid volatilization.

Correia et al. (2007) observed that atrazine adsorption in clay soil increased as a function of contact time in notill and native forest soils, and the authors also point out that the quality of soil organic matter can increase herbicide adsorption capacity in the ground. The same authors calculated an atrazine adsorption coefficient in the clayey soil tested, reaching a value of Kf = 11.28, a value considered high by IBAMA, which indicates a higher potential for micro-pollutant adsorption in this soil type. Other authors seeking to evaluate atrazine adsorption in clay soils rich in organic matter have found atrazine adsorption of 22.8% within 24 hours (YUE et al., 2016).

The fact that we have detected atrazine after a long period in the anaerobic reactors tested may signal the permanence of this compound in the soil, taking longer to be charged to the soil solution, where it would in fact be susceptible to biodegradation processes. In this sense, due to soil characteristics, temperature, pH, agitation, and physicochemical properties of atrazine we can believe that the mobility of atrazine in the reactors (adsorption and desorption) influenced the presence of atrazine in the liquid fraction collected for the soil analyzes.

Another important fact that we highlight is about the production of biosurfactants, which are compounds produced by microorganisms extracellularly or as part of the cell membrane. These by-products are capable of improving the solubility and biodegradation of contaminants, such as atrazine (COLLA, 2015).

The fact that atrazine detection was most noticeable in biotic reactors may be related to biosurfactant production. Microorganisms after a long time exposure may have developed the ability to produce these substances to bring atrazine into the soil solution, where the organic micropollutant would in fact be susceptible to biodegradation processes.

This reasoning is consistent and has been studied by other authors (ABBASI, 2018; JADEJA; MOHARIR; KAPLEY, 2018; MAURO; CAMPOS; LANGENBACH, 2007). After atrazine has been desorbed from the soil by the action of biosurfactants, it is unlikely to be adsorbed again, a phenomenon not observed in abiotic reactors, where atrazine appears to undergo adsorption and desorption cycles, which strengthens the theory of biosurfactant production in the soil in biological reactors.

Although atrazine has low vapor pressure, which gives it a low volatile potential, this potential is not exclusively evaluated by the intrinsic properties of the compound, as it also depends on the environmental conditions to which the compound is inserted, such as temperature and pressure. In this sense atrazine may undergo volatilization. (LIN, 2017). The atmosphere of the nitrogen gas pressurized reactors subjected to agitation and higher temperatures may have promoted diffusion and liquid-gas mixing phenomena, and considering that only the liquid fraction of the reactors was analyzed, the gas fraction may also contain atrazine.

Under abiotic conditions atrazine may also undergo chemical hydrolysis, which occurs by dechlorination of the molecule and substitution by a hydroxyl, which may give rise to deisopropylatrazine (DIA). Chemical hydrolysis is accelerated at low pH values, by the presence of humic substances, and temperatures above 30°C (OLIVEIRA, 2015). We conducted the reactors at 30°C, and the only metabolic intermediate found in the PAR was deisopropylatrazine (DIA). These results may indicate the occurrence of chemical hydrolysis in these reactors, which would justify the formation of this metabolic intermediate in abiotic reactors.

The fact that we detected DIA in abiotic reactors was not expected since microbial activity in these reactors was nonexistent. However, it is known that physicochemical phenomena such as chemical hydrolysis can occur, promoting the degradation of the compound (GOMES; SANTOS; SILVA, 2004). In addition, atrazine half-life is variable and depends on factors such as agitation, temperature, pH, soil organic matter content and quality, soil type, and even more specific characteristics such as the type of organic colloids and inorganic substances present in the soil. This set of factors may cause changes in the atrazine degradation process, which opens a gap for further studies to analyze the behavior of atrazine in different soil types and different abiotic conditions.

Thus, it was not possible to observe atrazine biodegradation in the PAR. It is possible that atrazine was adsorbed by the soil, since the soil used as inoculum is clayey and has a high cation exchange potential, which are typical characteristics of the red latosols and nitosols found in the sample collection region. However, the formation of DIA suggests the occurrence of atrazine degradation processes, since this metabolic intermediate stands out among the most well-known organochlorine by-products of atrazine, together with desethylatrazine (DEA) (COELHO; BARNARDO, 2017).

Another important factor to be emphasized is that the time for atrazine degradation under the conditions studied was short, thus requiring more time to assess the occurrence of degradation. The results observed in biotic reactors indicate that in conditions without supplementation with other carbon sources and enriched inoculum, more time is required before atrazine biodegradation can occur.

3.2 Composite Anaerobic Reactors (CAR) **3.2.1** Composite denitrifying reactors

The results we found in denitrifying compound reactors are shown in figures 9 and 10.



Fig. 9: Nitrate consumption in denitrifying composite reactors

1,200 1,000 0,800 0,600 0,400 0,200 0,000 0,000 0,10

Fig10: Atrazine detection in denitrifying composite reactors

We observed that after three days of operation there was an average increase of $12 \pm 1\%$ (161 mg / L) in nitrate present in all denitrifying composite reactors (Figure 9). This increase occurred due to the inoculum source used, which was from the compound reactor (300 mL) operated for 45 days, which still had 48% (620 mg / L) of the total nitrate added in the reactors.

Considering this increase in nitrate, we detected an average nitrate consumption of $68 \pm 2\%$ (923.3 mg / L) for biotic reactors, $24 \pm 6\%$ (328 mg / L) for abiotics and 80% (1088 mg). / L) for control after 68 days of operation. This discrepancy in the results of different operating conditions indicates the occurrence of biological activity in biotic reactors to the detriment of abiotics.

The control reactor showed higher nitrate removal than biotic reactors (22% more), which may indicate that the microbial community developed better in the absence of atrazine, as it is known that this herbicide can be used by microorganisms after a exposure time, thus requiring microbial adaptation to the compound (SCHLEDER, 2016).

Regarding the detection of atrazine, we observed 100% removal of atrazine in both biotic and abiotic reactors. After 71 days of analysis atrazine was no longer detected, suggesting that under supplemented conditions the biological degradation of atrazine is faster.

3.2.2 Composite sulfetogenic reactors

The accompaniment of sulfetogenic composite reactors is expressed through figures 11, 12 and 13.



Fig. 11: Sulfide production in sulfetogenic composite reactors



Fig.12: Sulfate consumption in sulfetogenic composite reactors



Fig 13: Atrazine detection in sulfetogenic composite reactors

We observed an average sulfide production of 0.05 \pm 0.01 mg / L in the biotic reactors whereas in the abiotic sulfide production was not detected, being found 0.01 \pm 0.00 mg / L of sulfide after 3 days, which remained until the end of the rehearsal. The value found comes from the sulfide residual of the inoculum used. The control reactor produced 0.03 mg / L sulfide, lower than the biotic reactors.

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Regarding the average sulfate consumption, we noticed in the biotic reactors higher values, $72 \pm 2\%$ (1580 ± 40 mg / L) compared to abiotic reactors, $10 \pm 3\%$ (268 ± 54 mg / L) and the control (62 %) over the 70 days of operation.

The results we found, both for sulfide production and sulfate consumption, show microbial activity in biotic reactors. This phenomenon was favored by the previous enrichment and adaptation of the bacteria in the reactors (300 mL) with 1 mg / L atrazine. As expected, the control showed lower values compared to atrazine biotic reactors. Probably because sulfate-reducing bacteria need a longer time to adapt to a new condition, where there is no longer one of the resources they were adapted to in their growth (DURRUTY; GONZALEZ, 2015).

After 70 days of analysis we detected 100% removal of atrazine in all sulfetogenic composite reactors except in the control that at no time did we detect atrazine. We also observed that after 37 days there was an average removal of $89 \pm 7\%$ atrazine in the biotic reactors to $53 \pm 3\%$ atrazine removal in the abiotics. We also highlight that the removal of atrazine in the biotic reactors after 3 days went from $59 \pm 6\%$ to $53 \pm 3\%$ in the abiotic reactors in the same period, which means that from the third day to the thirty-seventh day, there was no atrazine removal in the abiotic reactors.

As the sulphate-reducing bacteria (BRS) were adapted to the larger (300 mL) biotic reactors with atrazine and sodium lactate as a supplementary carbon source, when inoculated in reactors under the same conditions, varying only by the volume of the reactors (50 mL) and the absence of soil, it was expected that the BRS would have a good growth, as it was verified by the monitoring of these reactors. When inoculated in an environment without atrazine (control reactor), sulfide production and sulfate consumption values were lower than the biotic reactors, which was also expected, since there was a lack of resources that the bacteria were already adapted to metabolize.

The atrazine removal process in these reactors shows that the microbial activity of the biotic reactors was more significant in a shorter time (37 days) than the nonbiological processes that may have occurred in the abiotic reactors.

3.2.3 Composite methanogenic reactors

The results of studies on methanogenic composite reactors are shown in Figures 14 and 15. In which we noticed a total average production of $3.9 \pm 0.2 \mu$ mol of methane only in biotic reactors (Fig. 14). This shows

more intense microbial activity than in pure methanogenic reactors.



Fig.14: Methane production in methanogenic composite reactors



Fig.15: Atrazine detection in methanogenic compound reactors

We observed rapid removal of atrazine after three days of operation (100%). This result suggests that, for methanogenic condition, it is necessary to monitor the removal of this compound at shorter time intervals.

3.2.4 General discussion about composite anaerobic reactors (CAR)

In all composite reactors we noticed rapid removal of atrazine. These results reveal that studies involving the degradation of this compound under conditions with enriched bacteria, adapted and inoculated in reactors supplemented with other carbon sources should be studied in a shorter time interval than the study of reactors without previous enrichment and supplementation.

In addition, the results found in abiotic reactors show the need for more specific studies on the physicochemical processes that can occur within these reactors. Another important fact to note is that there was no detection of atrazine metabolic intermediates in any of the compound reactors studied, which may be another indicator that the degradation processes were so fast that no detection of metabolic intermediates was possible.

IV. CONCLUSION

With this research we show that atrazine is a compound that can undergo different types of degradation processes, and that these processes depend on specific environmental conditions, such as microbial action and physicochemical conditions of the environment, as well as intrinsic characteristics of this herbicide.

We also showed that for pure anaerobic reactors (PAR) the removal of atrazine was slower, which may be related to adsorption processes and slow biological activity, since there was no previous enrichment of the microbial populations present in these reactors. For the composite anaerobic reactors (CAR), it was observed that the atrazine removal process was faster, which demands shorter time interval for the monitoring of the degradation of the compound in this operational condition.

For both PAR and CAR there was no variation considered relevant in the removal of atrazine, which puts the different oxidation media studied in a very close range.

From the results obtained in this study, it is suggested further research in abiotic reactors, including analyzes of the sedimentary fraction, as well as the PAR gas fraction as well as the CAR, in order to detect atrazine in these matrices, since atrazine It is mobile and can be found in the liquid fraction as well as in the solid and / or gas fraction.

Our results may contribute to a more complete analysis of the behavior of this compound in the environment, as well as the main variables that imply its displacement and degradation. Thus, our work sheds light on the breadth of research that can be developed in this area, and we stress the importance of this information for decision-making by public agencies and for bioremediation projects for atrazine-contaminated areas.

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REFERENCES

- Abbasi, Shahryar. 2018. "Solid-Phase Extraction Based on Multi-Walled Carbon Nanotube (MWCNT) Sorbents Combined with Bio-Coacervation Extraction for the Determination of Atrazine from Water Samples Followed by HPLC Analysis." *Journal of the Iranian Chemical Society* 0(0): 0. http://dx.doi.org/10.1007/s13738-018-1428-6.
- [2] Campanari, Maria Fernanda Zaneli. 2017. "Metagenomics of Atrazine Degradation in Soil Under Different Agricultural and Semidecidual Forest Management." : 1– 76.
- [3] Cecilia, Daniele, and Federico Maggi. 2016. "Kinetics of Atrazine, Deisopropylatrazine, and Deethylatrazine Soil Biodecomposers." *Journal of Environmental Management* 183(September): 673–86.
- [4] Coelho, Edumar Ramos Cabral, and Luiz Di Barnardo. 2017. "The Presence and the Removal of Atrazine, Deethylatrazine, Deisopropylatrazine and Deethylhidroxiatrazine in a Pilot Plant Consisted of Ozonation and Slow Sand Filtration." Sanitary and Environmental Engineering: 789–96.
- [5] Colla, Luciane Maria. 2015. "Biosurfactants in Bioremediation Process." *Exact and Natural Sciences Journal* (August).
- [6] Chen Z, Wang C, Gschwendtner S, Willibald G. Denitrification nitrogen gas formation and gene expression in alpine grassland soil as affected by climate change conditions Soil Biology & Biochemistry Relationships between denitri fi cation gene expression, dissimilatory nitrate reduction to ammonium and nitrous oxide and dinitrogen production in montane grassland soils. *Soil Biol Biochem.* 2016;87(April 2013):67-77. doi:10.1016/j.soilbio.2015.03.030
- [7] Dellamatrice, Priscila M., and Regina Teresa Monteiro. 2014. "Principais Aspectos Da Poluição de Rios Brasileiros Por Pesticidas." *Brazilian Journal of Agricultural and Environmental Engineering* (July 2015).
- [8] Douglass, James F., Mark Radosevich, and Olli H. Tuovinen. 2014. "Mineralization of Atrazine in the River Water Intake and Sediments of a Constructed Flowthrough Wetland." *Ecological Engineering* 72(August 2015): 35–39. http://dx.doi.org/10.1016/j.ecoleng.2014.08.016.

[9] Duarte, N. C. Effect of the concentration of organic matters in dynitrification in a reactor of packaged and UASB. Campinas, 2018.

- [10] Gomes, Pricília Santos Pereira, Luciana Bagdeve de Oliveira dos Santos, and Liza Maria Cerqueira Silva. 2004. "Study of Herbicide Atrazine Recovery in Natural Waters Using High Performance Liquid Chromatography (HPLC).": 18–21.
- [11] Jadeja, Niti B, Prachiti Moharir, and Atya Kapley. 2018.
 "Genome Sequencing and Analysis of Strains Bacillus Sp. AKBS9 and Acinetobacter Sp. AKBS16 for Biosurfactant Production and Bioremediation Genome Sequencing and Analysis of Strains Bacillus Sp. AKBS9 and

Acinetobacter Sp. AKBS16 for Biosurfactant." Applied Biochemistry and Biotechnology (July).

- [12] Kabra, Akhil N. et al. 2014. "Toxicity of Atrazine and Its Bioaccumulation and Biodegradation in a Green Microalga, Chlamydomonas Mexicana." *Environmental Science and Pollution Research* (October): 12270–78.
- [13] Kolekar, Parag D., Swapnil S. Phugare, and Jyoti P. Jadhav. 2014. "Biodegradation of Atrazine by Rhodococcus Sp. BCH2 to N-Isopropylammelide with Subsequent Assessment of Toxicity of Biodegraded Metabolites." *Environmental Science and Pollution Research* 21(3): 2334–45.
- [14] Lin Z, Sun X, Strauss H, Lu Y, Xu L, Lu H. Sulfur isotopic evidence for the origin of elemental sulfur in gas hydrate-bearing sediments of the northern South China Sea. *Geophys Res Abstr.* 2017;19(1993):2502.
- [15] Machado CS, Fregonesi BM, Zagui GS, Martinis BS de, Segura-Muñoz S. Atrazine in river water: human health risk assessment by recreational exposure. *Environ Manag Sustain J.* 2018;7(2016):36-46. doi:10.19177/rgsa.v7e3201836-46
- [16] Oliveira, Diego Almeida do Carmo; Ana Paula Barbosa do Carmo; Jandyra Maria Bento Pires; Jaime L. M. 2013.
 "Comportamento Ambiental e Toxidade Dos Herbicidas Atrazina e Simazina." *Revista Ambiente e Agua*.
- [17] PBHP3. Plano da Bacia Hidrográfica do Paraná 3. Disponível em: <<u>http://www.aguasparana.pr.gov.br/pagina-239.html</u>> Acesso: 07/10/2019.
- [18] Tomassoni, Fabíola et al. 2014. "Soil Bioremediation Technique." ActaIguazu 3(3): 46–56.
- [19] Tuovinen, Olli H, Vaidehi Deshmukh, Bestamin Ozkaya, and Mark Radosevich. 2015. "Kinetics of Aerobic and Anaerobic Biomineralization of Atrazine in Surface and Subsurface Agricultural Soils in Ohio." Journal of Environmental Science and Health Part B-Pesticides Food Contaminants and Agricultural Wastes 50(10): 718– 26.
- [20] Yue, Lin et al. 2016. "Adsorption Desorption Behavior of Atrazine on Agricultural Soils in China." *Journal of Environmental Sciences* 57.

The Memory of Horror in the Filmic Body and the Writing of the Event

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Abstract— In this article, we seek to demonstrate how horror movies can be part of writing a political and historical event. Our reflection takes up the question that appears in Barthes in a text called The Writing of the Event, which contains an analysis of May 1968 in France. We looked at two horror movies that contain memories of October 2005 and reflected on "who are we and what we do today?". Our goal is to contribute to the diagnosis of the present.

Keywords— memory, body, horror movie; discourse.

