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FOREWORD

I am pleased to put into the hands of readers Volume-7; Issue-2: 2020 (Feb, 2020) 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 DOI (Digital Object Identifier) also, this will improve citation of research papers. Now 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

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The Impact of Industry 4.0 on the Different Social Classes of the Industrial Pole of Amazonas

Richardson Pinheiro Mota¹, Livia da Silva Oliveira², Fábio Peso da Cruz³, Jean Mark Lobo de Oliveira⁴, David Barbosa de Alencar⁵

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Abstract— Industry 4.0, also known as the 4th revolution, directly intervenes socially in people's lives, as it pressures new concepts and the use of the workforce, combined with production that is increasingly interconnected virtually and with great technological appeal. Thus, social impacts are inevitable due to this business model reached as social classes, and as this technological vision is a reality with no return, now it is more water and steam, because the optimism with this advance is immense and the interconnection with artificial intelligence and others will really interfere in the life and daily life of the classes that do not have access to certain forms of revolution, because academic privileges with an education in the state of Amazonas can also suffer an abyss of connection with the best statistics of institutions with technological mediations associated with the culture that still creeps in the technological and professional milieu that still exists in our country and that is how it should be divided as a social that will always determine some dominant class or technology in the middle of living together.

Keywords— Industry 4.0; Industrial Pole Amazon; Artificial intelligence.

I. INTRODUCTION

In Brazil and mainly in the state of the Amazon, a classification of social classes is defined according to family income and basically divided into classes such as: high, medium and low. These economic classification criteria are the Secretariat for Strategic Affairs (SAE) and the Brazilian Association of Research Companies (Abep), each group (high, medium and low) is registered by letters, to know: class A, B, C, D and E. As some groups have subdivisions, for example, a class A (A1, A2), a class B (B1, B2) and a class C (C1, C2).

Social classes are those formed by a group of people with common interests and socioeconomic parity. In society as a whole there are several social classes, since there is a hierarchy between rich and poor. But hierarchy can also arise by caste, knowledge and external factors.

Being a class A with greater economic power and its members, or higher educational level, a technological adaptation is something quick and easy to send, but another is detected in Class E, low class, that is, with less purchasing power and low quality of life. Family income, assets and education are taken into account. IBGE classifies partner classes in six categories, taking into account family income:

Table.1: Classification of Social Classes.

Class A	Above 20 minimum wages
Class B	10 to 20 minimum wages
Class C	4 to 10 minimum wages
Class D	2 to 4 minimum wages
Class E	Up to 2 minimum wages

Source: Authors, 2020.

ABDI calculates a minimum annual estimate of reduction of industrial expenses in Brazil, from the implementation of industry 4.0, it will be around R \$ 73 billion / year.

The whole scenario that exists today in the industrial market is going to change and the concern is related to social classes. We know that the first classes will be recognized and privileged, but the classes with less purchasing power would operate that constitute the majority existing in the industrial centers, how to survive this technological avalanche, it is necessary to invest massively in education (propaedeutic, and professional and technological) , and in science, technology and innovation. Due to the unimaginable impacts on the world of work, it is also necessary to develop public policies to protect these workers, to address issues related to employment and income generation in industries.

II. BIBLIOGRAPHIC REVIEW

2.1 Industry 4.0

In very specific lines, we can understand industry 4.0 as a new production model applied to companies, resulting from the fourth industrial revolution, which brought about a significant advance in the connection between man and machine.

However, industry 4.0 is, currently, what promotes a sequence of continuous advances in the productive progress, causing a more elaborate aspect in relation to the use of technology, consecrating the principle of automation to a stage well above what the industry is used to. As a result of its particular connection with attributes such as: connectivity, artificial intelligence, data science, big data, IoT, machine learning and others; An extremely large event takes place within organizations, changing the way machines are repeated and using references to

enhance the production process, making it more accessible, efficient and autonomous.

2.3 How Will the Industry 4.0 Professional Be?

Undoubtedly, it cannot be said that it will result in new ways of working, a transition in the profile of professionals and the tasks required to excel in the market. In addition, there are some drivers who have driven Industry 4.0 and will cause several changes at work. However, we can mention, among them, demographic and socioeconomic factors: adaptable work, the growth of the middle class in emerging markets, climate change and political inconsistency. As the technological vectors treated in the research include the mobile internet, cloud technology, Big Data, new energy sources and the Internet of Things.

Below are the graphs with complete data from the World Economic Forum report:

Demographic and Socioeconomic Vectors

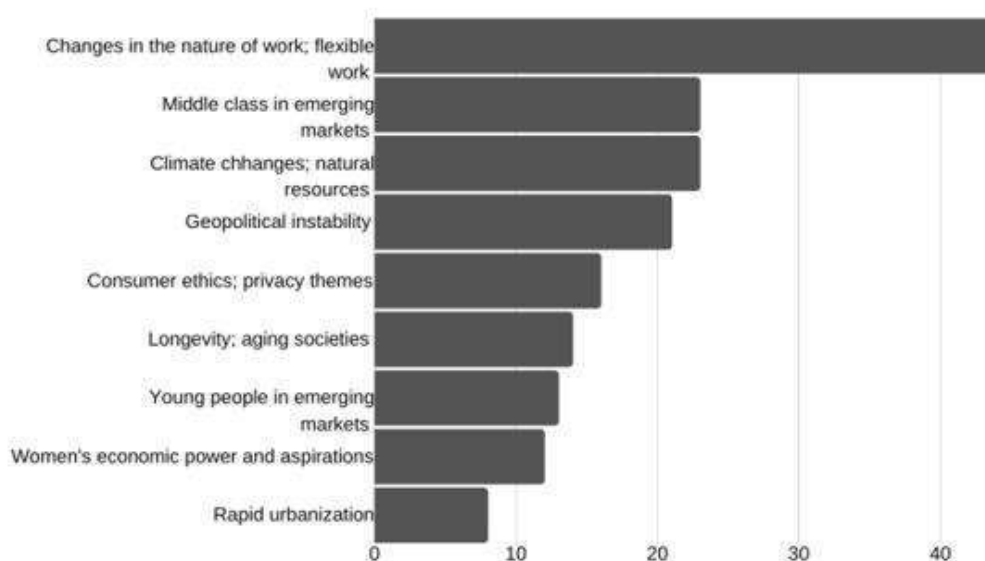


Fig. 1: Demographic and Socioeconomic Vector

Source: Authors, 2020.

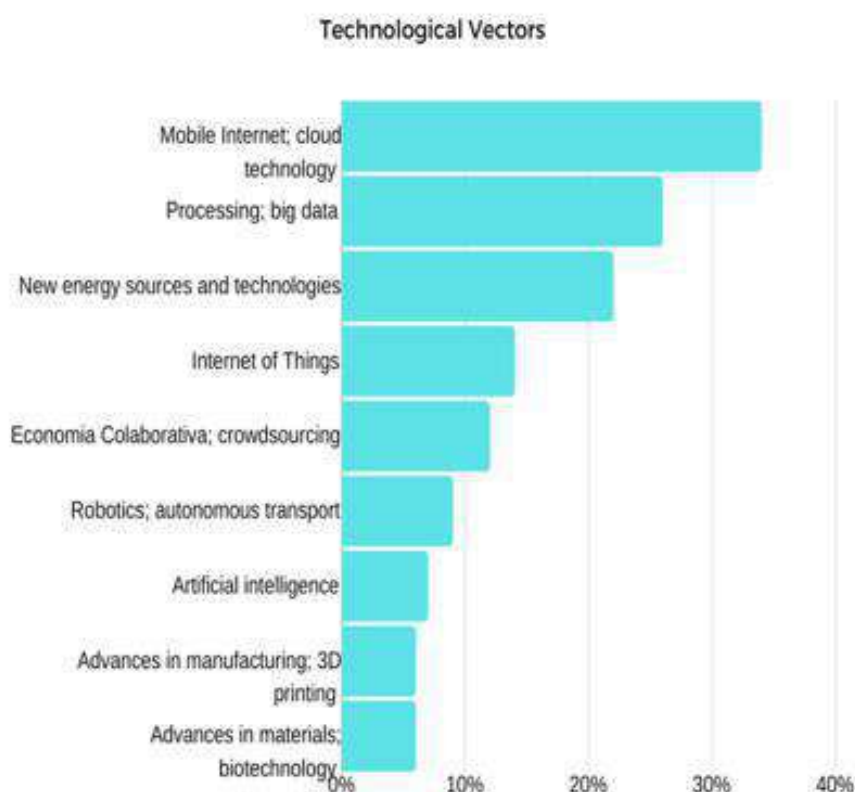


Fig. 2: Technological Vector

Source: Authors, 2020.