I. INTRODUCTION

Michel Foucault's endeavors have changed, by modifying, our relationship with knowledge and truth to the extent that his theoretical-active intervention has introduced a change in power relations and knowledge in contemporary culture, from his Western matrix spread by medicine, by psychiatry, by criminal systems and sexuality. We would say that not only Foucault's work, but also his own unsettling and pyrotechnics (*artificier*)figure of political activist subverted the whole order of modern thinking produced in the West.

The lectures he taught at the renowned *Collège de France* are proof of the pyrotechnic dimensional breadth of his unsettling and subversive work. His obsession with the present led him to deal with the event through his genealogy. For Foucault, "the event - the wound, the victory-defeat, the death It is always an effect, entirely produced by bodies that clash, mingle, or separate; but this effect is never of the order of the bodies [...] "(FOUCAULT, 2000: 246).

We would say that bodies are under the order of the event; they are material effects of the event. In this way, "when they collide, when they mix, when they suffer, they cause on their surface events, which are without density, mixture or passion, which, therefore, cannot be cause anymore [...]" (FOUCAULT, 2000: 246).

However, Foucault was not the only one of his generation to worry about the event. Paul Veyne, Jacques Derrida, Gilles Deleuze and Roland Barthes are some of their contemporaries who have also tried to reflect on the issues related to the event. The writing of Barthes's event, published in 1968, leads us to reflect, "How can an event be written?" (BARTHES, 1972: 161). We return to this question to analyze two horror films: *Frontière* (*s*) and \hat{A} *l'interieur*. The first directed and produced by Xavier Gens and the second by Alexandre Bustillo and Julien Maury.The reason for this choice is that these two productions, both released in 2007, have the October 2005 event as the background of their plots.

The thesis is that these two productions are part of the Barthesianpolygraphic writing of the event whose fuse is the death of 17-year-old teenage girls ZyedBenna and 15-year-old BounaTraoré, who were electrocuted in a station at *Electricité de France* (EDF) when they escaped control of the local police. This fact is linked to the French biopolitics insofar as it enters the entry of illegal foreigners to the country.The demonstrations that began around Paris spread throughout France in a violent but also symbolic manner and, above all, by the speech of the protesters and the authorities, much like the event described and analyzed by Barthes in 1968.

II. THE CRISIS IN THE SENSE OF THE BODIES AND THE BIOPOLITICS

In The Birth of Biopolitics, a Lecture he taught at Collège de France from 1978 to 1979, Foucault treated this term / theme as "the way it has sought, since the 18th century, to rationalize the problems posed by governmental practice by the phenomena inherent in a set of living populations: health, hygiene, birth, longevity, race "(FOUCAULT, 2008: 432).One of the questions initially reflected in this course was "how can the 'population' phenomenon, with its effects and its specific problems, be taken into account ', in a system concerned with respect for the subjects of law and freedom of initiative? Of individuals?

For Foucault, liberalism "must be analyzed, then, as the principle and method of rationalization of the exercise of government - rationalization that obeys, and therein its specificity, the internal rule of the maximum economy" (FOUCAULT, 1997: 90). But "of course this is not an 'interpretation' of liberalism with exhausting pretensions, but a possible plan of analysis - that of governmental reason" (FOUCAULT, 1997: 94); under which biopolitics is structure to order the bodies, placing them under government and state control in discursive practices and by devices that configure biopolitics, in Foucaultian terms.

The biopolitics of which Foucault speaks is also an event in itself. On the one hand, because it is formed by a set of discursive events; on the other, because, we would say, with Foucault, "it is produced as an effect of and in a material dispersion" (FOUCAULT, 1996: 57-58).

It is within liberalism that we will see the passage from what Foucault called disciplinary societies to the stage of control societies.It is precisely from that point that we can talk about the docilization of bodies and, on the other hand, about the disorder and its crises, especially those of meaning that are in the order of biopolitics.In these terms, "it is known the increasing place these problems have occupied since the nineteenth century, and the political and economic issues they have this day" (FOUCAULT, constituted to 1997: 89).Foucault's first example of the birth of biopolitics is one whose debate "took place in England in the midnineteenth century about public health legislation" (FOUCAULT, 1997: 89), but devoted himself to two other contemporary examples: "German liberalism of the years 1948-62 and American liberalism of the Chicago school" (FOUCAULT, 1997: 94-95).

In the German case, "this excess was the war regime, the Nazis, but beyond that, a kind of directed and planned economy, originating from the 1914-18 period and the general mobilization of resources and men; it was also 'state socialism' "(FOUCAULT, 1997: 95). Already in the American, "he also developed in relation to this 'excess', which was, according to him, represented, since Simons, by the politics of the New Deal, the planning of war and the great economic and social programs, sustained.[...] during the postwar period by the democratic administrations "(FOUCAULT, 1997: 96).

This new phase of liberalism became known as neoliberalism. Foucault noted that the American case differs from the German case because while Germany considered that market price regulation "is in itself so fragile that it must be sustained, organized 'ordered' by a vigilant internal policy of social interventions (implying aid to unemployed, health coverage, a housing policy, etc.)"(FOUCAULT, 1997:96); American neoliberalism sought to extend the rationality of the market, the analysis schemes it proposes, and the decision criteria it suggests to non-exclusively or non-priority economic domains (cf. FOUCAULT, 1997: 96), such as family and birth or delinquency and criminal policy.

The French opted for the German model, "from what we might call a strongly nationalized government, a strong leadership, a strong administrative one, with all the problems it entails" (FOUCAULT, 2008: 266).In this historical context, the strike of the miners broke out in 1963, revealing to the world the inhumane working conditions of the French mines. In 1966 and 1967, they will also be marked with several strikes.The crisis sparked the following year, with the occupation of the University of Nanterre and Sorbonne by students because of the ban on girls sharing girls' housing in Nanterre, so a general strike paralyzed the country for three months with membership of the working class.Some philosophers and historians consider this the greatest popular event in Western Europe since the Paris Commune in 1871.

Entering the order of the May 1968 event, via Barthes, we can observe three levels or ways in which this event was written, "whose polygraphic conjunction may form its historical originality" (BARTHES, 1972: 161). To Barthes, "not only did the crisis have its language, it was also language (somewhat in the sense that André Gluscksmann can speak of war): it is speech that has, in any case, plotted history" (BARTHES, 1972: 163).

These three ways are *speech*, *symbol* and *violence*. In Foucaultian terms, these levels or ways would be the ways in which the event took place, that is, its materiality occurred at these levels of material dispersion. The speech of the May 68 event (la parole), the first level described by the semiotist, concerns, above all, those emitted by radio channels which, at that time, "within the terms of Western culture, where nothing can be apprehended without sense, radio speech was the event itself "(BARTHES, 1972: 162). But Barthes also highlighted the talk of power relations between the different groups and parties and the student talk.

Regarding the symbolic level, Barthes noted that they "were produced and consumed with great energy; and above all, surprising fact, they were maintained by a general, participant complacency" (BARTHES, 1972: 165).The symbols of this crisis formed a symbolic field that articulated itself with the same symbolic discourse that "seems to have finally marked members and opponents of the contestation: almost all planned the same symbolic game" (BARTHES, 1972: 166).For the semiologist, "a symbolic field is not just a gathering of (or an antagonism) of symbols; it is also formed by a homogeneous rule game" (BARTHES, 1972: 166).

In this description of the May 68 event, Barthes was able to inventory a symbolic field formed by the three-flag paradigm (red / black / tricolor); by the barricade that "allowed to irritate and unmask other symbols; property, for example, with the French from then on, living more in cars than in houses"; and by the "monument (the Bourse, the Odeon), manifestation, dress, occupation, and, of course, language, in its most codified (ie, symbolic, ritual) aspects" (BARTHES, 1972: 165). The Violence, the third level of the writing of this event, symbolized concretely and then verbally 'in the streets', the place of unleashed speech, free contact, antiinstitutional, anti-intellectual and anti-intellectual space, immediate opposition to the possible ruses of all the mediations.

Hence, "this writing of violence (eminently collective writing) does not lack even a code; Whatever way one decides to analyze it, tactical or psychoanalytic, violence implies a language of violence "(BARTHES, 1972, p. 167). In this case, "the presence (or the postulation) of the code does not intellectualize the event (contrary to what anti-intellectualist mythology continually announces): the intelligible is not the intellectual" (BARTHES, 1972: 167).

We note that in Barthes's analytical description the three levels or ways of May 68 worked reciprocally, guided by two postulates of even more controversial scope. The first of these postulates concerns the strict separation of the concepts of speech and writing, "according to Derrida's proposition" (BARTHES, 1972: 167).

Already "the second postulate consists in not having in view the describing scriptural as a" deciphering "" (BARTHES, 1972: 168). This statement made by Barthes has to do with what he stated earlier about the intelligible not being the intellectual, that is, "it is necessary, little by little, to replace the interpretation with a new discourse, which would have as its end not the discovery of a structure unique and 'true', but the foundation of a game of multiple structures: the written establishment itself "(BARTHES, 1972: 168).

Barthes's prediction in The Writing of the Event about a new theory that could account for the emergence of his own object of study by investigating the unknown rules of the event finds its place in Foucault's archeogenealogy, this theoretical space in which we dealt with various materialities of which we cite the paintings (*Las Meninas, La Musique aux Tuileries, Argenteuil,* *L'Exécution de Maximilien* etc.), the Panopticon and films such as *Hitler: un film d'Allemagne*.

The statement is one of the tools used by Foucault in his archaeogenealogical endeavors. It has a dimension ranging from micro to macrocosm; that is, the statement has its limits and its independence; "It is rather a function that is exercised vertically in relation to the various units, and which allows us to say, regarding a series of signs, whether they are present or not" (FOUCAULT, 1987: 98). This notion of utterance brings Foucault closer to Barthes. "Indeed, it is curious how Barthes and Foucault will insist more and more on widespread pragmatics" (DELEUZE, 1992: 112). At this point, we believe that Barthes's work can be articulated with Foucault's because of this pragmatics Deleuze speaks of Hence May 68 can be seen as a set of discursive events that constitute his own polyform writing.

III. THE BODY OF HORROR UNDER THE ORDER OF MEMORY

The uniqueness and historical originality of May 68 marked the beginning of a new world order whose slogan is *"Il est interdit interdire"* (forbidden to forbid). This event, which began with student protest against conservatism that prevented young people of the opposite sex from staying in the same university housing, eventually became a space of criticism against US liberalism and imperialism, especially with regard to war from Vietnam.

The effects of this crisis are still felt today, as the bodies of now are fragments of this revolution; that is, the bodies of today are effects of the yearnings of the bodies of that historical moment in which May 68 took place. This event in France has subverted the order of world politics as relations between men and women, teacher and students, government and citizens have changed. We would say that the memory of this event, which reorganized the senses of liberal biopolitics in France, regulates them in the now, in the present tense. To demonstrate this, we will use, as an example, the 2005 Suburb Crisis, an event against measures that sought once again to limit the mobility and coexistence of foreigners in the national space, which broke out with the death of the two teenagers mentioned above.

Moirand's (2010) study of the discourse clashes in French newspapers that reported the 2005 Suburbs crisis and the 2006 Universities crisis showed, among other things, how the memory of May 68 was paradoxically evoked by these newspapers, given that it "is part of the collective memory of the French, in the sense given to it by Maurice Halbwachs, memory sociologist" (MOIRAND, 2010: 38). This memory, in a way, use to guide the construction of the representation of this event, having May 68 as a regulatory paradigm of the senses and effects of bodies.

As with the use of the memory of May 68 by the French newspapers, directors of two French horror film productions have also used this same strategy to translate the fear and horror of the threat of far-right growth in presidential elections in Paris. 2002; ie Frontière (s) and À l'interieur are proof that horror films can be part of the writing and memory of the event as they used images of the events linked to the deeds of the attempt to restrict individual rights of citizens. In addition to the images we find in these films, we can see this in the statement made by Xavier Gens.

He says the idea for the movie came in 2002, at the time of the election, when the far right moved to the second round. It was at this moment that he became aware of the extreme gravity of the situation, making him feel a deep fear. Hence, I wanted to try to translate this anxiety through a scenario. Being a big fan of genre movies (like The Texas Chainsaw Massacre), he told himself that the best vehicle for translating this story would be a metaphor for anxiety through the escape of a bunch of young people, all representative of today's youth. Nevertheless, as they try to escape this new policy, they fall into the trap of an even more dubious ideology (GENS, 2007).

So Gens drew on his memory as a viewer of the American film, The Texas Chainsaw Massacre, to translate his fear that also affected much of the French and foreigners living in France. He also drew on the 2005 Riot images to express his fear of the arrival of far-right candidates in the 2002 presidential elections. These images and the use of other references form a kind of filmic device that acts as a political apparatus in horror film productions. Thus, the moving images of *Frontière* (*s*) and \hat{A} *l'interieur* to deal with this memory put into play by the film structure, whose bodies are effects of both the filmic event and the event to which it refers.

In a way, the horror film productions that use this device are also forms that rewrite the event, which, for us, is a kind of work that never concludes because it has in its order the commentary, principle responsible for the transmission of multiplicity, of chance, that is, "of what I would risk saying to number, form, circumstance of repetition" (FOUCAULT, 1996: 26). In this case, we would say, with Foucault, that "the new is not in what is said, but in the event of its return" (FOUCAULT, 1996: 26).

In Foucaultian terms, this type of apparatus contributes to the diagnosis of the present, to the extent that it can be used as a type of discourse whose materiality occurs through horror films. In this light, we can consider films such as Frontière (s) and À l'interieur as artifacts that allow us to diagnose our present, always reflecting: who are we today? Why do we need to reflect on the present through such a question?Perhaps this is a way of preventing the diseases of power from taking shape and eventually destroying the humanity within us.

IV. FINAL CONSIDERATIONS

Throughout this article, we have discussed another form of event writing that we find useful in diagnosing the present. Who would think that horror movies can be used to reflect on "who we are and what we do today?" and how can they be part of writing an event? In our approach, we treat the films *Frontière* (s) and \dot{A} l'interieur as part of the writing of the Suburban Crisis, as they bring in their filmic structure a critique of the conservative politics adopted at that time and a critique of the growth of the French far right in the political scenario of the country. However, undoubtedly the great contribution of this work was to bring the Foucauldian gestures closer to those developed by Barthes. We return to Barthes's question "How can an event be written?" seeking to update Barthes's discussion in 1968 by including Foucault's Archeogenealogy in our gesture as we reflect on the 2005 Suburb Crisis. The use of images of political events in horror film productions such as Frontière (s) and À l'interieur demonstrates, on the one hand, the resumption of a filmic aesthetic of horror committed to the political contestations and social reflections that marked North American productions. Americans in the 1970s; and, on the other, the political engagement that belongs to French filmmakers. In this perspective, these two horror films are part of the writing of the struggle that began in May 1968.

REFERENCES

- À L'INTERIEUR. Direção: Julien Maury. Produção: Priscilla Bertin, Vérane Frédiani, Rodolphe Guglielmi, Frederic Ovcaric, Teddy Percherancier e Franck Ribière. Paris: La Fabrique duFilm, 2007; Pathé 2008. DVD. Disponível em: <<u>https://www.youtube.com/watch?v=ptd6-c73TM</u>> Acesso jan. 2015.
- [2] ARAUJO, A. Utopias e heterotopias no interior e nas fronteiras do discurso-corpo no cinema francês de horror contemporâneo. In: MILANEZ, N.; GHAMA-KHALIL, M.; PESSOA-BRAZ, A. (org.). Outros corpos, espaços outros. Vitória da Conquista, Labedisco, 2014.
- [3] ARAÚJO, A. P.; MILANEZ, N. O discurso fílmico de horror francês e a questão "do quem somos nós hoje": um lugar para memória do corpo. In:VII SPEL, 2012, Vitória da Conquista - BA. Anais do VII SPEL. Vitória da Conquista - Bahia, 2012.
- [4] DELEUZE, G. Conversações. Tradução de Peter PálPelbart. – Rio de Janeiro: Editora 34, 1992.

- [5] BARTHES, R. Elementos de semiologia. Tradução de IzidoroBlikstein. – São Paulo: Cultrix, 1971.
- [6] _____. A escrita do acontecimento. In: TODOROV, T. et al. Semiologia e linguística (seleção de ensaios da revista Communications). Tradução de Lígia Maria PondéVassalllo e Moacy Cirne - 2ª edição - Petrópolis -RJ: Vozes, 1972.
- [7] COURTINE, J-J. Decifrar o corpo: pensar com Foucault. Tradução de Francisco Morás. – Petrópolis, RJ: 2013
- [8] FRONTIÈRES. Direção: Xavier Gens. Produção: Luc Besson, Hubert Brault, Eric Garoyan, RodolpheGuglielmi, Bertrand Ledélézir, NoëlMuracciole, FredericOvcaric, Teddy Percherancier e Laurent Tolleron. Paris: Cartel Productions, BR Films, <u>EuropaCorp</u> e Pacific Films, 2007.
- [9] _____. A ordem do discurso: aula inaugural no Collège de France: pronunciada em 2 de dezembro de 1970. Tradução Laura Fraga de Almeida Sampaio. São Paulo: Loyola, 1996.
- [10] ______. Theatrumphilosophicum. In: Ditos e escritos II
 Arqueologia das ciências e história dos sistemas de pensamento. MOTTA, Manoel Barros da (Org.). Tradução de Elisa Monteiro. Rio de Janeiro: Forense Universitária, 2000.
- [11] _____. O nascimento da biopolítica: curso dado no Collège de France. Edição estabelecida por Michel Senellart; sob a direção de François Ewald e Alessandro Fontana; tradução Eduardo Brandão; revisão da tradução Claudia Berliner. - São Paulo: Martins Fontes, 2008.
- [12] GENS, X. Frontières: interview du réalisateur Xavier Gens. Disponível em:
- [13] <<u>https://www.youtube.com/watch?v=RFmZTITo_88</u>> Acesso em acesso nov. 2012.
- [14] MILANEZ, N. Discurso e imagem em movimento: o corpo horrorífico do vampiro no trailer. – São Carlos-SP: Claraluz, 2011b.
- [15] ______. Foucault e a história da análise do discurso: olhares e objetos. In: CONTI, M. A.; FERNANDES, C. A.; MARQUES, W. Michel Foucault: aportes teóricos e metodológicos. - Uberlândia: Edufu, 2013.
- [16] MOIRAND, S. Le choc des discours dans la presse française: de la crise des banlieues à celle des universités.
 In: Explorations and Encounters in French. Londre: University of Adelaide Press, 2010, p. 35-77. Disponível em:

<<u>http://www.adelaide.edu.au/press/titles/explorations/Explorations-Ebook.pdf</u>>.Acessado em 30 de julho de 2012.

[17] MOTTA, M. B. Apresentação à edição brasileira. In: Ditos e escritos III - Estética: Literatura e pintura, música e cinema. Tradução de Inês Autran Dourado Barbosa. - Rio de Janeiro: Forense Universitária, 2001.

The Effect of Visionary Leadership on Study Program Performance in Lldikti IX Sulawesi

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Abstract-----The study program has an important role in improving the performance and behavior of lecturers and education personnel to realize the success of the study program, especially in providing better teaching services to students. Visionary leadership is expected to be able to provide advantages for study programs to continue to live and develop. This study aims to determine how much influence the visionary leadership has on the performance of study programs in providing learning and administrative services in LLDIKTI Sulawesi and Gorontalo. This type of research uses quantitative descriptive with the steps: porposional data collection and purposive sampling technique sampling, the instrument includes: questionnaire, observation, documentation, de with data analysis validity, reliability test, simple essay regr, correlation and t test, coefficient of determination. The research proves that the visionary leadership has a positive influence on the performance of the study program in teaching and administrative services by 62, 4%. Based on this, in improving the performance of the study program, the study program leader has an important role in creating the behavior of lecturers and education staff to provide good service to students through visionary leadership. **Keywords— Leadership Visionary, Performance Studies Program.**

I. INTRODUCTION

Human Resources in an organization has an important position in the implementation of organizational work processes in achieving goals. Humans in organizations become the main element compared to other resources. Although many factors affect the organization such as modern machines, strong capital, technology and sophisticated systems, but without humans to handle and manage it will not be meaningful for the development of the organization. Human resources that design and formulate all strategies and objectives of the organization. Expertise or competence achieve to its goals. one of them strategic leadership is the attitude of an individual who leads a variety of activities from a group towards a goal to be achieved together. Strategic leadership involves the ability of leaders to be able to manifest a clear vision and mission view in the organization, a leader who is very intelligent in observing an event in the future and can describe his vision and mission clearly. He can arouse the enthusiasm of his members by using his motivation and his craftsmanship, to make an organization more lively, to move all the components in the organization, so that the organization can develop.

The quality of the leader is often seen as the most important factor of an organization's success or failure. So that the issue of strategic leadership is a factor that attracts attention. This will bring consistency that every leader is obliged to pay serious attention to fostering, mobilizing, directing all the potential employees in his environment in order to realize the volume and workload directed to the goal. When leaders show good leadership, elements of the organization will have the opportunity to learn the right behavior to deal with their work. Success or failure to carry out tasks is determined by strategic leadership, because the position of leader dominates all activities carried out, and is an inseparable element and occupies a very important position in an organization. in the implementation of statutory provisions. Increasing the administration of education that is efficient and effective will support the achievement of financial efficiency, meaning that when public services are provided by the service provider to the party served in accordance with simple conditions or the mechanism or procedure is not complicated, it will reduce costs or burdens for the service providers and also the recipient of service.

Standard **Operating Procedure** (SOP) The implementation of education is a benchmark that must be considered as a reference and can be implemented by the study program . Rules and Standard Operating Procedures (SOP) that have been made into benchmarks and guidelines for organizing study programs . But in reality, the rules and service standards that must be provided are still underestimated by certain elements so that the existing SOPs are only displayed, but their implementation or application is still lacking in attention, this is a pathology in conducting education which will lead to the practice of KKN. So the problem now is that the rules that have been made have not been able to implement them. In his words, the organizer of education was shown to create the tridarma function of tertiary institutions. A good study program requires that the organizers must be able to take responsibility and account for their attitudes, behavior and policies to the community as the recipient of consumers. For this purpose, strategic leadership is needed in order to be able to create professional apparatuses to optimize the implementation of their main tasks and functions and to be supported by a spirit of serviceoriented service in providing education, services, and community empowerment.

The reality in the field is still widely seen that education service providers that are carried out by study programs often ignore or even disappoint the community in asking for services. Too many rules and service procedures are too rigid, convoluted, costs and time are not clear, there are no SOPs / they are not implemented, and there are conditions that are not connected / rational. To obtain simple services, the community must be faced with a convoluted process.

Events like this have become a culture in the community, so that people become less trusting and lazy to deal with conditions like this. The crisis of public confidence in the study program is certainly not unreasonable. Visionary or professional leadership has a code of ethics that serves as a guideline for carrying out their duties. The problem that arises in the field is its enforcement. The code of ethics is only read at the oath of office, the next day it just disappears without supervision. So that the role of the leader will be influential in creating a quality work ethic by providing direction of motivation and coaching to subordinates to be able to work cleanly, serve professionally and try to increase public confidence in the study program. By creating potential Human Resources (HR), they will be able to have professional competency quality, thus the quality of professional competency becomes an important and reasonable aspect in every transaction.

II. RESEARCH METHODS

The research conducted is a quantitative descriptive research. Determination of the research sample using purposive sampling to obtain explanatory research. The 289 sample study programs research of using the Regression analysis method . Data collection techniques researchers performed by are questionnaires and documentation.

III. ANALYSIS AND DISCUSSION

Simple Linear Regression Analysis Simple linear regression analysis is used to find out the magnitude of the influence of leadership leadership on the performance of study programs in providing educational services in LLDIKTI IX Sulawesi and Gorontalo. The regression test results are known in the following table:

Table1. SimpleLinearRegressionTestResultsBetween Vsioner Leadershipand StudyProgramPerformance

	Model	Unstandardize	ed Coefficients	Standardized Coefficients	t	Sig.
í.		В	Std. Error	Beta		
- 	(Constant)	29,847	12,362		5,414	0,000
1	х	1,381	0,482	0,790	4,024	0,004

Coefficients^a

Dependent Variable: SUM_x1
By looking at table 1. a simple linear regression equation can be made as follows:

Y = 29,847 + 1,381X

From the results of the simple regression equation above it can be seen that in a constant state the study program performance variable (Y) will rise by 29,847 from the beginning. The coefficient value for the variable of 1.381 indicates that the independent variable of visionary leadership has a positive influence on the performance of study program employees (Y) in LLDIKTI IX Sulawesi and Gorontalo because the value is not negative. This implies that if the increase in the independent variable of visionary leadership, the Table 2. Test Results t

dependent variable and the performance of the study program will increase by 1,381. Based on the regression equation it is concluded that visionary leadership has a positive effect on the performance of study programs in providing educational services in LLDIKTI IX Sulawesi and Gorontalo, so that they receive H1. T test (Partial) T test was conducted to find out the magnitude of the influence of the leadership of the questionnaire on the performance of the study program in providing educational services in LLDIKTI IX Sulawesi and Gorontalo, while the value of the influence of the independent variables on the dependent variable can be seen in the following table

Model	T Hitung	T Tabel	Sig.
1 (Constant)	5.414	1.753	0,000
Leadership (X)	4.024	1.753	0,004

Source: Primary data processed, 2019

Based on table 2, it was found that visionary leadership had an influence on the performance of the study program in providing educational services according to LLDIKTI IX in Sulawesi and Gorontalo with tcount(4.024)>ttable (1.753) or receiving H1. While it is also known that there is a significant influence between the leadership of the questionnaire on the performance of the sig value study program . (0.004) < (0.050). Table 3. Determination Coefficient Results (R2)

Coefficient of Determination (R²)

Test the coefficient of determination (R2) for men getahui percentage of influence leadership v isioner on the performance of the study program in m emberikan educational services in at LLDIKTI IX Sulawesi and Gorontalo, the data presented in the following table:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,790*	0,624	0,581	0,24118

Predictors: (Constant), X Source: Primary data processed, 2019

Based on the table above it appears that the R value of 0.790 or 79, 0% which shows the relationship between the dependent variable to the strong independent variable. While R Square of 0.624 indicates that a large p resentase variations influence leadership v isioner on the performance of the study program in providing administrative services in the Village Bed & Breakfast District of BatuBatu by 62, 4%. It can be said that the independent variable is strong enough to influence the dependent variable, while the rest is influenced by other variables not examined.

IV. DISCUSSION

The results of the study prove that visionary leadership has a positive influence on the performance of study programs in providing educational services in LLDIKTI IX Sulawesi and Gorontalo with tcount (4,024). It is known that there is an influence of visionary leadership on increasing the performance of study programs in providing educational services by 62.4%, this is known from the heads of study programs who have provided services on time, are responsible for providing services and have ethics when providing services. Visionary leadership is able to influence others through the process of communication and direction that directs both within the organization and outside the organization to achieve the desired goals in any situation and condition. Visionary leadership reflects a process, whereby LLDIKTI IX Sulawesi and North Sumatra influence the study program, by providing guidance and facilitating activities and relationships within an organization. As explained by Ali (2013), stated that visionary leadership is a person's ability to influence others with five strategies, namely specivic, measurable, achievable, relevant and timed.

In the present study found a positive influence between leadership v isioner on the performance of the study program, which means that the better the visionary leadership applied by a pemimpin in a course maka the better the performance of the study program. Conversely the lower the visionary leadership applied by a leader in an organization, the worse the performance of the study program. The visionary leadership implemented by the LLDIKTI IX Sulawesi and Gorontalo study programs, namely the leadership is able to calm the work atmosphere, provide support in working, perform a calm attitude in critical situations, be able to make appropriate decisions, make participation or push to achieve goals and the leader does provide motivation to work better in providing good educational services to the community

The improvement of good education services is inseparable from the existence of a firm leader so that he is able to make the right decisions to improve the services provided to the community. Based on RI Law No. 25/2009, it is explained that educational services as an activity or series of meeting the needs provided to the community, so the services provided must pay attention to the public interest, professionalism, equality of rights, participation, transparency, accountability, timeliness, speed, convenience and affordability. If some aspects are felt by the public who get service courses d i LLDIKTI IX Sulawesi and Goron talo the visionary leadership duties menciptak declared successful in the early performance of the study program quality, especially in Sulawesi and Gorontalo LLDIKTI IX .

Based on the explanation, it can be understood that the principles in providing education services are simple, and easy straightforward, easy to understand to implement; clarity of technical and administrative requirements, details and procedures for payment, accuracy in which services can be received correctly, correctly and lawfully; security where processes and products provide a sense of security and legal certainty: responsibility, service

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management leaders in this case designated study programs are responsible for service providers and problem solving; completeness of infrastructure, availability of work facilities and infrastructure, work equipment and other supporting facilities including telecommunications and information technology.

V. CONCLUSION

The implementation of visionary leadership in the study programs at LLDIKT encourages Sulawesi IX and Gorontalo to succeed. Because visionary leadership is able to explain his vision clearly formulated in his missions into the objectives of the study program, visionary leadership has very high integrity, he is an example of future leadership. He can also protect his subordinates well if there are difficulties. The biggest failure of the study program is from a leader, he cannot formulate his vision into the mission of the study program. And most of the strategic leadership of the study program is not responsible for the vision and mission he made .

Visionary leadership has several advantages in competence so that it qualifies as a leader compared to other ordinary members. Because with these advantages authoritative and obeyed by all elements of the organization. Especially the advantages in the field of morals and morals, fighting spirit, sharpness of intelligence, sensitivity to the environment, and perseverance. It also has high personality integrity so that it becomes mature, responsible, and immoral.

REFERENCES

- Anwar Prabu Mangkunegara. (2014). HR Performance Evaluation". Bandung: RefikaAditama. Anwar Prabu Mangkunegara. 2003.
- [2] HR planning and development. Bandung: Publisher Refika Aditama.
- [3] Burt Nanus (2001). Visionary Leadership, Jakarta: Prenhalindo.
- [4] Creswell, JW 2014. Research Design Qualitative, Quantitative, and Mixed Approaches. Yogyakarta: Student Library.
- [5] Dawes, J. (2004), "Assessing the impact of a very successful price promotion on brands, categories and competitor sales", *Journal of Product & Brand Management*, Vol. 13 No. 5, pp. 303-314. https://doi.org/10.1108/10610420410554395
- [6] DwiSetyorini (2008). The Role of Leaders in Cultural Embodiment, http://www.unika.ac.id
- [7] Drucker, PF (1996). The Leader of the Future, New York: The Drucker Foundation.

- [8] Fiedler, FE (1967). A Theory of Leadership Effectiveness, USA: McGraw-Hill.
- [9] Gary Dessler (1997). Human Resource Management, USA: Prentice Hall.
- [10] Huang, H., Chang, Y., Yeh, C. and Liao, C. (2014), "Promote the price promotion", *International Journal of Contemporary Hospitality Management*, Vol. 26 No. 7, pp. 1065-1082. https://doi.org/10.1108/IJCHM-05-2013-0204
- [11] Jakob Edler, Daniela Frischer, Michaela Glanz, Michael S tampfer, 2014. Organizational Transformation and Scientific Change: The Impact of Institutional Restructuring on Universities and Intellectual Innovation, ISBN: 978-1-78350-684-2, eISBN: 978-1-78350-683-5, ISSN: 0733-558X
- [12] Ken Blancard (2012). Empowerment (Take More Than a Minute), Yogyakarta: Amara Books.
- [13] M Teguh, et al. (2017). Basic Islamic Leadership Training, Yogyakarta: UII Press.
- [14] Muhammad SyukriSalleh, 2013, Strategizing Islamic Education, International Journal of Education and Research, Vol. 1 No. June 6, 2013.
- [15] Nawawi, Ha from and M. Martini Hadari. 2018. Effective leadership. Yogyakarta: Gajah Mada University Press
- [16] Republic of Indonesia Law Number 44 Year 2018 & Republic of Indonesia Government Regulation Year 2018 Regarding Education Organization
- [17] Paul Hersey, Ken Blancard (1982). Management of Organizational Behavior, USA: Prentice Hall.
- [18] Pakde Sofa (2018). Understanding Leadership, http://massafa.wordpress.com
- [19] Secundo, G., Elena-Perez, S., Martinaitis , and Leitner, K. (2015), "An intellectual capital maturity model (ICMM) to improve strategic management in European universities", *Journal of Intellectual Capital*, Vol. 16 No. 2, pp. 419-442. https://doi.org/10.1108/JIC-06-2014-0072
- [20] Xia, L. and Bechwati, N. (2017), "The impact of price promotions on checkout donations", *Journal of Product & Brand Management*, Vol. 26 No. 7, pp. 734-749. https://doi.org/10.1108/JPBM-11-2016-1359

Framework of Outcome-Based-Education (OBE) for Massive Open Online Courses (MOOCs) in Islamic Finance Education

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Abstract— This paper present framework of outcome-based-education (OBE) for massive open online courses (MOOCs) in Islamic finance education program. The framework that integrated outcome-based-education (OBE) with Bloom's taxonomy needs a clear explanation in developing a reliable delivery method of course in MOOCs. Therefore, this study developed continuous quality improvement framework, deep learning Bloom's taxonomy framework and MOOCs implementation framework with integration of outcome-based-education (OBE). This paper provides significant contribution of providing framework that reliable and robust for implementation of teaching procedure in massive open online courses (MOOCs) with integration of continuous improvement and outcome-based-education (OBE) approach.

Keywords—Massive Open Online Courses (MOOCs), Outcome-Based-Education (OBE), Islamic Finance.

I. INTRODUCTION

Outcomes based education (OBE) becomes most important terms in measuring the performance of students in higher education institutions in Malaysia. It was attracts most researchers to investigate the impact of OBE implement in higher education institutions. Besides that, the development of technology was influenced the education system in Malaysia especially on implementing online education system. Therefore, higher education institutions of Malaysia must have a good framework in implement online learning.