2.4 Negative Impacts of the Fourth Industrial Revolution

Certainly, it is justified to challenge industry 4.0 for several reasons. For example, possible cyber-attacks are a problem. Industrial espionage is based on the assumption that the more connected it is, the more vulnerable it becomes.

In the same way, another possible unfavorable impact is the division of power to technocrats, those who have technical knowledge in relation to today's technologies. In addition to commercial purposes, innovations must be applied as noble results, in the same way to contain entire nations economically, ending with their domestic market.

It is also worth mentioning the use of artificial intelligence in a dishonest way, such as coup, wars and fake news. However, none of the problems mentioned disturbs as much as the results of the Fourth Industrial Revolution on the labor market. It is clear that industry 4.0 will be able to generate a great impact on industries.

2.5 The Labor Market in the Age of Industry 4.0

Empowering automation, therefore, machines are assigned even more humane functions. An example of this is Google, with the creation of a robot journalist who plans to write 30,000 news a month. However, broader ways of

extracting from professionals should be studied, whose position may cease to exist, reallocating them to strategic activities and, also, the emergence of new professions, such as the data scientist. The ingenious machines will certainly cause layoffs, specifically in Europe, however the government is already taking steps to resolve this impasse.

Consequently, improving social welfare was one of the ideas offered, based on Nordic countries, such as Denmark by economist Erik Brynjolfsson. In his book entitled “The Second Age of Machines”, Brynjolfsson proclaims the idea that society should discuss the prosperity divide as soon as possible, after all, industry 4.0 will lead to the success of some, but the resignation of millions. Thus, for the economist, the increase in tax or universal basic income may be one of the solutions to address all these negative issues.

2.6 Workplace Qualifications in Amazonas

Public domain behavior in the municipal, state and federal sectors needs to be improved in order to become more effective within the conception of the Fourth Industrial Revolution. The State Administration must have a long-term vision to comply with market practices and provide security for the owner to invest. As well as the prominence of idealizing technological education tools

within educational institutions, they offer good possibilities for training future qualified workers.

The Entrepreneur needs to imagine that there will be a reduction in tariffs and an increase in quality, consequently initiating the main investments in this machinery. The market itself will have to analyze the willingness to qualify the workforce within companies or service providers. However, one should not depend only on the private body, it is essential that the State also integrates.

In summary, it would require preparing the debate to improve the actions of entrepreneurship, training young people, within the argument of respect for discussions of nature. Thus, obliging the viability of business incubators and the enhancement of the most structured and appropriate consecutive and productive stages. In this way, the State would help to generate possibilities for business training, technological management and assistance with credits, guiding and investing in infrastructure.

III. MATERIALS AND METHODS

After a successful research, but also frustrating, that at first elements were found that would help Industry 4.0 in its applicability in the most diverse areas. Certainly, used as a bridge for studies, SENAI-AM is an industrial teaching institution, so it tends to enjoy a more detailed and detailed perspective of this advanced manufacture. In other words, the material contains fragments that result in strategies for companies, according to what was presented in congresses such as IEEE (Institute of Electrical and Electronics Engineers) and CMS (Conference on Manufacturing Systems) that were presented for a new change on your production line. Total automation should be implemented and using other technologies, promoting an investment with lower personal costs, solving the absence of demand. Therefore, taking into account that there are a large number of people working with no future prospect of qualification in their area, the difficulty of maintaining this desire is obstructed by a series of problems, such as the distance between the educational and industrial poles, causes in these workers give up. Since the best way to produce higher quality products, with greater innovation and, above all, with security, there is a need for a greater investigation of these needs on company employees, so that everything does not turn into something very scary and difficult to learn.

For a better use of the results and complementation, surveys from the Government of Germany (PLATAFORM INDUSTRIE 4.0, 2017) and cases mentioned by the Government of Japan (Robot Revolution Initiative, 2017) were used, however 38 cases were identified. Result of

several cases and not involving the presentation process carried out.

IV. RESULTS AND DISCUSSIONS

SENAI, the National Service for Industrial Learning, found that there must be a major implementation in several areas of industrial services, mainly in automation, in order to achieve the objective of increasing productivity in factories. As the development in Professional Education is expanded in Technical High School, however improving and giving more support to future working people, the improvement and qualification tends to supply the lack of precarious manufacturing. In short, courses in Mechatronics, Information Technology, Electronics, Electrotechnics, Mechanics and Civil Construction (Buildings) have the greatest demand for specialists in the area in the industry in Amazonas. There are those that demand specializations, with a focus on: Industrial Electrician, Installer and Repairer of Air Conditioning and Refrigeration Devices, Quality Inspector, Welder, Production Line Operator and among others. In addition, the development of activities linked to renewable energy is a point to be highlighted as well.

Table.2: Areas with higher demand for training – Technicians.

Areas	Demand 2019-2023
Transversal	10.819
Metalworking	4.922
Transport equipment and vehicles	4.321
Electronics	3.681
Energy and telecommunications	3.291

Source: Authors, 2020.

Industrial occupations with higher demand for training inside and outside the industry – Technicians

Table.3: Areas with higher demand for training – Higher.

Areas	Demand 2019-2023
Management	2.752
Computing	2.460
Production	1.080
Transversal	761
Construction	722

Source: Authors, 2020.

Industrial occupations with higher demand for training inside and outside the industry – Superior.

Table.3: Professional qualification by area

Occupations	Professionals to be qualified
Information technology analysts	1.934
Production, quality, safety and related engineers	1.080
Production and operations managers in an extractive, processing and utility company	667
Engineering and technology researchers	606
Civil and related engineers	536
Electrical, electronics and related engineers	478
Supply and related managers	279
Mechanical and related engineers	238
Information technology administrators	237
Maintenance and related managers	190
Production control technicians	6.407
Automotive vehicle assemblers (assembly line)	4.093
Electronics technicians	2.629
Production planning and control technicians	2.501
Electricity and electrotechnical technicians	2.023
Mechanical technicians in the manufacture and assembly of machines, systems and instruments	1.967
Civil construction technicians (infrastructure works)	1.208
Civil construction technicians (buildings)	717
Transport logistics specialists	697
Supervisors of electrical assemblies and installations	647

Source: Authors, 2020.

V. CONCLUSION

Given the importance of the subject, it is clear that Brazil has a late development in relation to its industrialization. In addition, it is classified as almost a century of technological backwardness compared to other countries, such as Europe, the United States, Japan and others, which started their process under the regime of the First Industrial Revolution. However, it is also worth

mentioning that Brazilian involvement has declined considerably, around 50% in 20 years, according to the 1st Brazilian Congress of Industry 4.0 in 2017. The lack of investment in workers' specialization results in a grotesque fall in the area of free trade, more precisely, in the State of Amazonas, the bad custom of hiring people with low education levels leads to precarious competition with international and also national markets. The strengthening of the local commercial sector is based on investment in raw materials using tax incentives, however, the Government must treat as a primordial stimulus in companies, both private and state, to implement better conditions of labor and the use of training resources for its employees. As a result of this, both the number of jobs and the Brazilian economy need all this industrial construction to progress and, with that, result in growth in the manufacturing sphere.

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Nursing in the Promotion of Men's Health: Educational Practice on Prostate Cancer in a Basic Health Unit of the Amazon Region Brazil

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Abstract— The "Blue November" became worldwide known through initiatives that had their genesis in 2003 in Australia. Brazil was one of the pioneer countries to formulate a policy directed to this population niche, called the National Policy for Integral Human Health Care. In this way, it aims to report the experience of nursing academics in a social responsibility action with male users of a basic health unit in a neighborhood of Belém, Pará, Brazil. This is an experience report from the experience of two academics from the Nursing undergraduate course at the State University of Pará (UEPA), which took place in a Basic Health Unit in a neighborhood of Belém, Pará, Brazil. The methodology used was problematization with the help of Arco de Maguerez. The action carried out obtained positive and satisfactory results that met the expected expectations. It is worth highlighting the active participation of the participants in the action, since they showed interest in discussing the issue addressed. Scientific knowledge assumes an important role in the practical field, however, at that moment humanization must prevail, because the nurse will find in his professional life different profiles and situations. The relevance of the dynamics on myths and truths and the conversation wheel as educational tools of primary prevention for health has been realized. Nursing, being called the science of caring, helps individuals deal with their health condition and changes when they cannot. The nurse has an important role in the development of actions and strategies that aim to bring health care in a way that meets the needs of the public present.

Keywords— Health Education; Men's Health; Primary Health Care; Nursing.

I. INTRODUCTION

In Brazil prostate cancer represents the second most prevalent cancer in the male population, that 75% of cases occur in individuals over 65 years, studies show that the increase in incidence is related to new more effective diagnostic methods (INCA, 2019).