Malaysian universities are developed online teaching and learning platform known as Massive Open Online Courses (MOOCs). MOOCs offered core modules and students from other public universities can participate in those courses through MOOCs online learning platform. The students from public and private universities can access by register under MOOCs online learning platform. Initial higher education institutions of Malaysian offer courses by MOOCs online learning are ICT Competency course led by Universiti Malaysia Sarawak; Introduction to Entrepreneurship course led by Universiti Teknologi MARA; Ethnic Relations course led by Universiti Kebangsaan Malaysia; and Islamic Civilization & Asian Civilization course led by Universiti Putra Malaysia (Fadzil, et al., 2015). This system was attracted most students from Malaysia and worldwide to participant on

the MOOCs online learning platform. However, there are several problem faced by lecturer in implement MOOCs online learning such as process of deliver and measuring the performance of students engaged on the MOOCs online.

In the global innovation in education field, OBE are looking as a good platform in measuring the performance of students. OBE is depends on a shift in focus from inputs to outcomes and on greater accountability for results (Chase Furman, 1995). Therefore, this study was presented a framework of OBE for MOOCs online learning in Islamic finance education program. The framework is integrating OBE with Bloom's taxonomy. There are many study in Islamic Finance fields (Abu Bakar and Rosbi, 2019; Abu Bakar and Rosbi, 2018; Abu Bakar and Rosbi, 2017; and Abu Bakar and Rosbi, 2016), but researches on the implementation of OBE for Islamic Finance education program are scarce. Thus, this study tries to fulfill the gap by presented a framework of OBE for MOOCs online learning in Islamic finance education program. The implementation of OBE in Malaysian university, especially on the courses that offer MOOCs online learning is still have a space for improvement.

II. LITERATURE REVIEW

In recent decades there is a widespread interest in the outcomes of educational experiences and how those

outcomes meet a variety of social needs (Tam, 2014). With the continuous development and penetration of the internet, there have been vast amounts of changes to the traditional method of classroom teaching. MOOCs have become one of the eminent online learning platforms provided in higher education of Malaysia. MOOCs is known as open online learning courses that offer free learning to entire students that register under MOOCs platform. The main purpose of online learning is to offer its learners an access to education materials at their own pace and time as well as lowering the average educational learning cost (Ahmad Fesol, et. al., 2017). MOOCs show a combination of network information significant technology and educational resources (Zheng, et. al., 2018).

MOOC also provided opportunities for thousands of learners to participate in free higher education courses online (Yousef, 2015). The first MOOCs started in year 2008 introduced by George Siemens and Stephen Downes. The movement in offering MOOCs spread to Europe where two major autonomous MOOCs projects were initiated: OpenupEd and FutureLearn. OpenupEd was launched in year 2013 and Futurelearn started their first course in September 2015 (Chea, 2016). Wong suggested the factors leading to effective teaching of MOOC revolve six areas according to the stages of course delivery namely, preparation, attraction, participation, interaction, consolidation and post-course support. Drago and Wagner suggest that online students are more likely to have stronger visual and read-write learning styles. Zapalska and Brozik (2006) concluded that the achievement of online learning can be improved by providing instruction in a manner consistent with each student's learning style.

Study by Aharony and Bar-Ilan (2016) reveal that perceived usefulness and perceived ease of use have major influence on the intention to enroll in MOOCs online learning. Then, Machadao (2016) suggested that learning is the process of acquiring relative permanent changes in understanding, attitude, knowledge, information, capacity and ability through experience. Study by Ahmad Fesol, et al., (2017) found that learning outcome is the best predictor for students' perception towards MOOCs online learning. Mee, et al. (2018) focused on undergraduate's perception of MOOCs in Mandarin subject in fostering their employability skills and found that two employability skills which are 'information gaining skill' and 'system and technology skill' are positive perception.

While study on the OBE reveal that the widespread interest in the outcomes of educational experiences has resulted in a shift away from the teacher-centered model towards the learning-based model focusing on what students know and can actually do (Tam, 2014). Outcomes-based education means focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experience (Spady, 1994; Macayan, 2017).

Therefore OBE was advocated by Malaysian Ministry of Education as the basis for higher education institutions in Malaysia. OBE was explained what students can demonstrate at the end of the teaching and learning process. Learning outcomes can be assessed and evaluated through various measurement tools such as examination, quizzes, assignment and others. In Malaysia, the OBE system is implemented by the Malaysia Quality Agency (MQA). The Agency holds the task to improve the quality of human capital in the country from three main aspects namely, knowledge, skills and attitude (Abdul Karim and Yin, 2013).

The basic OBE model considers any curriculum as a structured entity with a set of learning objectives and means to achieve those objectives (Akhmadeeva, 2013). Nasrallah (2014), examine the ambiguity surrounding course learning outcomes and how they are perceived by faculty members, while simultaneously investigating the dominant teaching perspectives, practices and assessment techniques. This study found that faculty members and students withheld similar perceptions when it came to efficient teaching; however, they disagreed regarding the utility of constructive alignment as a proposed teachinglearning model. Deneen, et al., (2013) found that students did not perceive significant differences between OBE and traditionally organized courses. Lack of explicit discussion of OBE with the students may have denied students ability to make fully informed evaluations of OBE innovations. Guzman, et al., (2017) found that the faculty members manifest a great extent of understanding of OBE primarily the active participation of students in the learning activities. While, Cooper (2007) investigates the quantitative case study in Queensland schools and suggested that to achieve an effective understanding of OBE should establishes a relationship between successful implementation of an OBE curriculum and an understanding of the curriculum's intended constructivist learning theory and pedagogy.

III. FRAMEWORK FOR DEVELOPMENT OF OUTCOME BASED EDUCATION IN ISLAMIC FINANCE

The objective outcome-based-education is to meet with two main aims as follow:

- a) Ensuring that all students are equipped with the knowledge, competence, and qualities needed to be successful after they exit the educational system.
- b) Structuring and operating facilities for education providers to make sure outcomes can be achieved and maximized for all students.

Figure 1 shows the overview process of delivery for massive open online courses (MOOCs) with outcomebased-education. The first step is planning stage that incorporates for program learning outcome and course learning outcome for developing delivery and assessment method for MOOCs.





The second step involving implementation of assessment and delivery that already planned in stage one. This step involving delivery lecture, performing formative and summative assessment including calculating an appropriate student learning time.

Step three is about evaluating and reviewing about the attainment of students. The purpose of reviewing is to evaluate the validity for assessment method and teaching method in achieving outcome-based-education (OBE).

Final step is suggesting and performing improvement in attaining better score for outcome-based-education (OBE). The suggestion is focusing on learning activities and learning assessment to create course content that more appropriate for MOOCs that meet with standard of outcome-based-education (OBE).

Deep learning process using Bloom's taxonomy of learning domain

The learning process in outcome-based-education is based on taxonomy level. The taxonomy level in functioning to make sure testing and assessment methods are appropriate to measure students understanding in achieving outcome that specified for a particular course in MOOCs. The Bloom's taxonomy level is using six categories of learning domain as shown in Figure 2.

The first level of taxonomy is remembering which includes student are examines to recall facts and basic concept in course of Islamic Finance that using online platform of massive open online courses (MOOCs). The first level of taxonomy is to list the basic knowledge during learning in lecture session.

The second level of taxonomy is understanding which require students to explains ideas or concepts that involving recognize theories in courses of Islamic finance. This stage involved with interpretation and extrapolation of course content in Islamic finance.

The third level is applying which requires students solves a problem using knowledge and appropriate generalizations. This stage involving students need to illustrate and apply knowledge of Islamic finance to solve issue.

The fourth level is analyzing that indicates students need to breakdown knowledge into parts and shows relationships among the parts in solving an issue. The students need to examine and comparing for analyzing problems in Islamic Finance with integration of theories. The behavioral verbs that represent intellectual activity are to calculate, analyze, differentiate and examine.

The fifth level of taxonomy is evaluating. The level of evaluating requires students to shows judgement about value of materials and methods for given purposes. This level asks students to appraise and evaluate issue in Islamic finance with proper support and defend of justification.



Fig.2: Deep learning using Bloom's Taxonomy

The sixth level of taxonomy is creating cognitive ability. The creating is defined as a type of critical thinking that focuses on putting parts together to form new and original whole. The behavioral verbs that represent intellectual activity are design, create, formulate, develop and construct.

Integration of three main domain of Bloom's Taxonomy

Learning domain for outcome-based-education can be divided to three groups namely cognitive, psychomotor and affective. Figure 3 shows integration of three domains of learning assessment in outcome-based-education (OBE).



Fig.3: Level of cognitive, affective and psychomotor domain

Framework for implementation outcome-basededucation (OBE) in massive open online courses (MOOCs).

In ensuring quality of delivery and assessment in online learning using massive open online courses

(MOOCs) platform, an integrated approach need to be developed. Outcome-based-education (OBE) is an approach to education in which decisions about the curriculum are driven by learning outcomes that students should display at end of the course.

The principle of OBE is consisting of four main principle, as follows:

(a) Clarity of focus about outcomes:

The culminating exit outcomes are set as focus of learning. In this situation, student-centered learning is developed which students are aware about what is their expected outcome for specific course and curriculum.

(b) Designed backwards:

The curriculum is designed backward using major outcomes as the focus and linking all activities including planning, teaching and assessment decisions directly to desired outcomes.

- (c) Consistent and high expectation of success: OBE implemented to ensure students to succeed and providing them to engage deeply with the issues they are learning and to achieve high challenging standard set.
- (d) Expanded opportunity:

The curriculum is developed to encompass students to learn at their own pace according their own competency. The OBE is functioning to address individual need and differences with utilizing available time and resources to attain the course outcome at the end of particular course.

Figure 4 indicates the process flow of implementation outcome-based-education (OBE) with quality improvement method in delivering and assessing online courses of massive open learning courses (MOOCs). The process starts with preparing all materials for a course from perspective of course learning outcomes (CLO) and program learning outcomes (PLO). Then, implementation is performed using online platform. If the understanding of students, does not achieve at required level, close monitoring need to be perform. At the end of semester, evaluation and improvement is needed to close loop of OBE system.

The outcome-based education also is highly correlated with constructive alignment of education. Both of these theories are implemented in Islamic Finance education to develop reliable curriculum, teaching method, teaching outcome and assessment. Figure 5 shows constructive alignment for education system in Islamic finance.



Fig. 4: Process flow of implementation OBE in online course for MOOCs



Fig.5 Constructive alignment education system

IV. CONCLUSION

The aim of this study is to develop a reliable framework of outcome-based-education (OBE) for massive open online courses (MOOCs) in Islamic finance education. Main conclusions of the outcome-basededucation for MOOCs are as follows:

- (a) Outcome-based-education is objective and outcome drive, where every stated objective and outcome can be assessed and evaluated systematically with continual improvement. Every learning outcome is intentional and therefore the outcomes must be assessed using suitable performance indicators.
- (b) Outcome-based-education is developed using clarity of focus element. Education system need to be organized so that teachers and learners can focus clearly, consistently, systematically and creatively on the important outcomes that learners are to achieve.
- (c) Moreover, outcome-based-education (OBE) is system of designing downwards and delivering upwards. The curriculum design must be a clear definition of significant learning that students are to achieve. The important instructional decisions can be made by tracing back from this desired-end-result and identifying enabling outcomes that will assist learner to achieve the broader long-term outcomes.

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REFERENCES

- [1] Abdul Karim, N.A. and Yin, K.Y. (2013). Outcome-Based Education: An approach for teaching and learning development, *Journal of Research, Policy & Practice of Teachers & Teacher Education*, 3(1), 26-35.
- [2] Abu Bakar, N. and Rosbi, S. (2016). Error Diagnostic for Weighted Moving Average to Forecast Sharia-compliant

Securities in Malaysian Stock Exchange. International Academic Research Journal of Business and Technology, 2(2), 29-37.

- [3] Abu Bakar, N. and Rosbi, S. (2017). Impact of the Corporate Structure and Sharia-Compliant Status to Average Degree of IPO underpricing in Malaysia Market. *Advanced Science Letters*, 23(9), 8758-8761.
- [4] Abu Bakar, N. and Rosbi, S. (2018). Evaluation of Risk Reduction for Portfolio in Islamic Investment Using Modern Portfolio Theory. *International Journal of Advanced Engineering Research and Science*, 5(11), 27-34.
- [5] Abu Bakar, N. and Rosbi, S. (2019). Mathematical Model Composition of Stock Price Composite Index: A Case Study of Malaysia Stock Exchange. *International Journal of Advances in Scientific Research and Engineering*, 5(3), 57-64.
- [6] Aharony, N. and Bar-Ilan, J. (2016). Students' perceptions on MOOCs: An exploratory study. *Interdisciplinary Journal* of e-Skills and Life Long Learning, 12, 145-162.
- [7] Ahmad Fesol, S.F., Salam, S. and Shaarani, A.S. (2017). An Evaluation of Students' Perception on MOOC Instructional Design Elements. *Journal of Applied Environmental and Biological Sciences*, 7(10), 173-179.
- [8] Akhmadeeva, L., Hindy, M. and Sparrey, C.J. (2013). Overcoming obstacles to implementing an outcome-based education model: traditional versus transformational OBE. *Proc. 2013 Canadian Engineering Education Association* (CEEA13) Conf., 1-5.
- [9] Chan, A. and Chan, C. (2009). A new outcome-based curriculum: its impact on student core competence. *Journal* of Applied Research in Higher Education, 1(2), 24-32.
- [10] Chase Furman, G. (1995). Administrators' perceptions of outcome-based education: a case study. *International Journal of Educational Management*, 9(6), 32-42.
- [11] Chea, C.C. (2016). Benefits and challenges of massive open online courses. ASEAN Journal of Open Distance Learning, 8(1), 16-23.
- [12] Cooper R (2007). An investigation into constructivism within an outcomes based curriculum. *Issues in Educational Research*, 17(1), 15-39.
- [13] Deneen, C., Brown, G.T.L., Bond, T.G. and Shroff, R. (2013). Understanding outcome-based education changes in teacher education: evaluation of a new instrument with preliminary findings. *Asia-Pacific Journal of Teacher Education*, 41(4), 441-456.
- [14] Fadzil, M., Abdol Latif, L. and Munira, T.A. (2015). MOOCs in Malaysia: A preliminary case study. *E-ASEM Forum: Renewing the Lifelong Learning Agenda for the Future. Bali, Indonesia.*
- [15] Guzman, M.F.D.D., Edano, D. C. and Umayan, Z.D. (2017) Understanding the Essence of the Outcomes Based Education (OBE) and Knowledge of its Implementation in a Technological University in the Philippines. *Asia Pacific Journal of Multidisciplinary Research*, 5(4), 64-71.
- [16] Macayan, J.V. (2017). Implementing Outcome-Based Education (OBE) Framework: Implications for Assessment

of Students' Performance. *Educational Measurement and Evaluation Review*, 8(1), 1-10.

- [17] Machadoa, M.A.S., Moreira, T.D.R.G., Gomes, L.F.A.M., Caldeirad, A.M. and Santose, D.J. (2016). A fuzzy logic application in virtual education. *Procedia Computer Science*, 91, 19 – 26.
- [18] Mee, C.K., Sui, L.K.M. and Salam, S. (2018). Undergraduate's Perception on Massive Open Online Course (MOOC) Learning to Foster Employability Skills and Enhance Learning Experience. *International Journal of Advanced Computer Science and Applications*, 9(10), 494-499.
- [19] Nasrallah, R. (2014). Learning outcomes' role in higher education teaching. *Education, Business and Society: Contemporary Middle Eastern Issues*, 7(4), 257-276.
- [20] Spady, W. (1994). Outcome-based education: Critical issues and answers. Arlington, VA: American Association of School Administrators
- [21] Tam, M. (2014). Outcomes-based approach to quality assessment and curriculum improvement in higher education. *Quality Assurance in Education*, 22(2), 1-13.
- [22] Yousef, A.M.F., Chatti, M.A., Wosnitza, M. and Schroeder, U. (2015). A Cluster Analysis of MOOC Stakeholder Perspectives. *International Journal of Educational Technology in Higher Education*, 12, 74–90.
- [23] Zapalska, A. and Brozik, D. (2006). Learning styles and online education. *Campus-Wide Information Systems*, 23 (5), 325-335.
- [24] Zheng, M., Chu, C. and Wu, Y. (2018). Online-to-Offline Teaching Reform in China: Outcomes-based Education. *The Future of Innovation and Technology in Education: Policies and Practices for Teaching and Learning Excellence*, 237-252.

Identification of Construction, Refurbishment and Demolition Wastes in the Urban Area of Porto Nacional - TO

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> Abstract— With the development of the civil engineering business, cities are growing, and new construction is emerging, leading to the generation of construction waste, renovation and demolition. Therefore, this work aimed to identify these residues in small works in the urban region of Porto Nacional - TO. Through a survey of data, we studied 10 (ten) works of the municipality, observing the waste in relation to its identification, classification, separation and destination, was noted if there was presentation of compliance with current standards and laws. This is because improper disposal of these materials generates environmental, social and public health impacts. Thus, after the analysis of the works, waste management was proposed to minimize these problems with alternatives for reuse and recycling of these products. Hopefully, this study can bring improvements to local health, as well as help in the development of the city, and may even cause savings in the construction process.