According to Brasil, (2016), The "Blue November" became worldwide known through initiatives that had their genesis in 2003 in Australia. It is a movement that encompasses strategies focused on promotion, prevention and health care in order to expose and raise awareness of the importance of prevention and early diagnosis of diseases that plague the male population, among them prostate cancer.

Nevertheless, the month of November should be treated as a special period for the care of men's health, the Ministry of Health recommends that such actions should be carried out on a permanent basis, and that they should bring diverse themes, such as: access and welcome, prevention of violence and accidents, sexual and reproductive health, mental health, major illnesses, stimulation of healthy living habits, etc.(INCA, 2018).

Brazil was one of the pioneer countries to formulate a policy directed to this population niche, called the National Policy for Integral Human Health Care, with the objective of understanding the socio-cultural and institutional barriers, being important for the strategic proposal of measures that will promote men's access to primary health care services (Brasil, 2008).

Silva & Tavares, (2016)disagree that the proposal to include men in health care actions is still challenging due to the obstacles of long working hours, massively macho culture, for not having the recognition of the care and appreciation of the body in the purpose of health as social issues.

Primary prevention in health is an important practice in the daily life of all professionals in the area, and it uses tools such as educational actions, communication and social mobilization that make the individual involved an active subject of the action, constituting the construction of empowerment (Lima, Oliveira, Macedo, Dias, & Costa, 2014)..

Thus, health education prevents the health of the individual and the community, and it is up to the team to contribute to the quality and maintenance of men's lives by guiding, identifying, exploring, solving problems, giving explanations, clarifying doubts and showing the importance of health care and examinations that prevent and diagnose prostate cancer early (Gurgel, Santos, Monteiro, & Lima, 2015).

In this perspective, the objective was to report the experience of nursing academics in a social responsibility

action with male users of a basic health unit of a neighborhood of Belém, Pará, Brazil.

II. METHOD

This is a report of experience in the vision of two second year scholars of the Bachelor of Nursing course at the State University of Pará (UEPA), which took place in a Basic Health Unit in a peripheral neighborhood in the city of Belém, Pará, Brazil, with the purpose of offering a primary health prevention service about prostate cancer. The methodology used was problematization with the help of Arco de Maguerez.

The above-mentioned methodology has five stages which are: observation of reality, which uses the survey of the problems of the chosen reality; survey of key points, which are the listed analyses of the possible problems to be worked on; theorization, which consists of the search for literature that addresses the importance of the subject; hypotheses of solution, elaborated in a critical way, creative to viable solutions; and the application to reality, which constitutes the execution of the decisions taken to intervene in the difficulties (Prado, Velho, Espíndola, Sobrinho, & Backes, 2012).

The first stage of the arch took place in a training camp, the same in which the action took place, in a meeting between the Unit's nurses and the guiding teacher.

The second stage was held in a meeting of the students together with the teacher mentor, where there was a sharing of the possible needs to be worked on. The theme was directed to prostate cancer, due to the occasional November to be focused on campaigns about men's health and the importance of prevention and early diagnosis about the comorbidity to be worked on, in which from this, the third stage (theorization) was carried out through bibliographic research in scientific research platforms: Scielo, Ministry of Health booklets, Virtual Health Library, Lilacs database.

The fourth stage consisted in the survey of solution hypotheses, which were elaborated from the theoretical-scientific support of the theorization. This stage was of utmost importance, as it discussed and elaborated the activities to be carried out in the action, selecting those that best fit the target audience.

The application to reality took place on November 27th of two thousand and nineteen, in the morning shift, from 9:00 a.m. to 10:30 a.m., in the courtyard of the establishment. There were users of the Basic Health Unit, Community Health Agents, Nurses of the Unit, teachers and students present at the action.

The tools used at this time were: dynamics of myths and truths, where each participant was given plaques (red representing the situations considered myths

and green representing the situations considered true) to answer the questionnaires, a structured conversation wheel based on the questions used in the dynamics about prostate cancer. Afterwards, gifts were distributed and coffee breaks were served.

III. RESULTS AND DISCUSSION

The action carried out obtained positive and satisfactory results that met the expected expectations, it was observed the mobilization of community health agents in the dissemination of the action to be carried out, as well as the active participation of men in both moments of the activity, thus generating an exchange of knowledge between participants and the organizing committee of the action.

Bacelar, Coni, Santos, & Sousa, (2018), pointed out in his work that there was the success of the activities carried out, to a great extent, the involvement of the multidisciplinary team of the Family Health Strategy, which encouraged the participation of men and collaborated in all actions planned, which was configured in strengthening the collective construction of health education, through the integration of interdisciplinary knowledge, conferring the expansion of the discussion and themes addressed to the male public.

In this way, it is also worth highlighting the active participation of the users of the Basic Health Unit, since they showed interest in discussing the theme approached, bringing to action the empirical knowledge and the reality of life in relation to the theme of Prostate Cancer, thus helping to generate contextualized and collective knowledge on the theme, thus creating a space for reflection and critical awareness in the participants on the importance of caring for themselves.

Queirós, Vidinha, & Filho, (2014) reports that the theory developed by Dorothea Orem, consists in the idea that individuals, when capable, should take care of themselves, performing activities for their benefit to maintain life, health and biopsychosocial wellbeing, therefore, when self-care is effectively performed, it helps maintain structural integrity and human functioning, contributing to their development.

A survey showed in relation to the stigma about prostate cancer, in relation to the rectal touch examination, reflecting in men a feeling of refusal about the preventive care of the disease, that the main among them and the rectal touch, because they reported to affect their masculinity. Thus, this behavior only keeps men away from basic health services, but little by little this public has become aware of the importance of prevention (Gomes, Nascimento, Rebello, & Araújo, 2008).

In view of the results obtained, it is worth emphasizing that these actions of social responsibility focused on the health area contribute in a positive way to the life and health of the people who participate in them. Furthermore, it corroborates for the professional and human growth of the individuals who are willing to carry them out.

Health education is an educational process that involves the relationships between health professionals, the managers who support them and the population who needs to build their knowledge and increase their autonomy in individual and collective care, aiming at the critical and reflective development of the individual about their health (Falkenberg, Mendes, de Moraes, & de Souza, 2014; Peruzzo et al., 2018).

The nursing in the promotion of the man's health, has a fundamental role, because it is the nurse the managing professional in the primary attention, this way it has the autonomy to plan and to execute educational practices directed toward the man's health, however, it is distinguished that this public has low adhesion to the programs of the primary attention, being thus necessary the active search of this public, therefore, these practices will be able to sensitize the men for the self-care, and consequently to influence in the precocious diagnosis and treatment. Thus, the impact of educational practices on primary health care can be noted (Bezerra & Júnior, 2014).

The realization of educational practices performed by nursing academics, promotes a professional training with a holistic vision, and stimulating the role of educator that is essential for the nurse professional. For this type of action, it is necessary to observe the performed, identify the problem, plan and execute, thus, this process promotes the academic to visualize the performed and preparing it for the job market, with a perception that the practices of promotion and education in health are fundamental to impact on public health problems, impacting on reducing morbidity and mortality (Sardinha, Maciel, et al., 2019; Sardinha, Silva, et al., 2019)

IV. CONCLUSION

Scientific knowledge assumes an important role in the practical field, however, at this moment, humanization must prevail, because the nurse will find in his professional life different population profiles and situations, where he will have to assist the user in a humane way, becoming an attentive listener so that he can meet his needs. In this panorama, several obstacles should be overcome so that the population feels more receptive to the care, generating mutual trust and more productive care.

The relevance of the dynamics on myths and truths and conversation wheel as educational tools of

primary prevention for men's health was perceived as being of fundamental importance for society. The action allowed users and academics a greater knowledge about the subject, providing a satisfactory exchange of experiences, besides contributing to the formation of students. The educational action in health carried out in the Family Health Strategy has positively contributed to the transformation of a preventive care practice and better perception by men of the importance in health care.

V. NURSING CONTRIBUTIONS

Nursing, being called the science of caring, helps individuals deal with their health condition and changes when they cannot. The nurse being one of those responsible for leading primary care health teams, has an important role in the development of actions and strategies aimed at bringing health care to meet the needs of the public present.

In view of this, the participation as academics of the actions of extension, social responsibility, promotion and prevention to health is of relevant importance for the development of the same in the area, because it contributes in the field of knowledge and prepares them for the planning, organization and execution of activities with emphasis on basic care, promoting and preventing the health of people.

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Manufacturing, Applications, Analysis and Design of Cold-Formed Steel in Engineering Structures: A Review

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Abstract— The concept of cold-formed light steel (CFS) framing construction has been widespread after understanding its structural behavior and characteristics through massive research works over the years. Application, manufacturing, design, and optimization of cold-formed steel structures continue to see significant improvements and refinements. The objective of this paper is to provide a comprehensive brief review of recent advances in different aspects of cold-formed steel structures. Therefore, in this review, the latest efforts and researches related to cold-formed steel structures are highlighted and discussed.

Keywords— Application, Cold-Formed Steel, Connections, Direct Strength Method, Optimization, Manufacturing.

I. INTRODUCTION

Due to rapid growth in the construction industry, there is a need for more advanced structures. The consideration of the construction material is an essential aspect in order to fulfil the advantage, quality, and economy of the construction. Therefore, decreasing the quantity of the material in many construction industries has been the priority for sustainable development. For that, the steel has been considered as a preferable option in the construction area due to its untold advantages over other materials, where the superior sustainable performance of steel members minimizes the environmental impacts when measured through the whole life cycle. Moreover, steel is a basic material for construction in the evolution chain, where it is considered as an effective material for any local energy producing, transportation as well as commercial and residential construction [1].

In steel structures, essentially, there are two types of steel to make the structural members: hot-rolled steel (HRS) and cold-formed steel (CFS) [2]. HRS is formed at high elevated temperature (up to 1400 °C in blast furnaces or electric arc furnaces), while the CFS is produced at room temperature. The differences in the properties of CFS and HRS in terms of structural performance, strength, and failure modes are influenced by the manufacturing method. For example, the HRS type is very well known

among designers as it can accommodate heavier load than the CFS [1].

1.1 What are the Cold-Formed Steel Structures?

Cold-formed steel structures are light-weight structural products that are made by forming flat plane sheets or panels with different shapes which can meet the structural and functional requirements and support more than the flat sheets themselves. The produced shapes are thin-walled and can offer high value of capacity-weight load ratio among the various structural components. Therefore, the CFS members also called “light gauge steel members.” Reducing labor costs and producing a valuable economy can be achieved by using such light- weight components as well as easy handling of that product [3], [4].

1.2 Historical Overview:

Producing of the CFS sections has been initiated for more than a century since the first steel flat sheets were made by the steel mills. Great Britain and the United States began using the CFS members in buildings construction in the 1850s. In the 1920s and 1930s, there was not a wide acceptance of CFS to be as a construction material, because there were inadequate design guidelines and a lack of building codes information. Virginia Baptist Hospital, which constructed around 1925 in Lynchburg, Virginia, is considered as early applications used CFS in building materials [5]. In the past few decades, more development of CFS has been achieved by aesthetic

architecture projects or light weight steel buildings [6]. The usage of CFS members as a structural frame is increased not only in residential structures but also in multi-story commercial structures, e.g., roof systems, wall studs, girts, and steel-framed housing [7]. This is because of the advantages of cold formed steel, which get over the disadvantages of conventional products. Therefore, the interest of CFS in both research and construction aspects increased rapidly, especially in, USA, Canada, China, Australia and some European Countries which are considered Industrialized Countries [1], [3], [8].

1.3 Why a Review?

Due to:

- a. The unique features and advantages of CFS, which makes its range of applications wider.
- b. CFS member's issues and disadvantages such as structural stability (primarily due to their large width to thickness) and other issues [1].
- c. The lack of design guidelines related to this type of steel structure [9].

Massive research works over the years were done on the CFS in order to get more investigation on the advantages of the CFS element and improving its properties as well as understand its structural characteristics [9].

The researches focused on several disciplines like building performance, design methods, wind and seismic design, durability, fire resistance, construction safety, framing method and sections strength and behavior, e.g., compression members, distortional and elements buckling, curved and corrugated panels, purlins and flexural members, torsion and distortion, mechanical properties, web crippling, storage racks, composite and plasterboard construction, design optimization, etc. So, from the beginning of this millennium, several reviews have been conducted on the development of CFS structures such as Hancock [3], Schafer [10], Camotim et al. [11], Yujie et al. [12], Schafer et al. [13], Yeong et al. [9], Rondal [14], etc. [4]. However, as a result of the extensive researches which are conducted every year in several disciplines related to CFS, a literature review for these new researches should be done frequently in order to summarize and link these researches with previous studies for more understanding of CFS structures behavior, improving design codes of CFS structures, and also serving as guidance for future researches. Thus, our review coming in this context.

1.4 Review Content:

The main objective of this review is providing a new review of references on CFS research, as found in high

quality journals in the last few years. Which clarify the development and current progress in different CFS research disciplines. This review covers both introductory and advanced topics that may the structural engineers, students, and researchers are interested in it. Section 2nd of this review briefly describes the manufacturing and construction methods, while sections 3rd and 4th covers the CFS structural members and their applications in engineering structures. Connections types and issues are discussed in section 5th. The behavior of CFS structures is reviewed in section 6th. Sections 7th and 8th discuss the development in design, and optimization of CFS, respectively. Finally, in section 9th, the review is ended up with conclusions.

II. MANUFACTURING AND CONSTRUCTION METHODS.

2. 1. Manufacturing Methods:

Generally, CFS members are essentially made from steel plate, sheet, or strip materials, which have a thickness from 0.5 to 6 mm, where sheets or coils of CFS can be accommodated with a wide up to 60-inches and 3000 feet long by specific machines. Cold-formed steel can be made by different methods: 1. Cold Roll Forming, 2. Press Braking, 3. Bending Brake Operation.

Cold Roll Forming is widely used by the automotive industry for mass production of building components (structural members, roof truss, wall panel, corrugated sheets, frames of windows and doors, etc.).

In this method, the metal is forming through a specific process, where a sheet of metal is compressed through a pair of rolls to increase strength, reduce thickness, and improve surface finish. The rolling process happens with the temperature ambient condition below the steel's recrystallization temperature. Moreover, any desired shape with any length can be produced in a cold rolling process. In fact, more rolls will be used in case of more complex shape design. To minimize the residual stress formation in both the edge and notch of the steel section, therefore the speed rate of rolling is slow within the range of 6 m/min to 92 m/min, and that would affect the strength of the CFS sections [15], see figure 1. Simple shapes with small quantities can be created by the press-braking process, for example, roof sheets, decking sections, etc. The Press-braking method uses a beam as equipment that is moving over a stationary bottom bed and having the dies for the desired product, as shown in figure 2.



Fig.1: Cold Roll Forming Line.

Source: Believe Industry Website [133].



Fig.2: Hydraulic Press Brake.

Source: Wikipedia Website [134].

2. 2. Construction Methods:

2.2.1 Penalization Method of Framing versus Conventional Field Assembly Method:

The typical projects of CFS structures are configured of a large number of individual pieces that compose a repetitive framing to get the final structure. There are lightweight pieces and easy for handlings, such as joists, clips, studs, and tracks, which is considered as one of the advantages of this system over others. However, significant time is required to assembly these large numbers of pieces. Thus, to minimize the duration of the construction process and labor efforts, these individual pieces are fabricated into subassemblies before transferring to the construction site. Because the subassemblies resembling a panel, so this process is commonly called Panelization, see figure 3. The panels are common wall (containing tracks, studs) or floor elements (containing joists, tracks).



Fig.3: Example of erection of panelized floor.

Source: FORTECO Website [135].

In addition, the panels may have the floor, wall, or roof sheathing built-up before shipment to the construction site. The advantages and disadvantages of the Panelization Method of Framing against Conventional Field Assembly Method are shown in the following table (Table 1) [16].

Table.1: Advantages & Disadvantages of Panelization Method of Framing against Conventional Field Assembly Method

Advantages	Disadvantages
Some construction can be occurred indoors and avoid the weather conditions because of the interior environment where the assemblies are done and controlled.	Special consideration of construction tolerances is required in case of larger dimensional tolerances of panels, foundations, and the other parts of the building and which may be a problematic issue.
Efficient assembly can be achieved since the set-up jigs are used to construct the repetitive sub-assemblies.	In the Fast-track projects, the design and preconstruction time required for panelization may not be allowed.
High quality control of the assembly comparing with in-field.	Difficult modifications of designs if panels have been fabricated early.
A significant reduction of the erection time can be achieved assembly in the field, especially if designs are done prior to being constructed on-site.	More transportation and crane costs are required over the structures which can be built in the field because of the size and weight of subassemblies units, despite that CFS panels are still lighter than other construction materials.

2.2.2 Framing Options:

The available primary alternatives in CFS structures are namely; ledger framing, platform framing, and balloon framing system (rarely used) see Figure 4.

- In the platform framing, the joists work through the intersection between stud/joist, and the joists interrupt the studs. In this configuration, the axial load was transferred from the upper stud into the lower stud by the floor joist web and web stiffener [16].