Keywords— Identification, Impacts, Management, Reuse, Waste.

I. INTRODUCTION

With the development of the civil engineering business, cities are growing, and new construction is emerging, leading to the generation of construction waste, renovation and demolition. This fact is relevant since there is an irrational waste of materials, which causes environmental and social impacts to the population. Thus, it is necessary to know and classify the waste, so that they can have a correct destination.

Thus, the materials from buildings are composed of various products, which are classified in: soils, ceramic materials such as natural rocks, cement based on lime and mortar, red ceramic residues, white ceramic, plaster and glass; metallic materials, such as steel, galvanized steel sheets, brass, among others; organic materials represented by woods, plastics, bituminous materials, paints, packaging paper, etc. (JOHN; AGOPYAN, 2000).

According to Siqueira (2017), through the Brazilian Technical Standard (NBR) 10004: 2004, the Brazilian Association of Technical Standards (ABNT) divides the waste in relation to the possible dangers to the environment and public health in: class I - hazardous and class II - not dangerous.

Waste that may be hazardous to health or the environment is Class I waste due to its physical, chemical

and / or biological characteristics. Also, they have at least one of the following properties: flammability, corrosivity, reactivity, toxicity and pathogenicity (ABNT, 2004).

Waste considered non-hazardous, which are class II, can be separated into: class II A, which have biodegradability, combustibility or solubility in water as properties, are classified as non-inert; and class II B, which do not have their constituents solubilized at higher concentrations, water potability standards, except for color, turbidity, hardness and taste characteristics, are classified as inert (ABNT, 2004).

National Environmental Council (CONAMA) Resolutions No. 307 (2002), No. 348 (2004), No. 431 (2011) and No. 469 (2015) classify waste into Class A, Class B, Class C and class D where:

- Class A: Reusable or recyclable waste as aggregate (ceramic materials, mortar, cladding plates, concrete, soil, pipes, etc.);

- Class B: are recyclable waste for other uses (plastic, paper, cardboard, metals, glass, wood, plaster, etc.);

- Class C: are residues that are not designed techn ologies or applications eco nomic feasible that allows its recycling or reclamation;

- Class D: Hazardous wastes, such as paints, solvents, oils and others or those contaminated or harmful to health,

as well as tiles and other objects and materials containing asbestos or other products harmful to health.

Thus, in order to improve disposal on the construction site, appropriate internal storage and transport should be carried out for each type of waste, thus facilitating the separation and sorting of Construction and Demolition Waste (RCD), making them more viable to be reused and recycled, thus minimizing the impacts of their disposal.

According to Schneider (2003), when these residues are irregularly disposed, they damage landscapes and threaten public health, since they work with niche for several species of pathogenic vectors such as rats, cockroaches, fungi, viruses, among others.

S ccording Nagalli (2014), there is the re management system solid síduos which aims to reduce, reuse or recycle these wastes, including perform and comply with planning, responsibilities, practices, processes and resources in order to describe the fundamental steps to achieving of the steps mentioned in programs and plans.

Therefore, in view of the risks posed by the dumping of RCD in inappropriate places, this study aimed to identify the construction, remodeling and demolition wastes in the urban region of Porto Nacional - TO, observing the possible impacts of these materials and proposing ways of management for the municipality.

II. METHODOLOGY

The research was descriptive, qualitative and quantitative, by indirect approach procedures through field research.

The present study was carried out in the urban area of Porto Nacional - TO, located at a latitude of $10 \circ 42'29$ " south and a longitude of $48 \circ 25'02$ " west, zone 22, with about 60 km from the state capital, as shown in fig. 1.



Fig. 1: Location of the study area.

Ten (10) construction, renovation and demolition works were selected at random in the urban area of Porto Nacional, in different sectors of the city. Because it is an indirect approach, the works were not identified and were differentiated by letters, from Artwork A to J.

Technical visits were made to each of the selected works, and a waste identification questionnaire was applied to the works and the types of RCD produced in each one were observed. After obtaining the data, spreadsheets were produced for analysis of the identification, classification and final destination of the waste.

Construction and demolition solid wastes were identified according to Conama Resolution No. 307 (2002) in:

- materials from buildings;

- Reform materials;
- Materials from repairs and demolitions of civil works;
- Materials resulting from land preparation and excavation.

RCDs were classified at first according to NBR 10.004: 2004 in class I for hazardous waste, and class II for non-hazardous, and also within class II, class II A (non-inert waste) and class II B (inert waste).

They were then classified according to Conama Resolutions No. 307 (2002), No. 348 (2004), No. 431 (2011) and No. 469 (2015) where the waste was separated into class A, class B, class C and class D.

The destination was verified and the conformities and nonconformities were verified according to the Conama resolutions n° 307 (2002) and n° 448 (2012), where the waste should be destined according to the classes A, B, C and D.

After verifying the destination, appropriate final provisions and management methods were proposed for each of the works analyzed, according to the amount of waste identified.

III. RESULTS AND DISCUSSIONS

Through the application of a questionnaire containing 11 (eleven) questions, we identified how the management occurs and estimated the types of waste most produced in the region, from the works analyzed, based on November 2019. The results obtained with the questionnaire are presented in Graph 1 to Graph 12.

Of the 10 (works) visited, 04 (four) were located in the Jardim América sector, 03 (three) in the Aeroporto Sector, 01 (one) in the Jardim Brasília sector, 01 (one) in the Centro sector and 01 (one) in the Jardim Querido sector, as shown in Graph 1.



Graph 1: Location of the studied works.

It was observed that some answers of the questionnaires were omitted by the interviewees, because they were also made visual identifications and photographic memorials made for their verification, thus obtaining some contradictions.

The first question was about the knowledge of the RCD classes (Graph 2). It is noticed that 80% of the employees responsible for the works did not have knowledge about the RCD classes, which can directly interfere with the waste treatment.

According to Lima and Lima (2009), a qualification of the employees is relevant, so that they are trained and know how to classify the waste, so that they can perform an adequate separation.



Graph 2: Knowledge of RCD classes.

Regarding the separation and sorting of CDW (Graph 3), it was observed that of the 20% of those who knew the waste classes, only half, make a separation. Therefore, no screening occurs in 90% of the analyzed works.

As Lima and Lima (2009) separate the waste on the site is important in the management of the RCD, because it helps to avoid its contamination by disposing them in categorically divided containers, thus contributing to their recycling. It is necessary that the RCDs are deposited until they reach an ideal volume for their external transport to the final deposit, where they can be recycled, reused or have a final destination.

Pereira, Jalali and Aguiar (2004) state that the separation of the RCD should be performed at the beginning of the work by selective demolition and selective collection of waste. It is noted that site separation can be difficult, and in some cases recycling at a plant is not feasible, due to the lack of efficient solutions for waste separation with excessive mixed materials and absorbed contamination.



Graph 3: RCD separation and sorting.

Although most works state that there was no separation or sorting, it was found that there were small separations, especially the separation of wood (class B) from other residues, for possible reuse, as shown in Fig. 2.



Fig. 2: RCD images separated in the works.

When asked about the implementation of the Civil Construction Waste Management Plan (PGRCC), 80% of the works in the region did not comply with Conama Resolution No. 307 (2002), Graph 4. This resolution states that construction companies have a duty to plan a PGRCC, being a requirement for the license of the projects with the municipalities. In the management project, it is important

to estimate the amount of each waste, according to the classes resulting from that work, and the place where the waste will be sent safely and ecologically is established.

Paula (2017) argues that the placement and monitoring of PGRCC is a costly methodology in which it is crucial to understand the shortcomings and make suggestions for changes in order to achieve advances and improvements in the construction sector.



Graph 4: PGRCC Realization.

Regarding the temporary packaging of waste, most of the storage, about 70%, is done using stationary buckets (Graph 5). Currently, the most used tools for storing RCDs according to Lima and Lima (2009) are stationary drums, bags, bays and buckets, which should be properly marked showing the type of waste each one can keep, in order to maintain order in the work and preserve the quality of the packaged materials.

Melo and Fernandes (2010) point out that these buckets are of specific use to the RCD class A, which has several components that can be recycled in a common way. However, it is often analyzed the use of these buckets for the disposal of other wastes such as class D, which are considered hazardous wastes from the construction process, presenting some products harmful to health.



Graph 5: RCD Packaging.

Fig. 3 shows the identification of waste disposal in the stationary buckets of some works studied, with no separation, being placed even with household waste.



Fig. 3: Images of irregular RCD arrangement in works.

It was also observed the use of sidewalks and lots around the buildings, for the temporary placement of the RCD, as shown in Fig. 4, which can cause environmental damage to the region.

According to Oliveira and Mendes (2008), in most municipalities, a large portion of RCD is placed in inappropriate places such as river and stream banks or wastelands, causing siltation of streams and rivers, contamination, and proliferation. of disease vectors.



Fig. 4: Waste lot plotted RCD image.

Regarding hazardous waste (Class D), all respondents reported making no distinction regarding this waste (Graph 6), probably due to lack of knowledge about this classification.



Graph 6: Distinction of hazardous waste.

The temporary storage of hazardous waste, pending recycling, recovery, treatment and disposal, according to ABNT NBR 12.235: 1992 can be done in containers, drums, tanks and in bulk.

Regarding the issue of the Transport Manifest (MTR), it was found that 30% of respondents did not know if the work emitted MTR, and the other 70% stated that there is no emission (Graph 7). This result can be considered alarming, given that no monitoring occurs, which can lead to pollution and environmental damage.



Graph 7: MTR emission.

The MTR is used as one of the ways to prove the correct destination of the waste produced on site, being a monitoring tool of paramount importance to know the waste and to know its final destination. It is through this document that the generator proves that it correctly transported the waste and sent it to licensed areas (OLIVEIRA, 2010).

Regarding the final destination of the CDW, most of it is deposited in the dump, and the other part is not known where they are sent for reverse logistics, landfill or recycling depending on the final destination (Graph 8).



Graph 8: RCD Forwarding.

The final disposal of waste is a huge problem for construction, from small to large works. Santos (2009) argues that despite the existence of legislation for such a situation, in practice, the irregular deposition of RCDs, present in almost all Brazilian cities, is analyzed, especially when it comes to medium and small works.

According to Law 12,305 of August 2, 2010, the environmentally appropriate final destination consists of reuse, recycling, composting, recovery and energy recovery, as well as other types of disposal accepted by the responsible agencies such as the National Environment System (SISNAMA), National Health Surveillance System (SNVS) and Unified Agricultural Health Care System (SUASA). It should be noted that they must be attentive to specific operational rules, in order to prevent damage or risks to the population's health and safety, as well as reducing environmental impacts.

Regarding destination according to classes 60%, they stated that the waste is not destined according to classes and 40% did not know (Graph 9).



Graph 9: Destination according to classes.

Due to the fact that most of the works are private, it was noticed that the majority of the collection of RCD is done by companies contracted by the work, and the minority by companies hired by the city (Graph 10).



Graph 10: RCD Gathering.

ABNT NBR 13.221: 2003 reports that appropriate transport should be used, following the relevant regulations. In this case, the transport equipment must be kept conserved, offering no risk of waste leakage or spillage during the trip. In addition, the waste must be well packaged to prevent it from spreading on roads or railways. It should also be borne in mind that they should not be transported with food, medicine or products intended for human use or consumption, or with packaging.

It was also observed that the most produced types in the region are Class A residues, as shown in Graph 11, which are ceramic materials, concrete remains, mortar, soils, among others, followed by Class B residues.



Graph 11: Most produced types of RCD.

Fig. 5 shows the most frequent residues in the visited works, in agreement with the data presented in Graph 11.



Fig. 5: Images of the most produced CDR in the work.

Regarding the reuse of materials (Graph 12), it is noted that only 30% of them do some sort of reuse, and the residues pointed to this situation were Class B, standing out for the reuse of wood remains.



Graph 12: RCD Reuse.

According to Lira (2016), this theme has been quite recurrent in the technical scientific environment, since the RCD have been used as aggregates for various jobs in construction, as well as in road paving. Therefore, reuse precautions should be taken for each type of waste, taking into account its class, destination and reuse.

IV. CONCLUSION

From the interviews and field identification it can be verified that most of the works do not have a control of the correct destination of the generated residues, besides the lack of knowledge by the workers. Specific qualification of the region's construction team is required for basic knowledge, such as differentiation of waste classes and sorting and handling modes. These measures are effective both to bring about savings in the construction process, as well as to minimize social and environmental impacts.

REFERENCES

- BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS. NBR 10004: Solid Waste -Classification. Rio de Janeiro, 2004.
- [2] BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS. NBR 12235: Storage of hazardous solid waste . Rio de Janeiro, 1992.
- [3] BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS. NBR 13221: Ground transportation of waste. Rio de Janeiro, 2003.
- [4] BRAZIL. Law no. 12,305, of August 2, 2010. Establishes the National Policy on Solid Waste; amends Law No. 9,605 of February 12, 1998; and makes other arrangements. Available at: < http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Lei/L12305.htm >. Accessed on: 25 Apr. 2019.
- [5] BRAZIL. Ministry of the Environment (MMA). National Council of Environment (CONAMA). CONAMA Resolution No. 307, of July 5, 2002. It establishes guidelines, criteria and procedures for the management of construction waste. Official Gazette. Brasília, DF: Official Press.
- [6] BRAZIL. Ministry of the Environment (MMA). National Council of Environment (CONAMA). CONAMA Resolution No. 348 of August 16, 2004. Amends CONAMA Resolution No. 307 of July 5, 2002, including asbestos in the hazardous waste class. Official Gazette. Brasília, DF: Official Press.
- [7] BRAZIL. Ministry of the Environment (MMA). National Council of Environment (CONAMA). CONAMA Resolution No. 431, of May 24, 2011. Amends art. 3 of Resolution No. 307, of July 5, 2002, of the National Environmental Council - CONAMA, establishing a new classification for the plaster. Official Gazette. Brasília, DF: Official Press.
- [8] BRAZIL . Ministry of the Environment (MMA). National Council of Environment (CONAMA). CONAMA Resolution No. 448, of January 18, 2012 . Changes the arts. 2, 4, 5, 6, 8, 9, 10 and 11 of Resolution No. 307, of July 5, 2002, of the National Council of the Environment -CONAMA . Official Gazette. Brasília, DF: Official Press.
- [9] BRAZIL. Ministry of the Environment (MMA). National Council of Environment (CONAMA). CONAMA Resolution No. 469, of July 29, 2015. Amends CONAMA Resolution No. 307 of July 5, 2002, which establishes

guidelines, criteria and procedures for the management of construction waste. Official Gazette. Brasília, DF: Official Press.

- [10] JOHN, VM; AGOPYAN, V. Recycling of construction waste. In: DOMESTIC SOLID WASTE RECYCLING SEMINAR, 2000, São Paulo. Available at: < http://sinop.unemat.br/site_antigo/prof/foto_p_downloads/f ot_12596yeciclagem_de_besiduos_da_constbucao_-_8_pdf_Reciclagem_de_residuos_da_construcao_-_8.pdf >. Accessed on: 24 Apr. 2019.
- [11] LIMA, R. S; LIMA, RRR Guide for the Preparation of Construction Waste Management Projects . Paraná: CREA-PR, 2009. 60p.
- [12] Lira, D. S. The recycling of civil construction waste and its reuse in the industry supply chain. In: FATEC Taquaritinga Technology Interface Magazine . P. 80-92, jun. 2016. ISSN is the online 2447-0864. Available at: <www.fatectq.edu.br/Interfacetecnologica> . Accessed on: 25 Apr. 2019.
- [13] MELO, AVS; FERNANDES, MPM The environmental aspect of demolition works . In: 2nd SEMINAR OF THE NORTHEAST REGION ON SOLID WASTE . Federal University of Bahia, 2010. Available at: < http://www.ppec.ufba.br/site/artigos/o-aspecto-ambientaldas-obras-de-demolicao >. Accessed on: 24 Apr. 2019.
- [14] NAGALLI, A. Solid waste management in construction . São Paulo: Text Workshop, 2014. 176p.
- [15] OLIVEIRA, EG; MENDES, O. Construction waste management and demolition: case study of CONAMA resolution 307. Goiânia, 2008. Available at: < https://mac.arq.br/wp-content/uploads/2016/03/estudo-decaso-construtora-consciente.pdf >. Accessed on: 25 Apr. 2019.
- [16] OLIVEIRA, TF G are from construction waste : requirements for construction of public works in the state of paraná Ponta grossa 2010. 2010. 45f. Monograph (Title d e Specialist in Public Works Construction). Postgraduate Course in Public Works Construction, Federal University of Paraná, Ponta Grossa, 2010.
- [17] PAULA, EBP Year of construction waste management a case study on its implementation . 2017. 37f. Course Conclusion Paper (Title d and Specialist in Environmental Management). MBA course in Management Amb iental, the Education Program Cont inuada in Agricultural Sciences, Federal University of Paraná, Curitiba, 2017.
- [18] PEREIRA, LH; JALALI, S .; AGUIAR, JLB Economic Viability of a Construction and Demolition Waste Treatment Plant. Department of Civil Engineering, University of Minho, Portugal, 2004. Available at: < http://hdl.handle.net/1822/2596 >. Accessed on: 25 Apr. 2019.
- [19] RODRIGUES, C. et al. A nalysis management and application degerenciamento project construction waste. In: XV National Meeting of Environmental Technology built, 2014, Maceió, Alagoas. Available at: < https://www.researchgate.net/publication/278676752_ANA LISE_DA_GESTAO_E_APLICACAO_DE_RESIDUOS_D

A_CONSTRUCAO_CIVIL_PROJETOS >. Accessed on: 25 Apr. 2019.

- [20] SANTOS, AL Environmental diagnosis of the management and disposal of construction and demolition waste (RCD): analysis of construction companies associated with SINDUSCON / RN and collecting companies operating Parnamirim -RN. 2009. in the municipality of 107f. Dissertation (Master Degree Production in Engineering). Production Engineering Program, Federal University of Rio Grande do Norte, Natal, 2009.
- [21] SCHNEIDER, DM Irregular
 Depositions of Construction Waste in the City of São
 Paulo . 2003. 132f. Dissertation (Master Degree in Public
 Health). School of Public Health, University of Sao Paulo ,
 Sao Paulo, 2003.
- [22] SIQUEIRA, JB This is a case study conducted at brooks environmental company on sustainable technologies for the disposal of industrial waste, following the guiding principles of environmental law for sustainable development . 2017.
 42p. Course Completion Paper (Postgraduate Degree in Environmental Law). Department of Rural Economics and Extension, Agrarian Sciences Sector, Federal University of Paraná, Curitiba, 2017.

FMEA method application based on occupational risks in the construction industry on work at height: A theoretical contribution

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Abstract— Falls with height difference represents one of the greatest risks found in the construction industry. Because of this, there is a need for the development of tools to assist in risk analysis for occupational accidents. FMEA has been increasingly introduced to different construction environments and recent developments have allowed its application as a tool for risk analysis. With this, the present study applies the tool to work in height in the civil construction. For this FMEA were built consisting of working environments such as works near to peripheries, works on supported scaffolds, works on suspended scaffolding and works near openings in the floor. A total of 65 faults were analyzed, showing their relationship between severity, occurrence and detection. With the application of the FMEA, it was possible to perceive that 49,2% of the total number of failures of the analyzed subprocesses are at a moderate level and 35,4% have a high risky degree, thus demonstrating the need for further studies to improve conditions against the inherent risks of work at height.

Keywords— FMEA; Accidents of Work; Work at height; Occupational risks; Civil Construction.

I. INTRODUCTION

Even though it occupies a small part of the active workers (RINGEN et al. 1995; FAZENDA, 2016) civil construction is one of the sectors of the economy that most groups occupational hazards and accidents at work, being still one of the biggest causes of fatalities in comparison with other industries (MROSZCZYK, 2015; FAZENDA 2016).

Micro and small enterprises make up 94% of the construction industry (TEIXEIRA and LIMBORG, 2005), where the risk is higher compared to large companies because of the low risk control ability (HASLE and LIMBORG, 2006). Wrong employee behavior, stringent legal requirements and the involvement of workers in inappropriate locations compose the barriers to the application of adequate risk management (GARNICA and BARRIGA, 2018). There is still an assertion that construction accidents are caused by poor management and incorrect procedures for execution out the work (HAMID et al. 2008).

Although there are several types of accidents inherent in the industry, such as electrocutions, contact with objects and the use of machines, work at height persists as one of major causes of accidents (WINGE the and ALBRECHTSEN, 2018; HAMID et al. 2008; GUIMARÃES et al. 2000). This issue has attracted the attention from the scientific community and has been demonstrated as a community effort to reduce its severity in cases of failure (NADHIM et al. 2016).

Several studies show the fatalities due to the risks of working at a height. In North American contractors, 264 fatalities in 2009 were related to falls, 40% higher compared to transport-related operations, the second largest fatality generator (MROSZCZYK, 2015). In Europe the same scenario is repeated, of the 782 cases of fatalities recorded in 2014, falls are the most frequent type of accident, accounting for 26% (WINGE and ALBRECHTSEN, 2018). In China, falls represent 56% of the fatal accidents recorded between 2012 and 2016 (SHAO et al. 2018).

Because of the work environment, falls result in a high severity for the worker performing the activity, relating to fatal accidents, contributing to such statistics, however, falls in a general situation still presents as one of the major causes of accidents. In a study of 500 cases of human injuries induced by occupational accidents, 113 (22.6%) were related to falls, followed by 113 (22.6%) caused by fall of objects (Ahmad et al. 2016). Another study analyzed 455 cases of accidents on constructions, in which 101 (22.2%) were cases of falls at height and 78 (17.1%) were cases of fall of objects (Hamid et al. 2008).

Specific studies also reveal a series of patterns by the similarity of environments, actions or failures that lead to the occurrence of fall accidents (NADHIM et al. 2016). Scaffolding and roofing falls, for example, stand out even when presented together with data from outside the construction environment (TÜRKOĞLU et al. 2019; IÇER et al. 2013). Consequently, several authors have sought to demonstrate the conditions under which accidents occur, either in case studies or in documentary reviews. Some of the failures are worthy of attention: failure in scaffolding, openings or deficiencies in the floor, stair-related failures and absences or inadequate use of PPE (WINGE and 2018; LEONAVIČIŪTĖ, ALBRECHTSEN, 2016; LIPSCOMB, 2014; HAMID, 2008; HALPERIN and MCCANN, 2004).

Because of this, there is a need for the development of new tools to improve the current conditions for the prevention of occupational accidents, whether exploring new indicators, mappings or operations understandings (HOVDEN et al. 2009). FMEA is a tool that has gained a wide range of applications in several areas such as food safety (SCIPIONNI et al. 2002), clinical analysis (JIANG et al. 2015), environmental risk assessment (ZAMBRANO and MARTINS, 2007) and administrative procedures (MILAZZO et al. 2009; RHEE and ISHII, 2003).

The FMEA corresponds to a systematized group of activities that can recognize and evaluate the failures of a product or service in addition to identifying which actions can be applied to reduce the probability of their occurrence (FORD, 2011). For your application, it is essential that information or databases be available that complement the research (MACDERMOTT et al. 2009)and this becomes one of the major problems in the construction of the FMEA because the values of the indexes, in situations of little information, become subjective to the teams that perform it (BANGHART, 2018).

In areas of poor tool development, the values of the indexes are imprecise, making it impossible to use the FMEA efficiently in order to guarantee continuous improvement (LAURENTI et al. 2012). However new

developments allowed to take the tool to civil construction, from the construction of gabions (PATRICIO et al. 2013) to the application in steel structures (SONG et al. 2007).The FMEA, however, presents the potential of integration in the analysis of occupational hazards within civil construction, Cavaignac and Uchoa (2018), proposed a model for adapting FMEA parameters as an attempt to reduce subjectivity.

Considering these aspects discussed and supported by the development of the FMEA in occupational risk analysis, the present study seeks to bring the applicability of the tool to relate different data presented by several authors regarding failures present in activities on work at height, relating them with their respective environments in the construction industry. Through the study it will be possible to obtain an analysis of the present working conditions in which the workers are exposed, and to bring a representativity of the severity of the works in height to the industry of construction.

METHODOLOGY

II.

For the elaboration of this work, research was carried out in the literature available in scientific journals on the subject. The data inserted in the table were obtained from the analysis of the current environment of work safety based on literature, study of the applied regulations for work in height in the civil construction, searches in news or case studies from failure modes and field visits to study the most commonly used control methods.

Due to the amplitude of the process chosen, it was divided into subprocesses, designated from working environments in height. Four subprocesses were used to prepare the FMEA: works executed near the periphery incorporates all work done near ends on floors above the ground floor; works carried out on supported scaffolds incorporates works accomplished using supported scaffolding; works carried out on suspended scaffolds incorporates works carried out using the suspended scaffold; works executed near openings in the floor – incorporates all work done near the internal ends of the building on floors above the ground floor.

These subsystems were then subdivided into three possible types of failures, to be assigned the potential failure modes. This subdivision seeks to relate failures from their common cause characteristics. The failure types assigned to the FMEA table were: human error – this aspect attributes the failures to problems related to human acts; structural failure – it considers structural failures either in the construction to be carried out or in work equipment; CPE or PPE failure – assigns failures to problems in collective or

personal protection systems. The failures were selected from the literature of the theme.

The FMEA will be applied from the parameters presented by Cavaignac and Uchoa (2018), with the objective of reducing subjectivity in the choice of severity, occurrence and detection indices, these values vary from 1 to 10 from their reality to the failure, shown by table 1. The severity value of each failure was selected by the worst situation, considering the more realistic possibilities by case studies presented from the literature. For the occurrence, the same statistical analysis of table 1 was maintained. And the detection was determined by field visits and interviews with professionals of the area.

	Table 1 - Adapted indexes to ocupational safety											
	Severity (S)		Occurrence (O)		Detection (D)							
Index	Consequence of failure	Index	Accidentnature	Index	Detection methods							
1	No real impact	6	Impactsuffered	1	Visual inspection							
2	Irrelevant trauma	5	Drop with level difference	2	Tactiletest / manual test							
3	Trauma requiring firstaid	5	Impactagainst	3								
4	Temporary incapacity without remoteness	5	Excessive or inappropriateeffort	4								
5	Temporary incapacity with small remoteness	5	Pressing or imprisonment	5	check-list/sequence of tests before process							
6	Temporary incapacity with large remoteness	5	Fall on the same level	6								
7	Partial permanent disability	4	Noise exposure	7								
8	Total permanentdisability	4	Contact with harmful substance	8	Instrumental inspection /mechanicaltests							
9	Death of those involved in the process	4	Electric shock	9								
10	Death of those not involved in the process	3	Friction or abrasion	10	Lack of effective methods							
		3	Contact with extreme									
			temperature									

Source: Cavaignac e Uchoa (2018).

III. RESULTS AND DISCURSIONS

The tables represent the body of the FMEA, translating the resulting values of occurrence, severity and detection into their respective RPN for failure modes. Each failure mode was analyzed separately, considering their respective situations and related regulations.

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Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeas	Detection	RPN (SxOxD)	Risk Degree
Human Error	Problems in ergonomics	Hamid et al. 2008; Wong et al. 2009	Excessive or inappropri ate effort	5	Temporary incapacity without remoteness	4	Tactile	2	40	Moderate
Human Error	Neglect at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	225	Critical

Table.2 -	FMEA	for works	executed	near	the	periph	ery
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Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeas ures	Detection	RPN (SxOxD)	Risk Degree
Human Error	Imprudence at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Human Error	Disorganizat ion of the work environment	Hamid et al. 2008; Wong et al. 2009	Impact against tools, machines and equipment	5	Trauma requiring first aid	3	Checklist	5	75	Moderate
CPE or PPE Failure	Absence of the guardrail	Winge and Albrechtsen, 2018; Leonavičiūt ė et al. 2016	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
CPE or PPE Failure	Failure of the guardrail	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Tactile	3	135	High
CPE or PPE Failure	Absence of the toe board	Winge and Albrechtsen, 2018; Leonavičiūt ė et al. 2016	Impactfro mfallingo bjects	6	Death of those not involved in the process	1 0	Visual	1	60	Moderate
CPE or PPE Failure	Failure of the toe board	Winge and Albrechtsen, 2018	Impactfro mfallingo bjects	6	Death of those not involved in the process	1 0	Tactile	4	240	Critical
CPE or PPE Failure	Absence of the safety net	Leonavičiūt ė et al. 2016	Impact from falling objects	6	Death of those not involved in the process	1 0	Visual	1	60	Moderate
CPE or PPE Failure		Leonavičiūt ė et al. 2016	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
CPE or PPE Failure	Failure of the safety net	Leonavičiūt ė et al. 2016	Impact from falling objects	6	Total permanent disability	8	Instrumental inspection	9	432	Critical
CPE or PPE Failure		Leonavičiūt ė et al. 2016	Drop with level difference	5	Death of those involved in the process	9	Instrumental inspection	9	405	Critical

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeas ures	Detection	RPN (SxOxD)	Risk Degree
CPE or PPE Failure	Absence of protection net	Winge and Albrechtsen, 2018; Leonavičiūt ė et al. 2016	Impact from falling objects	6	Death of those not involved in the process	1 0	Visual	1	60	Moderate
CPE or PPE Failure	Failure of PPE	Leonavičiūt ė et al. 2016; Hamid et al. 2008	Drop with level difference	5	Death of those involved in the process	9	Tactile	4	180	High

Source: the authors (2019).

Problems in ergonomics consider the execution of work without adaptations of the environment for the employee, forcing him to long working days without pauses, while exposed to adverse conditions. This may result in temporary incapacity without remoteness, having as potential cause of failure excessive or inappropriate efforts. The worker's own tactile discomfort can be used as a control measure, triggering or not the need for adaptations of the work environment, so his degree of risk is classified as moderate.

Negligence in work implies in the omission of the correct use of the PPE or lack of attention in the execution of the activities, its potential consequence is the death by the fall with level difference of the employee, since the incorrect use of the EPI's can lead to an unnecessary risk. Check lists identify the need or lack of PPE for the execution of activities and in some cases of work that require more attention, help to maintain the correct sequence of execution. The high severity in cases of errors committed by negligence results in a critical degree of risk.

Imprudence at work is the condition of the workeris put at risk by own responsibility, the worker takes inappropriate attitudes of risk with the mentality of ensuring the full functionality of PPE. This may result in the death of those involved in the process by the drop with level difference, as usually this risk action happens during absence of the supervisor, as NR 18 inhibits the execution of work at height without supervision, the control means to detect the failure is visual. This gives the failure a moderate degree of risk.

The disorganization of the work environment includes both the deposit of materials from the execution of previous activities and the inadequate disposition of the materials used in the actual activities. This failure mode considers the contact that the employee can have with these materials, making the activity difficult. In the event of accidents, a concussion or cuts may occur, trauma requiring first aid. Routine workplace checks should be maintained and controlled through check lists prior to performing any work at a height. The risk level is moderate.

Absence and failure of the bodyguard has the consequence of falling with a different level of worker, with the possibility of death of those involved in the process. The absence of the bodyguard, which is visually verifiable directly by the control methods, has its detection almost certain, its risk degree is moderate. Since its failure to be something unforeseeable and difficult to verify, considering several variables, such as failure of the structure by impact or mismatch during the installation, requires a tactile inspection of the perimeter of cover as a measure of control, its risk degree is moderate.

The absence and failure of the toe board has as potential cause of the failure the impact suffered by falling objects on the pavement below, either by falling tools or falling material. The impact of a high altitude can cause death of not involved in the process. The absence of the toe board, as it is visually detectable, has an almost certain probability of detection, which results in a moderate risk degree. Its failure, which does not present control methods and can occur either by the presence of small openings or by the failure of the materials resistance, requires tactile inspection as a control measure, because of this therisk degree is critical.

The safety nethas the objective, toprotect from the fall of materials and reduce the height of fall of people. Its absence due to being easily verified visually, has almost certain detection, two consequences are possible in this case: impact suffered by falling object with death of not involved in the process, having moderate risk degree; and the fall with death of the employees, due to the inability to reduce their fall height, this fault has a moderate risk degree. The failure of the safety net can occur due to its poor design, small openings, poor fixation and bad anchoring in the structure. That is, when it is installed, but there is an impediment of the execution of its objectives. Failure of its building materials requires an instrumental inspection as a means of control, in other cases cited faults, requires visual or tactile inspections with installation. Its failure can result in the impact suffered by falling object with permanent disability or even the fall with level difference with death of involved in the process, both have With the absence of the protection net there is no impediment of objects thrown by the execution of the activities to reach areas outside the protection platforms. These thrown objects expose both the workers and the people close to the building. Its consequence is the impact suffered by falling objects with the possibility of death of not involved in the process. As your control measure involves a visual inspection, therisk degree is moderate.

As a consideration of PPE, respective failures to personal fall protection were analyzed, such as: Lifeline rupture, rupture of the lanyard, failure or rupture of the fall arrester, carabiner rupture, rupture on the body harness and anchor structure failure. These items are crucial to the maintenance of the life of the employee who performs the activity, and they failure causes to fall with level difference with death involved in the process. The lifeline and lanyard should be exposed as a control measure to a tactile inspection of its entire surface for imperfections or apparent failure of its materials prior to the execution of the activities. Their failure has a high risk degree.