In CFS construction, there is a common of the platform framing in case of existing any rigid panels in the floor system or steel joists and/or metal deck with concrete, hollow-core panels. In addition, clear separation in construction elements can be achieved with these floor systems where the CFS-framed walls are separated in construction, and it can provide an efficient combination of components. With respect to the tolerances between systems, more tolerance is with the combination of CFS wall framing with non-CFS floor framing [16].

In panelized systems, the platform framing designs can be useful since the tolerance is increased because of placing the floor panels over the bearing walls rather than placing them onto the side of the wall. During the construction and while the ledgers are connected, the floor panels can be easily placed over the walls rather than of holding in place [16].

- Balloon Framing of CFS structures is parallel to balloon framing of wooden-frame, which is the original system for light wooden-frame structures that were used in the 1800s. With Balloon framing and by using two-story-high studs, a two-story house was built. In timber construction, this system was common to be used when long timbers were easily available [16].
- Ledger Framing: this option is similar to the previous one (Balloon option), but the difference that the CFS floor joists are hanged from a ledger connected to the inner face of the wall or studs, and the entire floor has sheathing.

Ledger framing is available for simple floor-by-floor construction, and it can reduce the cost by maximizing the spacing of wall stud and the spacing of floor joist. The load path of the horizontal diaphragm forces can be transferred directly to the vertical walls. Anyway, when the CFS joists are used for the floor framing, then the method is considered as a wide-use method [16].

Additionally, increasing axial loads in the studs with height leads to the more desired use of Ledger framing for multiple-level structures. Therefore, that forces must be transferred by the intersection of stud/joist at the floor levels. But these axial forces cause a web crippling in case of using a platform system, so the stiffeners are required in joists to avoid this phenomenon [16].

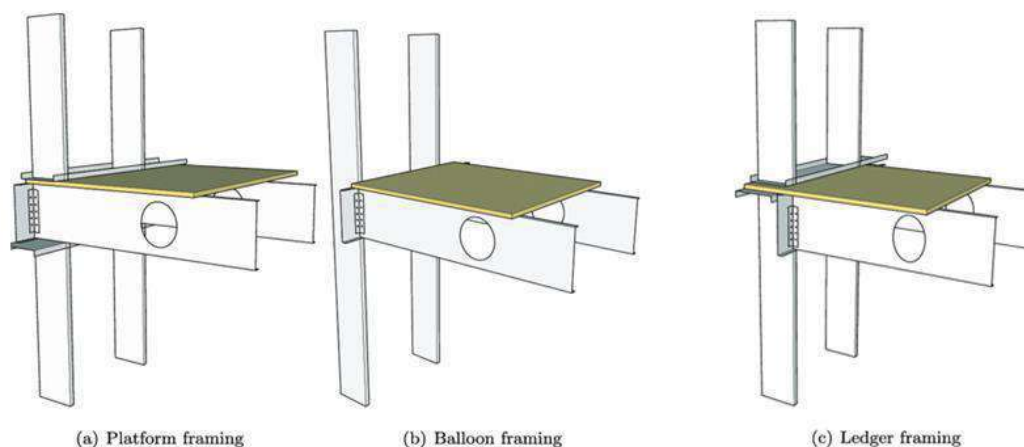


Figure 4. Constriction Framing Options. Source: Reference [17]

III. COLD-FORMED STEEL STRUCTURAL MEMBERS.

There are two major types of CFS structural members 1. individual structural framing members, 2. panels, and decks. Each one of them has a different cross-section, thickness, and properties [1]. CFS sections are generally thin-walled members with a thickness between 0.4 mm to

6.5 mm and they offer a very high ratio of load capacity-to-weight over the other structural component [18]. In the past few years, due to the features of CFS which allow for a wide variety of shapes and procedures, cross-sections innovations have started exploiting advanced manufacturing technology and begun to expand the limits of available design methods [13].

3.1. Individual Structural Framing Members (Bar Members):

Usually, the CFS sections have a depth ranging from (50-70mm) to (350-400 mm) for bar members and with typical thickness from about (0.5 mm) to (6 mm) [1]. For section thicknesses, which typically range from (1.0 mm) to (3.0 mm), yielding stress of the fabricated CFS members is (350 MPa) for normal steel and recently was increased to (550 MPa) for high strength steel [19]. The strain hardening and type of steel used are the reasons for increasing of yield stress. While, the increasing of the ultimate strength is directly related to the strain aging and depends on the metallurgical properties of the material, but with decreasing in the ductility [1]. Another factor that influences the mechanical properties of the CFS members is the availability of various cross-sections for CFS structural members. The most common CFS sections of bar members are:

3.1.1 Single Open Sections [20], [3]:

CFS open section members amenability for torsional deformation is high because of their low torsional rigidity resulting from their thin walls. In addition, the sections are probably exposed to eccentric loading from their shear centers, so they are subject to essential torques, as shown in figure 5. The common CFS open sections are:

- Channel Sections (C-sections) with and without lips (the lipped and plain channel [16]). Where the CFS framing industry has provided some modern variations of typical C sections to be used as studs, headers, jambs, distribution members, and even bracing [13]. In general, it was found that the lipped-channel section has more efficiency than the channel section regarding all the applied load.
- Z-Sections, typically with sloping lips.
- Angles Sections.
- Sigma sections: According to several studies, sigma sections are beneficial for their high load-carrying capacity. Sigma sections have torsional rigidity higher than standard channels. They are light in weight and have a smaller blank size.
- Perforated Sections which are similar to the aforementioned sections but with holes in order to provide room for services. These sections can be used in floor joists and storage rack structures [3], [13], see figure 6.
- Other open sections see figure 7.

Lipped C and Z sections are the most common sections with thickness varying from (0.9mm) to (3.2mm) [9],[21]. The yield strength of these sections is generally between 280 to 450 N/mm² [7]. They usually used as flexural

members in cold-formed design (purlins, girts, etc.) [3]. Other novel sections were developed, such as sections that used in trusses like wide flanges sections, narrow webs sections, sections with intermediate stiffeners, and return lips to be used as chords of the trusses [13] (see figure 8). For non-load-bearing applications sections, cold-formed from knurled steel has been developed (figure 9) which has the advantages of improving the thermal, fire and acoustic performance [13].

3.1.2 The hollow flange beam (LiteSteel Beam):

It was developed in Australia as a unique cold-formed section for use in particular as a flexural member. The typical sections are shown in figure 10. Usually, the flanges are fully welded or fastened to form tubular sections. However, there is another type has the flanges unwelded, and it is much weaker than the welded one [3],[22],[23]. This type of section is highly researched, where it was found that by using closed tubular sections for the flanges of a channel, this section is able to give capacities more associated with hot-rolled, than cold-formed [24][25]. However, as was concluded by the researchers that a high torsional rigidity concentrated in the flanges, while overall extremely beneficial, does lead to specific behavior and interactions more-notably lateral-distortion [26]. The Australian Cold Formed Steel (CFS) Specification provides a novel treatment of this unparalleled CFS building product [13].

3.1.3 Open Built-up Sections:

Some of the aforementioned sections can be joined together to form compound members with open built-up sections such as Wide Flange section (back-to-back lipped channel sections), T-section (back-to-back angle sections), etc. [1], see figure 11.

3.1.4 Closed Built-up Sections:

Some of the aforementioned sections can be joined together in order to form compound members with closed built-up sections such as tubular sections [1], see figure 12.

3.2. Panels and Decks:

Decks and panels (Corrugated or curved) are made from linear trays (cassettes) and profiled sheets, the depth of panels often ranges from 20 to 200 mm, while thickness ranges from 0.4 to 1.5 mm. A variety of open sections can be used, such as "hat-shaped" deck sections [3], [13], see figure 13.

For increasing the stiffness of both CFS sections and sheeting, intermediate and edge stiffeners are used. These stiffeners act as out-of-plane supports for the flat plate elements; therefore, it can improve the strength of sections.

The stiffeners can enhance the efficiency of the CFS by up to 50%, according to the study was conducted by [27]. After all, the performance of CFS sections varies with the grade, slenderness ratio, temperature, etc. and it is considered as a popular and effective field of research.

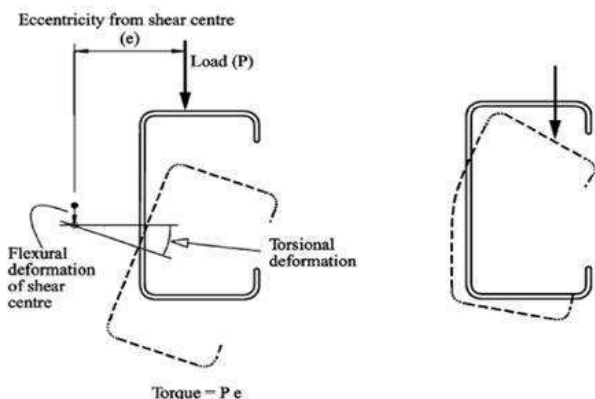


Fig.5: Torsional and Distortional Deformations of Single Open Sections Source: Reference [3].

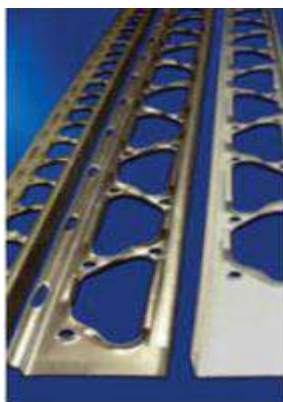


Fig.6: Perforated Sections (SteelForm DELTAStud) Source: Reference [13].

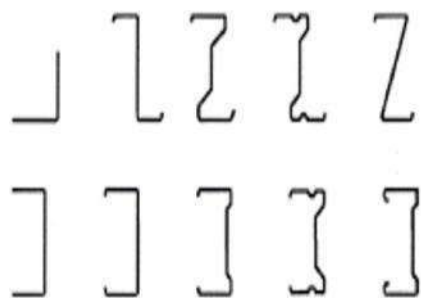


Fig.7: Single Open Section (Source: Reference [1]).

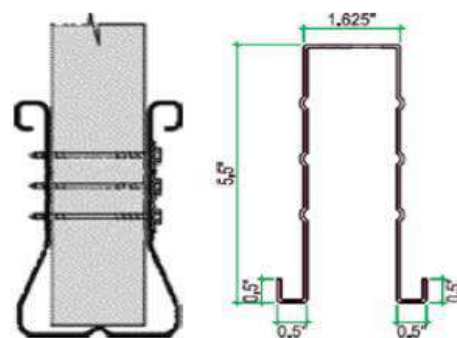


Fig.8: TrusSteel® Dyna Truss Chord and Nuconsteel NUTRUSS® Source: Reference [13][28].



Fig.9: ClarkDietrich UltraSteel® Stud Source: Reference [13]Reference [13][28].



Triangular Hollow Flange Rectangular Hollow Flange (LightSteel Beam)

Fig.10: The Hollow Flange Beams Source: Reference [23].

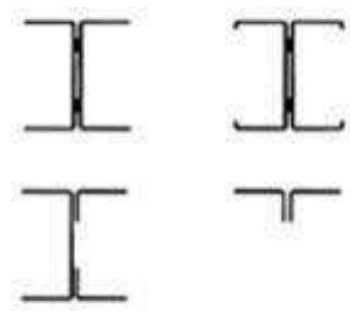


Fig.11: Open Built-up Sections (Source: Reference [1]).



Fig.12: Closed Built-up Sections

Source: Reference [1].

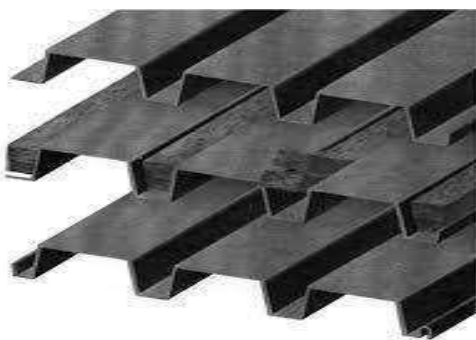


Fig.13: Panels and Decks Sections

Source: Reference [29].

IV. APPLICATIONS OF COLD-FORMED STEEL STRUCTURAL MEMBERS IN ENGINEERING STRUCTURES.

In general, HRS sections are used as primary structural members while CFS sections are used as secondary members to support claddings in forming external building envelopes [19], and these CFS secondary members are connected onto the primary structural members through web cleats as moment or pinned connections, depending on the configuration of connections [30]. Nevertheless, over the past three decades, there is a growing trend to use CFS sections as primary structural members in buildings construction for low to medium-rise residential houses, multi-story commercial buildings and portal frames of modest span [7] (e.g., roof systems, wall studs, girts, purlins, side rails and steel framed housing [7],[4]). It is also being used as minor structural elements in tall buildings and in the construction of infrastructures such as transmission towers, bridge, storage, and drainage facilities, bins, etc. [4],[30],[31], (see figure 14). That is due to the inherent features of CFS which overcome the downsides of conventional products. CFS features such as high weight to strength ratio, adaptability, versatility, non-combustibility, and ease of production have encouraged architects, engineers, and contractors to expand the using of CFS products, that can improve building performance and structural function, in addition, to provide aesthetic appeal at a lower cost [30]. The application of CFS

members in the engineering structures can be divided into the following categories:

4. 1. CFS Primary Load Bearing Members:

The primary areas of load-bearing CFS applications are:

4.1.1 Framing:

where CFS used to make the primary structural elements such as columns, beams, roof truss members [9]. CFS members are commonly in lightweight houses and prefabricated structures as load-bearing components [12]. Steel frame buildings constructed with galvanized sections of CFS are usually named as Light Steel Framing. The former system is considered as one of the industrialized building systems, and it has a lot of advantages over the traditional construction methods. As a result, it becomes a common construction choice for medium and low height buildings (see figure 15) as well as residential house constructions [9]. However, various researches have been conducted to reinforce the safety issue and increase the use of cold-formed steel members as primary structural components [9].

4.1.2 Composite sections:

CFS structural members can become even more effective as primary structural members when used in conjunction with other materials, particularly with wood and cementitious materials [3],[31]. For this purpose, there are two common ways which are; 1. use CFS composite beams in concrete slab systems, 2. as wall studs lined with gypsum plasterboard in residential buildings [3]. For example, in residential structures where light steel roofs and floors can be used with light steel composite members, as follows [31]:

- ‘Open’ roof systems using steel-timber composites.
- Light steel-timber floor beams
- Light steel slim floors.
- Gypsum composite floors members with steel lattice joists.

The primary use and benefits of these composite members are in residential buildings or medium-rise constructions, where the advantages of lightweight and longer spans availability can be realized [31].

4.1.3 Lateral Loads Resisting System (LFRS):

CFS can be used for some or all parts of the lateral load systems in some of the construction types. for example [16]:

- Structures with light-frame bearing walls where the gravity systems are constructed by using CFS joists or trusses and supported by CFS load-bearing walls in

addition to the lateral load resisting systems using CFS strap-braced walls or shear walls.

- Podium-Structures with CFS light-frame, where there is the ability to build the load-bearing structure atop lower levels of different constructions, such as steel or concrete structures.
- Hybrid structural systems where the primary gravity systems, diaphragms, and collectors have CFS trusses, joists, and load-bearing walls. Whereas for the vertical components of the lateral load resisting systems, moment resisting frames, concrete shear walls, structural steel braced are used.
- Penthouse structures that are used at the top levels of steel or concrete buildings; the penthouse structure is generally considered as an architectural component instead of considering as a part of the building's lateral load resisting system, and it is designed under ASCE 7 Chapter 13.

CFS framing resisting systems are typically considered as one category of the following [16]:

- Shear walls with wooden panels (oriented strand board (OSB) or plywood) connected CFS tracks and studs.
- Shear walls with steel sheet sheathing connected to CFS tracks and studs.
- Wall systems of CFS light-frame strap-braced member (tension braced walls, diagonal).
- Special Bolted Moment Frames (SBMF).
- The products which are not recognized by American Standard for Seismic Design of CFS Structural Systems (AISI 2015b), and AISI S400-15, in addition to shear walls with steel sheet connected to other sheathing materials, for example, gypsum board.

4. 2. CFS Secondary Load Bearing:

Generally, in the steel buildings, the secondary system can be provided by the CFS members [3],[9],[13],[19]. For instance, CFS decks and corrugated panels were used for a long period, but recently more development has been obtained on corrugated curved panels, and they are widely used in steel arch kinds of buildings e.g., farm building. They serve as both the secondary structural system and the building envelope providing economic designs and duct facilities for the electrical, heating and air conditioning system.

These curved and corrugated panels usually contain transverse corrugations that serve to bend the thin-walled steel sheet into a curved shape and simultaneously act as a stiffener. However, assessment of the strength of these corrugated and curved panels is difficult. Furthermore,

researches that work on these secondary systems remain active (particularly with purlins) [3], [13].

Another usage of CFS sections as secondary members is providing lateral restrictions of the braces by cold-formed steel studs (CFSS), see figure 16. Oguz et al. [32] investigated the performance of CFSS by conducting an experimental study and the cyclic inelastic performance of concentrically braced frames with and without CFSS infills designed to laterally restrain braces and delay their buckling. The results showed a significant increasing in the cumulative energy dissipation of the braced frames at the same level of ductility when CFS members are used for laterally restraining the braces against buckling.