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeasu res	Detection	RPN	Risk Degree
Human Error	Problems in ergonomics	Hamid et al. 2008; Wong et al. 2009	Excessive or inappropriat eeffort	5	Temporary incapacity without remoteness	4	Tactile	2	40	Moderate
Human Error	Neglect at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Total permanent disability	8	Checklist	5	20 0	Critical
Human Error	Imprudence at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Total permanent disability	8	Visual	1	40	Moderate
Human Error	Disorganizatio n of the work environment	Hamid et al. 2008; Wong et al. 2009	Impact against tools, machines and equipments	5	Trauma requiring first aid	3	Checklist	5	75	Moderate
Structural Failue	Scaffold structure overload	Winge and Albrechtsen, 2018; Halpein and McCann, 2004; Leonavičiūtė et al. 2016	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Structural Failue	Displacement of scaffold structure during use	Winge and Albrechtsen, 2018	Drop with level difference	5	Total permanent disability	8	Visual	1	40	Moderate

Table3 FMEA for works carried out on supported scaffolds

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Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeasu res	Detection	RPN	Risk Degree
Structural Failue	Irregular Scaffold Mounting	Winge and Albrechtsen, 2018; Halpein and McCann, 2004; Leonavičiūtė et al. 2016 Winge and	Drop with level difference	5	Death of those involved in the process	9	Checklist	6	27 0	Critical
Structural Failue	Slope on scaffold attachment surface	Albrechtsen, 2018; Halpein and McCann, 2004; Leonavičiūtė et al. 2016	Drop with level difference	5	Total permanentdisa bility	8	Tactile	3	12 0	High
Structural Failue	Absence of locking against undocking	Halpein and McCann, 2004	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Structural Failue	Scaffold with degradation in its state of use	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	6	27 0	Critical
Structural Failue	Irregular workingenviro nment	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Structural Failue	Absence of complete scaffold floor	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Structural Failue	Rupture of scaffold floor	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	22 5	Critical
Structural Failue	Poor floor fixing	Winge and Albrechtsen, 2018; Halpein and McCann, 2004	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	22 5	Critical
Structural Failure	Absence of stairs	Winge and Albrechtsen, 2018; Leonavičiūtė et al. 2016	Drop with level difference	5	Temporary incapacity with small remoteness	5	Visual	1	25	Minor / Secondary
Structural Failure	Stair case failure	Winge and Albrechtsen, 2018; Leonavičiūtė et al. 2016	Drop with level difference	5	Temporary incapacity with large remoteness	6	Tactile	3	90	Moderate
Structural Failure	Incorrect material disposal	Winge and Albrechtsen, 2018	Impactfrom fallingobjec ts	6	Temporary incapacity	6	Visual	1	36	Minor / Secondary

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence	Potencial Consequence of Failure	Severity	ControlMeasu res	Detection	RPN	Risk Degree
					with large remoteness					
CPE or PPE Failure	Absence of the guardrail	Winge and Albrechtsen, 2018; Leonavičiūtė	Drop with level difference	5	Total permanent disability	8	Visual	1	40	Moderate
CPE or PPE Failure	Failure of the guardrail	et al. 2016 Winge and Albrechtsen, 2018	Drop with level difference	5	Total permanent disability	8	Tactile	3	12 0	High
CPE or PPE Failure	Absence of the toe board	Winge and Albrechtsen, 2018; Leonavičiūtė et al. 2016	Impact from falling objects	6	Temporary incapacity with large remoteness	6	Visual	1	36	Minor / Secondary
CPE or PPE Failure	Failure of the toe board	Winge and Albrechtsen, 2018	Impact from falling objects	6	Temporary incapacity with large remoteness	6	Tactile	4	14 4	High
CPE or PPE Failure	Failure of PPE	Leonavičiūtė et al. 2016; Hamid et al. 2008	Drop with level difference	5	Total permanentdisa bility	8	Tactile	3	12 0	High

Source: the authors (2019).

The human errors take the same assumptions discussed previously, for their causes and control measures were assigned the same coefficients of work near the periphery. To determine the severity of negligence and imprudence in the execution of the work was considered the height of fall of the use of supported scaffolding that can result in the total permanent disability of the employee.

Scaffold structure overload occurs when the load of both materials and people exceeds the material's resilience. Usually this can occur when there is a purpose to accelerate the activities that are being performed. This can result in a drop in level difference with death of those involved in the process, since in addition to the impact of your body against the ground there may be perforations or other impacts by the debris from the collapse of the structure. As there will usually be no generalized consensus in the work of the maximum load capacity of the scaffold, its overload load can be confirmed visually. Because of the high severity its risk degree is moderate.

The displacement of the structure of the scaffold during use occurs in situations in which, in order to accelerate the construction process, the requirement of the release of the use of the scaffold is not made, because of this it is carried from one point to another of the construction still loaded with people or materials. Therefore, this can result in the fall with difference of level of the worker, by the considered height of the scaffolding and the fall being outside of the structure, we have the total permanent incapacity of the worker. Because it is visually verifiable directly, the control means can almost certainly detect the fault, because of that its risk degree is moderate.

There is also the possibility that structural failure can arise from the irregular assembly of the scaffold structure, services not inspected by qualified professionals before the start of their use can result in the fall with level difference with death of involved in the process, because the contact with the structure during the failure can result in head impacts or perforations in the body. Checking the equipment prior to the execution of the activities can be done using check lists addressing crucial points of the structure assembly. Its risk degree is critical.

The installation of the scaffold on an irregular surface with unevenness can result in its tipping or the movement in the scaffold floor resulting in an imbalance of the employees, with that the consequence of the failure is the fall with difference of level of the worker with total permanent incapacity. It may be visually verifiable prior to the use of the structure in case of more aggravating gradients. It has a moderate risk degree.

The detachable locking prevents full collapse of the structure in case of irregular assembly or other failures in the structure, its absence can then, in case of collapse, cause the fall with a difference of level of the employee, which in addition to the impact with the ground can be punctured by the collapsed structure, resulting in the death of those involved in the process. As this is an easily verifiable mechanism by visual inspection of the structure after assembly, it is almost certain that the fault will be detected. Its risk degree on account of its easy detection is moderate.

The state of degradation of the scaffold may be presented from both the apparent oxidation and the appearance of lesions in the structure or irregular behavior of its fixations. The degradation can lead to a rupture of the structure, causing the fall with a difference of level of the contributing with death due to other injuries with the collapse. This degradation, although may be apparent in some cases, may occur in places of difficult verification, such as in joining the components or internally to metal parts, in some cases requiring a operation using check list to fully stats its condition. Itsrisk degree is critical.

It is also indispensable to check the work environment for the execution of the activities in the scaffold, since the proximity of the structure to electrical networks can result in the electric shock and fall with level difference with death of the employee. Although it is visually verifiable prior to the execution of the work, other factors must be considered, such as the possibility of anchoring for PPE, its risk degree is moderate.

The absence of complete work floor, rupture and poor fixation, consider the fall of the worker internally to the structure of the scaffold, with the possibility of impact with the fittings of the structure, with the consequence of the death of involved in the process. The absence of complete work floor is almost certain to be detected by visual confirmation of the structure and its risk degree is moderate. The rupture of the floor that can happen immediately due to the failure of the materials or overload requiring in some cases check lists to verify certain aspects of the scaffold floor, its risk degree is critical. The poor fixation of the work floor can be visually checked, but in some cases the irregular assembly of the platforms may not be apparent, so the tactile verification becomes necessary, its risk degree is critical.

Stairs must be fixed to the structure of the scaffold, therefore two possible failures were considered: Their absence and their failure. The absence of the ladder may result in a level difference during scaffold climbing, which consequently results in temporary disability with large remoteness, this failure mode being visually recognized, have arisk degree minor or secondary. However, its failure can occur either by rupture of the ladder structure or by slipping during its climb, has as a consequence the fall with temporary incapacity with large remoteness, its survey can be done tactile to confirm its structural stability and absence of other failures, itsrisk degree is moderate.

Incorrect disposal of materials considers the fall of materials during the execution of the activity, due to the low altitude of the execution of the activities on the supported scaffold this mode of failure has as consequence the temporary incapacity with large remoteness by the impact suffered by falling object. By supervising the execution of the work on the scaffold this mode of failure can be detected visually, because of this its risk degree is minor or secondary.

The absence and failure of the bodyguard has as severity the total permanent disability of the worker, this severity considers the fall in the external region of the structure of the scaffold. The risk degree of the absence of the bodyguard is moderate, due to the ease of its detection. The failure of the bodyguard has a high risk degree because of its high severity and difficult detection.

Absence and failure of the toe bard has as severity the temporary disability with large remoteness of the employee. The absence of the footboard has a minor or secondary risk degree due to its visual detection and the footboard failure has a high risk degree because of the difficulty of detection before the failure occurs. The failures of PPE also assume the same values assigned to work next to peripheries, only the severities had different values to better fit the execution of works in supported scaffolds.

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence (O)	Potencial Consequenc e of Failure	Severity (S)	ControlMea sures	Detection (D)	RPN (SxOxD)	Risk Degree
Human Error	Problems in ergonomics	Hamid et al. 2008; Wong et al. 2009	Excessive or	5	Temporary incapacity	4	Tactile	2	40	Moderate

Table.4 - FMEA for works carried out on suspended scaffolds

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence (O)	Potencial Consequenc e of Failure	Severity (S)	ControlMea sures	Detection (D)	RPN (SxOxD)	Risk Degree
			inappropri ateeffort		without remoteness					
Human Error	Neglect at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	225	Critical
Human Error	Neglect at PPE use	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Human Error	Disorganizat ion of the work environment	Hamid et al. 2008; Wong et al. 2009	Impact against tools, machines and equipment s	5	Trauma requiring first aid	3	Checklist	5	75	Moderate
Structural Failure	Irregular Scaffold mounting	Winge and Albrechtsen, 2018; Halpein and McCann, 2004; Leonavičiūtė et al. 2016	Drop with level difference	5	Death of those not involved in the process	1 0	Checklist	6	300	Critical
Structural Failure	Scaffold with degradation in its state of use	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those not involved in the process	1 0	Checklist	6	300	Critical
Structural Failure	Scaffold structure overload	Winge and Albrechtsen, 2018; Halpein and McCann, 2004; Leonavičiūtė et al. 2016	Drop with level difference	5	Death of those not involved in the process	1 0	Visual	1	50	Moderate
Structural Failure	Instability of scaffoldstruc ture	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	7	315	Critical
Structural Failure	Absence of scaffold	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those	9	Checklist	5	225	Critical

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence (O)	Potencial Consequenc e of Failure	Severity (S)	ControlMea sures	Detection (D)	RPN (SxOxD)	Risk Degree
	anchorage at work level				involved in the process					
Structural Failure	Irregular workingenvi ronment	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	225	Critical
Structural Failure	Rupture of scaffold floor	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	225	Critical
Structural Failure	Incorrect material disposal	Winge and Albrechtsen, 2018	Impactfro mfallingob jects	6	Total permanent disability	8	Visual	1	48	Moderate
CPE or PPE Failure	Absence of the guardrail	Winge and Albrechtsen, 2018; Leonavičiūtė et al. 2016	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
CPE or PPE Failure	Failure of the guardrail	Winge and Albrechtsen, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	6	270	Critical
CPE or PPE Failure	Absence of the toe board	Winge and Albrechtsen, 2018; Leonavičiūtė et al. 2016	Impact from falling objects	6	Death of those not involved in the process	1 0	Visual	1	60	Moderate
CPE or PPE Failure	Failure of the toe board	Winge and Albrechtsen, 2018	Impact from falling objects	6	Death of those not involved in the process	1 0	Checklist	6	360	Critical
CPE or PPE Failure	Failure of PPE	Leonavičiūtė et al. 2016; Hamid et al. 2008	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate

Source: the authors (2018).

The human errors for suspended scaffolds follow the same work environments assigned to the peripheries, because of this the same parameters were applied for the occurrence, severity and detection.

There is the possibility that failure points in the structure of the scaffolding can be left during the assembly, this can lead to disassembly at critical points causing a drop with level difference with death of those not involved in the process. This failure can occur in several visible ways, such as disengagement and lack of pressure on the screws, check lists can be applied to check the most crucial points of the structure. It has critical risk degree.

The overload occurs when the specified design load of the scaffold is exceeded, in this case the overload refers to the structural failure of the metal beams in which the work floor is supported, which can result in the fall with level difference with the employee's death. Although the rupture can occur immediately, the overload is considered when loading the scaffold, because of this the failure has a high probability of detection, its risk degree is critical.

Suspended scaffolds should have their stability guaranteed throughout the work execution time, the instability of the scaffolding may come from either poor fixation, poor leveling or irregular descent of the scaffold. The instability can cause the fall with a difference of level of the employee with death, its method of control is defined by the adequate training of the users of the scaffold and the supervision of those in charge of the control, being able to have as a control measure the tactile of the employee. Its risk degree is critical.

The suspended scaffolding must also be fixed at the work level. If there is no fixation, winds and movement inside the scaffold can lead to the displacement of the structure, resulting in the drop with level difference with death of the worker. This failure can be detected through the training and checklist application of the adequacy of the work environment before the execution of the activities, because of this there is a high probability of detection. Itsrisk degree is critical.

The working environment from which the scaffolding is to be passed should also be checked. Obstacles may meet the scaffolding pulley system, or the structure mayencounter power grids. Although it is a visual check, some obstacles can go unnoticed by the team that performs the activity, so there is a need to apply a checklist addressing all aspects that must be verified during the installation of the scaffolding, due to this its risk degree is critical.

There is also the possibility of rupture of the work floor, this can occur through overload, bad conditions of use and poor assembly. It can cause the fall with level difference with death of the worker. Its risk degree is critical.

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence (O)	Potencial Consequence of Failure	Severity (S)	ControlMeasure s	Detection (D)	RPN (SxOxD)	Risk Degree
Human Error	Problems in ergonomics	Hamid et al. 2008; Wong et al. 2009	Excessive or inappropriat e effort	5	Temporary incapacity without remoteness	4	Tactile	2	40	Moderate
Human Error	Neglect at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Checklist	5	22 5	Critical
Human Error	Imprudence at work	Hamid et al. 2008; Cakan et al. 2014; Wong et al. 2009	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
Human Error	Disorganizatio n of the work environment	Hamid et al. 2008; Wong et al. 2009	Impact against tools, machines and equipments	5	Trauma requiringfirstai d	3	Checklist	5	75	Moderate
Structural Failure	Rupture of the ladder structure	Winge and Albrechtse n, 2018	Drop with level difference	5	Temporary incapacity with small remoteness	5	Instrumental inspection	8	20 0	Critical

Table.5 - FMEA for works executed near openings in the floor

Type of Failure	Potencial Failure Mode	Reference	Potential Cause of Failure	Ocurrence (O)	Potencial Consequence of Failure	Severity (S)	ControlMeasure s	Detection (D)	RPN (SxOxD)	Risk Degree
Structural Failure	Absence of ladder attachment and support	Winge and Albrechtse n, 2018	Drop with level difference	5	Temporary incapacity with large remoteness	6	Tactile	3	90	Moderate
Structural Failure	Ladder resting on non- resistant floor	Winge and Albrechtse n, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	6	27 0	Critical
Structural Failure	Absence of walkways	Cakan et al. 2014	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
CPE or PPE Failure	Poorsizing of walkways	Cakan et al. 2014	Drop with level difference	5	Death of those involved in the process	9	Instrumental inspection	9	40 5	Critical
CPE or PPE Failure	Rupture of the provisional closure	Winge and Albrechtse n, 2018	Drop with level difference	5	Death of those involved in the process	9	Checklist	6	27 0	Critical
CPE or PPE Failure	Absence of the elevator access closure	Winge and Albrechtse n, 2018	Drop with level difference	5	Death of those involved in the process	9	Visual	1	45	Moderate
CPE or PPE Failure	Failure of the elevator access closure	Winge and Albrechtse n, 2018	Drop with level difference	5	Death of those involved in the process	9	Tactile	3	13 5	High

Source: the authors (2019).

In relation to the use of stairs were considered three failures, the rupture of the structure of the ladder, the absence of fixation of the support of the ladder and the ladder supported on non-resistant floor.

For the rupture of the ladder structure, it was considered a fall with a difference in level, resulting in temporary disability with a small remoteness. As the failure can occur suddenly, whether by overload or bad condition of the ladder, the control measure is made by instrumental inspection, its risk degree is critical.

However, the absence of upper and lower attachment of the ladder supports may lead to accidental slippage of the structure, resulting in a fall with temporary injury with large remoteness. This failure can be tactile and visually recognized before the activity is executed. Its risk level is moderate.

There is also the chance that the ladder will be supported on non-resistant flooring, leading to falling between floors causing death of involved in the process. Detection of this failure is unlikely since a direct verification of the bearing surface is required, and rupture may occur immediately due to overload. This failure has a critical risk degree.

When crossing people or moving materials through an opening in the floor, it is necessary to install walkways. The absence of the walkways can result in a fall with a difference of level of the worker with death of those involved in the process, this fault can be verified visually, then it is almost certain that it will be detected, its risk degree is moderate. Poor sizing should also be considered because of the movement of loads on the walkways, the walkways should be monitored through instrumental inspection after its installation. Its risk degree is critical.

Provisional floor closuresprevent falling between floors in case of landslides. These closures can rupture in the event of major impacts, resulting in employee death. As there is unpredictability related to the rupture, it may be due to the quality of the material or the impact load, it becomes necessary a application of a check list to verify all openings. Its risk degree is critical. Absence and failure to elevator access closure should also be considered. The absence can result in the fall of the worker with death, however it has its detection almost certain in visual form by the methods of control, its risk degree is moderate. The failure of the closure considers the bad installation or the failure of the material, can result in the fall of the employee with death, the control measure is tactile to verify its stability and installation, its risk degree is high.