4. 3. CFS Application in Storage Racks:

Steel storage racks are one of the major applications of cold-formed steel. CFS storage racks are remarkably efficient structures with novel cross-sections (usually perforated sections) and connections in their design. Although the connections and members have not changed significantly in the last few years, understanding of behavior and translating that understanding into improved designs have been very active. The down-aisle strength and stability are very important factors in storage rack design. Beam to column joints significantly affects this stability, since the structures are usually unbraced in the down-aisle direction to allow for loading and unloading of pallets [3], [13].

Some studies on storage racks provide valuable information related to the sway and seismic behavior of racks, such as Baldassino and Bernuzzi [33], Bernuzzi, and Castiglioni [34], etc.. Moreover, Significant new testing has been conducted on uprights [35], [36], upright to shelf beam connections [37], [38], and base plates [39]. Testing protocols have become formalized [40], as well as analysis protocols, particularly in the use of second-order analysis [41], [42].

Other concerns, such as impact forces [43], [44], and progressive collapse [45], have also been studied. Standards organizations supporting the CFS rack industry are active and progressive, that because of the complicated nature of rack structural performance. For instance, the Australian rack standard (AS 4084) provides complete codified guidance on performing material and geometric nonlinear analysis on the imperfect structures (GMNIA), similar in spirit to Eurocode for shell structures [13].

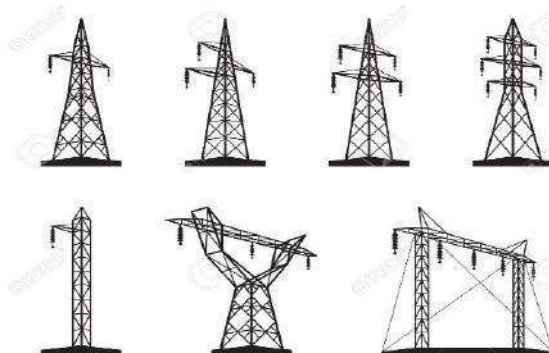


Fig.14: Some of CFS Applications Source: Reference [30] + 123RF Website [136]



Fig.15: Mid-rise CFS Framing
Source: Reference [127]

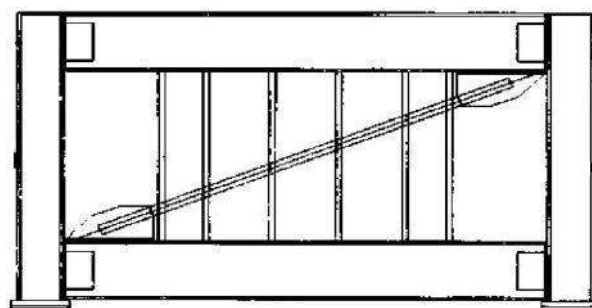


Fig.16: Lateral Restrictions of The Braces by CFS
Studs
Source: Reference [32]

V. COLD-FORMED STEEL CONNECTIONS.

The connection is the physical component that mechanically fastens the structural components and located where the fastening action occurs [46]. Therefore, the connection transfers the forces from the structural member to the supporting elements [9]. Accordingly, structural joints are classified into several categories by referring to its strength and stiffness to be able to transfer that forces [9].

Connections serve as important elements for light steel framing in order to achieve its structural stability. Compared to HRS sections, CFS connections perform dissimilarity [9]. As known, CFS sections are typically made of thin-walled elements, which consequently reduces the stiffness and ductility capacity of CFS structures because of the buckling behavior, resulting in limited structural applications in seismic areas [47]. Furthermore, relatively low strength and stiffness of the joints of the conventional CFS stud-wall frame systems [48] highlights the need for more investigations and improvements in CFS structures' connections [49].

There are nine types of joints which are commonly used in the construction industry of CFS structures [15], namely,

bolts, blind rivets, self-tapping screws, powder actuated pins, puddle welding, spot welding, clinching, nailing, and self-piercing rivets [9].

In this section, the current researches on the CFS connections will be discussed, particularly for bolted connections, screwed connections, piercing connections as well as the application of CFS in slotted track connections, steel roof truss end-connections, and portal frames (eaves, apex, and base) connections. The investigations of the structural behavior, strength, ductility, energy dissipation, seismic performance, failure mode, and other issues over the last few years will be reviewed, but because of the wide research area of the CFS connections, limited number of researches has been selected to clarify the importance of CFS in the structural engineering application as follow:

5.1 Bolted Connections:

The bolted connection is widely used as a fastener in steel constructions of both HRS and CFS [9]. In CFS structures, bolted connections provide ductility, energy dissipation capacity, and resistance to the moments, tensile, and shear loading [49]. Nevertheless, the development of a bolted

connection with a targeted design performance requires addressing many types of uncertainties. These include both physical and design deficiencies such as frictional coefficient, bolt pre-tension, positioning of bolts within their holes, instantaneous center of rotation (ICR) as well as precise force distribution within a bolt-group [49].

Shahini et al. [49] and Jun et al. [50] presented a detailed investigation on a new configuration of CFS bolted moment MR-connections, where the dissipated energy is mainly through bolted connections. The aim of incorporation of a friction-slip mechanism into a slotted bolting type of connection is to; postpone local buckling, improve ductility and seismic energy dissipation capacities [49],[50]. By means of validated finite element analysis, both cyclic and monotonic performance of CFS connections comprising two types of circular (CB) and square (SB) bolt group arrangements are studied comparatively without and with slip at various levels [49], see figure 17. Higher energy dissipation capacity is provided by the connections with slip comparing with the connections without slip by about 75% [49], see figure 18. CB connections produce more uniform bolt-group force distribution that is closer to the idealized method, while the SB connections encounter a significant delay of up to 30% in activation of bolt group slip that could lead to unfavorable beam local buckling [49]. By using a bolting friction-slip mechanism, the ductility, energy dissipation capacity and damping coefficient of the connections can significantly be increased (up to 200%) especially for CFS beams with thinner plates [50].

Jun et al. [51] studied the seismic performance of CFS connections by investigation of the effects of bolt arrangement, cross-sectional shape, and gusset plate thickness under cyclic loading. The results indicated that, for the same amount of material, increasing of ductility and energy dissipation capacity up to 100% and 250%,

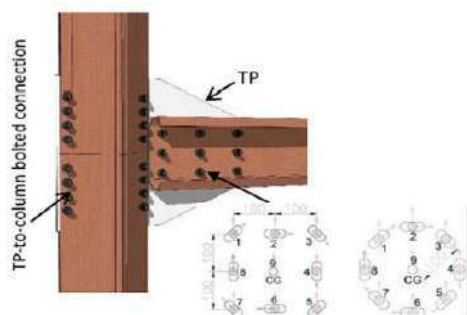


Fig.17: CFS joints with SB and CB bolting. Source: Reference [49].

respectively, by using folded flange beam sections with diamond or circle bolt arrangements compared to conventional flat-flange sections with square bolt arrangement, see figure 19. In addition, reduction of the moment capacity of the connection is possible by using gusset plates with the same or lower thickness as the CFS beam.

Rinchen et al. [52] investigated the flexural behavior of apex, eaves connections for CFS single C-section portal frames by conducting a series of connection tests and analyses of finite element models. It was clear that the apex connections reached their ultimate load capacities after inelastic buckling near the compression flange-web junction of one of the adjacent beams, while the eaves connections attained its ultimate load capacities upon ply bearing of M8 bolts on the C-section, see Figure 20. Lim et al. and Kwon et al. [53], [54] also studied the behavior of bolted connections in portal frames structures.

Yancheng et al. [55] Investigated the effects of end distance on thin sheet steel (TSS) bolted connections. It was found from the experiment that by increasing the end distances up to three times and five times the bolt diameter, the ultimate loads were increased for single shear and double shear, respectively. In addition to the behavior of bolted connection in multi-span of purlin was investigated by several studies [56], [57]. Many researchers investigated different aspects of bolted connections from various viewpoints such as:

1. the behavior of beam-to columns connections to predict the strength and stiffness of the connection [58],[59], [60],[61],[62].
2. the stainless CFS bolted connections [63].
3. the carbon steel bolted connection [128].
4. the failure mode of the bolted connection [64].
5. The tensile strength of bolted CFS channel section [65].
6. Lateral-torsional buckling and plastic behavior of single CFS channels bolted back to back bolted connections [129].

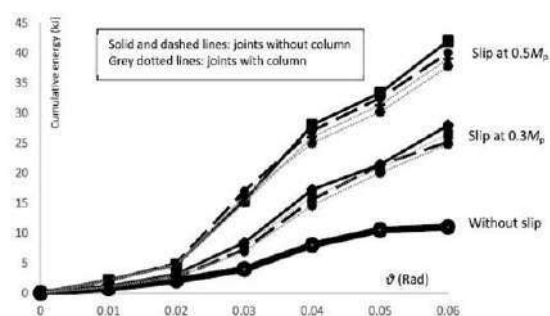


Fig.18: Cumulative energy dissipation curves of SB (solid line) and CB (dashed line) connections without slip and with slip levels Source: Reference [49].