3.1. Discussion

Several studies have demonstrated the link between different characteristics related to fall in height, such as the distribution between genders, age, place of fall and height of fall (TÜRKOĞLU et al. 2019; IÇER et al. 2013). In addition to the construction work, these characteristics go deeper into the analysis of the function performed, the type of construction and the activity that was being carried out during the accident (SHAO et al. 2008; WINGE and ALBRECHTSEN, 2017; AHMAD et al. NADHIM et al. 2016; LIPSCOMB et al. 2014). However two things become preponderant in these analyzes, the work environment performed and the causes of the accident, here being referred to as the 'failure' which translated an error during the operation to the accident.

From the data obtained by the FMEA, it is possible to be observed which work environments translate to a greater danger for the worker. Suspended scaffolds have an average RPN of 192.4, followed by openings in the floor with a mean of 159, works near the periphery with average RPN of 152 and scaffolds backed with 115. Winge and albrechtsen (2019) and Kang (2018) demonstrate in their studies that failures related to falls from the roof / platform / floor and falls from scaffolding are the biggest cause of accidents in work at height.

. In total, 65failure modes were investigated, varying by failure types and subprocess. The following table shows the result obtained and its statistical relationships.

			Supported	Suspended	Openings			
Index	Subprocess	Periphery	Scaffolds	Scaffolds	in the	Total	%	
			Scarrolus	Scattolus	floor			
	Drop with level difference	7	17	12	10	46	70,8%	
Ocurrence (O)	Impact from falling objects	5	3	3	0	11	16,9%	
	Impact against tools, machines and equipments	1	1	1	1	4	6,2%	
	Excessive or inappropriate effort	1	1	1	1	4	6,2%	
	Total	14	22	17	12	65	100,0%	
	Trauma requiring first aid	1	1	1	1	4	6,2%	
	Temporary incapacity without remoteness	1	1	1	1	4	6,2%	
Severity (S)	Temporary incapacity with small remoteness	0	1	0	1	2	3,1%	
	Temporary incapacity with large remoteness	0	4	0	1	5	7,7%	
	Total permanent disability	1	7	1	0	9	13,8%	
	Death of those involved in the process	7	8	9	8	32	49,2%	
	Death of those not involved in the process	4	0	5	0	9	13,8%	
	Total	14	22	17	12	65	100,0%	
	Visual	6	10	6	3	25	38,5%	
Detection (D)	Tactile	4	6	1	3	14	21,5%	
	Checklist	2	6	10	4	14	33,8%	
	Instrumental inspection	2	0	0	2	12	6,2%	
	Total	14	22	17	12	65	100,0%	
Risk	Minor / Secondary	0	3	0	0	3	4,6%	
Degree	Moderate	8	10	8	6	32	49,2%	

Table.6 - Statistical Relationship from the FMEA

International Journal of Advanced Engineering Research and Science (IJAERS)	
https://dx.doi.org/10.22161/ijaers.610.40	

High	2	4	0	1	7	10,8%
Critical	4	5	9	5	23	35,4%
Total	14	22	17	12	65	100,0%

Source: the authors (2019).

The occurrence of drop with level difference represented the potential cause of the failures with the highest result, with 70,8%, followed by impact suffered by falling objects with 16,9%. Impact against tools, machines and equipment represented, along with excessive or inadequate effort, 6,2% of the cases, because they were attributed to only one failure mode in each subprocess. This same pattern of linkage of the occurrence of failures is revealed in the case study of construction accidents, as demonstrated in the studies by Winge and albrechtsen (2019) and Ahmad et al. (2016), where falls in height are the main cause of failure, followed by contact with falling objects or thrown objects and contact with tools.

Through each work environment and the types of failure explored, severities were established from their consequences for workers. Because of this, the severities seek to correlate the failures of the execution of the work activities at height, with the physical incapacitation of the worker. Of the failure methods surveyed, 49,2% resulted in the death of those involved in the process, followed by 13,8% with total permanent disability and 13.8% with death of those not involved in the process. This is due to the critical nature of the activities, which usually expose employees to life-threatening activities. These summed values result in 76,8% of the analyzed severities, the remaining values come from temporary, permanent incapacity and traumas that require first aid.

Supported scaffolding has the greatest number of failures in which the consequence is permanent incapacity, this is due to the work environment, in which the fall height considered for the failures is smaller than those of the other subprocesses. In contrast, suspended scaffolds have death of those involved in the process as the severity with greater number of cases.Several studies demonstrate how scaffolding results in the greatest amount of fatality in high-rise construction work. Türkoğlua et al. (2019) relates in his study 16 fatality by scaffolding of the 23 cases related to construction. Leonavičiūte et al. (2016) shows scaffolds as the major cause of fatalities with 6 recorded cases. Mroszczyk (2015) places scaffolding as the third largest generator of fatalities in construction, with 37 deaths.

The detection is determined from the control measures for the studied process. To delimit this index, was considered the ways in which faults can be discovered by the control system. Failure modes that have a visual inspection method represent 38,5% and that require a tactile or check lists represents 21,5% and 33,8% respectively, and instrumental inspection characterize 6,2% of the analyzed failures.

The RPN value is the product of occurrence, severity, and detection values. Consequently, the high degree of risk of the failure may be the result of a single specific index, which should then be the focus of the RPN reduction action. 49,2% of the failures had a degree of moderate degree, while 35,4% had a critical risky degree. This is due both to the high severity of accidents at work because deaths are attributed to most of the failures, as well as to the inability of the control methods to detect failures efficiently.Failure modes considered as minor or secondary were cases where there is a non-compliance with the basic safety means, which are easily found by control methods or cases where the severity is low.

The sub-processes of periphery and supported scaffolding followed the same pattern as the suspended scaffold, with a degree of risk mostly at critical level. Openings in the floor had the same number of critical and moderate cases, this was due to the detection, in which the faults have a high probability of being detected.

Zeng et al. (2010) through a case study with the application of FMEA, notes the importance of integrating a cycle of continuous improvement, such as the Deming cycle, to achieve the desired reliability. In its study, it also classifies falls of the periphery, impact by falls of objects and openings in the floor of the construction as unacceptable faults. Patricio et al. (2013) obtained a moderate criticality for most of the faults in his case study of gabion construction using only severity and occurrence.

Reduction of RPN is possible by increasing the probabilities that failures are detected before they occur by adding new control methods to the work routine. Consequently, with the standardization of more efficient control methods in the detection of failures, there will be a reduction in its occurrence, further reducing RPN. The severity values can be reduced by the restructuring of CPE and PPE or even means of carrying out the activity that can expose employees to less risky situations.Table 7 presents actions that can be taken for the five largest RPNs resulting from the FMEA.

Position	Potencial Failure Mode	Risk Degree	Actions
1	Failure of the safety net	Critical	Professional set up; Utilize technological agent: safety monitoring system; Improve to the ergonomics
2	Poorsizing of walkways	Critical	Professional set up; Utilize technological agent: safety monitoring system;
3	Failure of the toe board	Critical	Professional set up; Frequent revision of safety regulation and regular inspection of sites
4	Instability of scaffold structure	Critical	Training for unskilled workers; Courses on how to use scaffolding agents; Stimulate emplyees to follow safety regulations;
5	Irregular scaffold mounting	Critical	Develop of scaffold safe erecting and dismantling; Professional set up; Frequent revision of safety regulations and regular inspections of sites

Table.7 – Actions to be taken on the fivelargestRPN

Source:Nadhim et al. 2016 adapted.

IV. CONCLUSION

This study allowed a better vision of the possible flaws found in work at height. The high number of failure modes defined as critical by RPN only showed the importance of actively maintaining security and control measures for these activities. These control measures should consider not only the maintenance and correct functioning of the equipment, but also the mental and physical well-being of the employees involved in these risky activities. Because of this, frequent training should be maintained, activities with guaranteed ergonomics should be attributed and recovery time between activities must be respected.

With recent developments FMEA has become a very useful tool for developing risk assessments. He demonstrated the determination of quantitative values for the prioritization of qualitative problems. However, in order to have a greater view on the possible causes of failures within a system, there is a need to have a multidisciplinary team and a history of data documenting failures of this process.

Therefore, the application of FMEA as demonstrated here does not demonstrate all possible failure modes, but only with this perspective is it possible to observe the criticality of safety in works at height. With the completion of this study, the next step is then the application of a quality system based on the data obtained by the FMEA. This quality system may privilege the analysis of risk degree for the prioritization the execution of corrections in failure modes, seeking to mitigate or reduce its consequences.

One of the major limitations of the study is the lack of information about work accidents in construction. This

information would allow a better delimitation of the occurrences for each construction process, helping to give a better characterization for the faults.

The same process presented here can be applied in different systems and work environments in the construction industry, trying to select which equipments or actions offer a greater risk to the employee. The FMEA can also have its indexes adapted to other areas of construction, aiming at a perspective beyond safety at work. Because of this, it is necessary to develop and demonstrate the application of these methods in areas such as projects, budgets or constructive models. The flexibility of the FMEA can extend the entire civil construction, ensuring a continuous improvement of the different processes.

REFERENCES

- AHMAD, S. IRAJ, M. ABBAS2, M. MAHDI, A. 2016. Analysis of occupational accidents induced human injuries: A case study in construction industries and sites. Journal of Civil Engineering and Construction Technology, v. 7, n. 1, p. 1-7. DOI: 10.5897/JCECT2015.0379
- [2] BANGHART, M. BABSKI, K. BIAN, L. STRAWDERMAN, L. 2018. Subjectivity in Failure Mode Effects Analysis (FMEA) Severity Classification within a Reliability Centered Maintenance (RCM) Context. International Journal of Aviation, Aeronautics, and Aerospace, v. 5, n. 1, p. 2. DOI: 10.15394/ijaaa.2018.1191
- [3] CAKAN, H. KAZAN, E. USMEN, M. 2014. Investigation of factors contributing to fatal and nonfatal roofer fall accidents. International Journal of Construction Education and Research, v. 10, n. 4, p. 300-317. DOI: 10.1080/15578771.2013.868843

- [4] CAVAIGNAC, A. UCHOA, J. 2018. Obtaining FMEA's indices for occupational safety in civil construction: a theoretical contribution. Brazilian Journal of Operations & Production Management, v. 15, n. 4, p. 558-565. DOI: 10.14488/BJOPM.2018.v15.n4.a9
- [5] Fazenda, M. D. 2016. Anuário estatístico da previdência social, Instituto Nacional do Seguro Social, Brasília. Available from: http://www.previdencia.gov.br/wpcontent/uploads/2018/07/aeps2016.pdf (access 22 jun 2018).
- [6] FORD MOTOR COMPANY. 2011. Failure Mode and Effects Analysis: FMEA Handbook, Version 4.2.
- [7] GARNICA, G; BARRIGA, G. 2018. Barriers to occupational health and safety management in small Brazilian enterprises. Production, v. 28 DOI: 10.1590/0103-6513.20170046
- [8] GUIMARÃES, L. COSTELLA, M. CREMONINI, R. 2000. Analysis of work accidents and professional diseases in Rio Grande do Sul state construction industry. Proceedings of the IEA 2000/Human Factors and Ergonomics Society Annual Meeting.
- [9] HALPERIN, K. MCCANN, M. 2014. An evaluation of scaffold safety at construction sites. Journal of Safety Research, v. 35, n. 2, p. 141-150. DOI:10.1016/j.jsr.2003.11.004
- [10] HAMID, A. MAJID, M; SINGH, B. 2008. Causes of accidents at construction sites. Malaysian journal of civil engineering, v. 20, n. 2.
- [11] HASLE, P; LIMBORG, H. A. 2006.Review of the literature on preventive occupational health and safety activities in small enterprises. Industrial health, v. 44, n. 1, p. 6-12.
- [12] HOVDEN, J. ALBRECHTSEN, E. HERRERA, A. 2010. Ivonne. Is there a need for new theories, models and approaches to occupational accident prevention?. Safety Science, v. 48 p. 950-956. DOI:10.1016/j.ssci.2009.06.002
- [13] İÇER, M. GÜLOĞLU, C. ORAK, M. ÜSTÜNDAĞ, M. 2013. Factors Affecting Mortality In Falls From Height. UlusTravmaAcilCerrDerg, v. 19, n. 6. DOI: 10.5505/tjtes.2013.77535
- [14] JIANG, Y. JIANG, H. LIU, S. 2015. Application of failure mode and effects analysis in a clinical chemistry laboratory. Clinica Chimica Acta, v. 448, p. 80-85. DOI: 10.1016/j.cca.2015.06.016
- [15] LAURENTI, R. VILLARI, B. ROZENFELD, H. 2012. Problemas e melhorias do método FMEA: uma revisão sistemática da literatura. P&D em Engenharia de Produção, Itajubá, vol. 10, nº 1, p. 59-70.
- [16] LEONAVIČIŪTĖ, G. DĖJUS, T. ANTUCHEVIČIENĖ, J.
 2016. Analysis and prevention of construction site accidents. Građevinar, v. 68, n. 05., p. 399-410. DOI: 10.14256/JCE.1428.2015
- [17] LIPSCOMB, H. SCHOENFISCH, A. 2014. CAMERON, W. et al. How well are we controlling falls from height in construction? Experiences of union carpenters in Washington State, 1989–2008. American Journal of Industrial Medicine. v. 57, n. 1, p. 69-77. DOI: 10.1002/ajim.22234.

- [18] MCDERMOTT, R. MIKULAK, R. BEAUREGARD, M. 2009. The basics of FMEA. SteinerBooks.
- [19] MILAZZO, M. ANCIONE, G. LISI, R. VIANELLO, C. MASCHIO, G. 2009.Risk management of terrorist attacks in the transport of hazardous materials using dynamic geo events. Journal of Loss Prevention in the Process Industries, vol. 22, n° 5, p. 625-633. DOI: 10.1016/j.jlp.2009.02.014
- [20] MROSZCZYK, J. 2015. Improving construction safety: A team effort. Professional Safety, v. 60, n. 06, p. 55-68.
- [21] NADHIM, E. HON, C. XIA, B. STEWART, I. FANG, D. 2016. Falls from Height in the Construction Industry: A Critical Review of the Scientific Literature. Int. J. Environ. Res. Public Health, v. 13, n. 638. DOI: 10.3390/ijerph13070638
- [22] PATRICIO, R. CATAI, R. MICHAUD, C. NAGALLI, A. 2013. Model of risk management based in the FMEA technique–a case study in the construction of Gabions. Electron J Geotech Eng, vol. 18, p. 4183-4199.
- [23] RHEE, S. ISHII, K. 2003. Using cost based FMEA to enhance reliability and serviceability. Advanced Engineering Informatics, vol. 17, n° 3-4, p. 179-188. DOI: 10.1016/j.aei.2004.07.002
- [24] RINGEN, K. SEEGAL, J. ENGLAND, A. 1995. Safety and health in the construction industry. Annual review of public health, v. 16, n. 1, p. 165-188, 1995. DOI: 10.1146/annurev.pu.16.050195.001121
- [25] SCIPIONI, A. SACCAROLA, G. CENTAZZO, A. ARENA, F. 2002.FMEA methodology design, implementation and integration with HACCP system in a food company. Food Control, vol. 13, n° 8, p. 495-501. DOI: 10.1016/S0956-7135(02)00029-4
- [26] SHAO, B. HU, Z. LIU, Q. CHEN, S. HE, W. 2009. Fatal accident patterns of building construction activities in China. v. 111, p. 253-263. DOI:10.1016/j.ssci.2018.07.019
- [27] SONG, J. YU, J. KIM, C. 2007. Construction safety management using FMEA technique: Focusing on the cases of steel frame work. In: 23rd Annual ARCOM Conference. p. 3-5.
- [28] TEIXEIRA, L; CARVALHO, F. 2005. A construção civil como instrumento do desenvolvimento da economia brasileira. Revista Paranaense de Desenvolvimento, n. 109, p. 9-26.
- [29] TÜRKOĞLUA, A.SEHLIKOĞLU, K. TOKDEMIRC, M. 2019.A study of fatal falls from height. Journal of Forensic and Legal Medicine, v. 61, p. 17-21. DOI: 10.1016/j.jflm.2018.10.008
- [30] WINGE, S. ALBRECHTSEN, E. 2018. Accident types and barrier failures in the construction industry. Safety Science, v. 105, p. 158-166. DOI:10.1016/j.ssci.2018.02.006
- [31] WONG, F. CHAN, A. YAM, M. WONG, E. TSE, K. YIP, K. CHEUNG, E. 2009. Findings from a research study of construction safety in Hong Kong: Accidents related to fall of person from height. Journal of Engineering, Design and Technology, v. 7, n. 2, p. 130-142.DOI: 10.1108/17260530910974952
- [32] ZAMBRANO, T; MARTINS, M. 2007. Utilização do método FMEA para avaliação do risco ambiental A method

to analyze the environmentalimpacts of small companies. Gestão & Produção, v. 14, n. 2, p. 295-309. DOI: 10.1590/S0104-530X2007000200008

[33] ZENG, S. TAM, C. TAM, V.2010. Integrating Safety, Environmental and Quality Risks for Project Management Using a FMEA Method, InzinerineEkonomika-Engineering Economics, vol. 21, nº 1, p. 44-52.