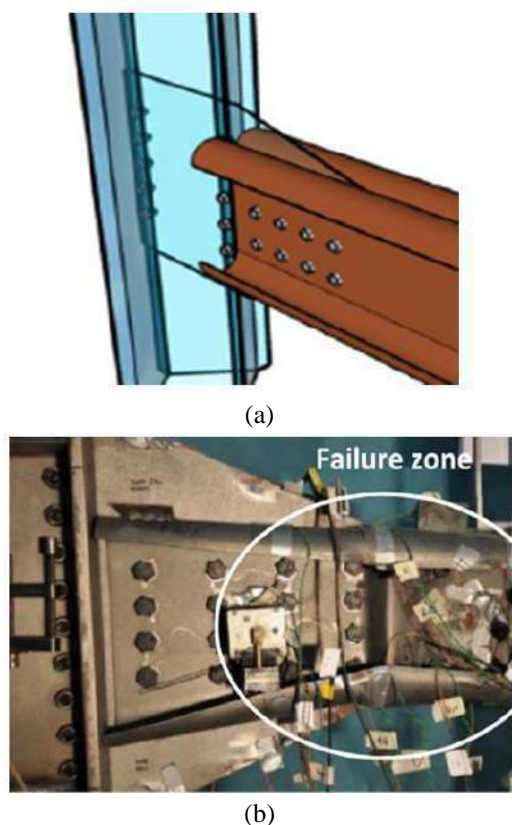


Fig.19: a) Folded-flange, b) Failure zone. Source: Reference [51]

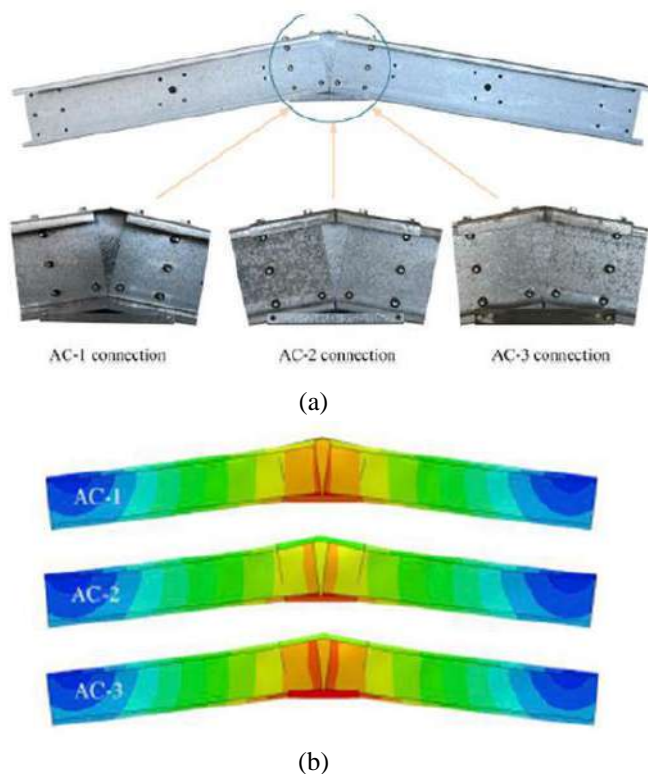


Fig.20: a) Apex connections with fastener configurations, b) Deformation of specimens at ultimate moment. Source: Reference [52]

5.2 Screwed connections:

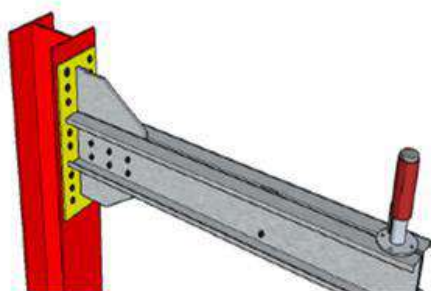
Screwed joints are effective and suitable when applying to the CFS sections with the condition that the total thickness should not give difficulties to the self-drilling process [9]. For steel-to-steel connections, although provisions exist to accommodate the use of screws in shear and tension, the predominant application of screws is in a shear mode [66].

Fiorino et al. [67] assessed the effect of screw diameter and thickness profile on the screwed connection response with reference to gypsum and cement-based solutions by conducting an experimental study of these connections for sheathed CFS structures with gypsum or cement-based panels. It was observed that the increment of the steel profile thickness and screw diameter did not produce an apparent increasing of strength. Bondok et al. [68] investigated the failure capacities and the energy absorption capabilities of roof truss end-connection with different screw configurations. It was found that the screw configuration and the direction of loading strongly affect the toughness (energy absorbed to failure) of the end-connection.

As known in roof battens and with multiple screw connections, the pull-out capacity cannot be calculated directly depending on the number of screw fasteners. Therefore, Mayoora et al. [69] investigated these capacities of two and four-screw fastener. The results showed 40% and 29% improvement of the total pull-out capacity of roof batten to purlin/rafter connection when two- and four-screw connections were used, respectively. Mahyar et al. [70] examined experimentally a beam-to-column connection by using a self-drilling screw in order to provide a failure mechanism for the CFS structure's connection. The results indicated a decrease of the plastic and maximum deformation while there was an increase in the maximum moment and stiffness when the profile thickness of the beam increased, see figure 21.

Ayhan et al. [71] conducted full-scale experiments to investigate the moment-rotation behavior of floor-to-wall connections which were used in ledger-framed CFS building. Pull-out of the ledger to joist screws has been only observed without floor sheathing present, see figure 22.

Screwed ridge joints were also studied under wind at roof pitch conditions [72]. In addition to the behavior of screwed connections was also studied from different viewpoints. [73].



(a)



(b)

Fig.21: Self-drilling screwed connection and failure mode

Source: Reference [70]

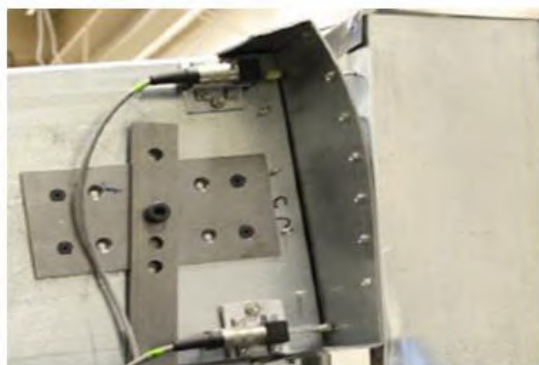


Fig.22: Fastener pull put failure mode.

Source: Reference [71]

5.3 Self-piercing riveted (SPR) connections:

SPR connection method is a practical and common method in the field of automotive and machinery industries. Furthermore, high strength, high stiffness, efficient installation, and anti-fatigue behavior are some advantages of SPR [74]. Most studies on SPR using numerical and testing methods concentrated on process parameters, mechanism of forming, fatigue, and mechanic performance [75].

Zhiqiang et al. [76], presented an experimental investigation of (CFS) shear walls with (SPR) and studied the effects of rivet spacing on mechanical behavior as well as failure modes of CFS shear walls. It was concluded that the rivet spacing at the sheet edges was a very important factor affecting the failure modes (see figure 23), and

mechanical properties of CFS shear walls, where the relationship of shear strength and ultimate deformation decreased linearly with the increase of the rivet spacing.

In Zhiqiang et al. [75], tested 78 SPR joints to evaluate the quality and shear strength. The results indicated that the failure mode was greatly affected by the sheet thickness and rivet length (see Figure 24), and the rivet length was an essential factor that affects the shear properties of SPR connections.

Many types of research have studied the behavior of SPR connections from different viewpoints, such as 1. Rivet diameter and length effects [77],[78],[79]. 2. Fatigue performance of SPR joints [80],[81]. 3. Hybrid SPR joints made of aluminum alloy composite materials [82]. 4. the structural behavior of SPR connections [83].

5.4 Slotted track connections:

Slotted tracks are widely used in building constructions. These connections do not require additional materials to reach the desired performance [84]. Espinoza et al. [84], proposed equations depending on mechanics. These mechanics-based equations can estimate the design strength of cold-formed steel slotted tracks for out-of-plane loads resulted from connected studs. Testing suggested that under the maximum differential displacement of the adjacent floor, the equations in the paper predicted lower values of the slotted track flange deflection. But, the strength of the slotted track flange may be greater.

Slotted tracks which have similar material properties and cross-sectional shapes, are produced by many manufacturers (Bailey Metal Products Limited [137], Brady Innovations LLC [138], CEMCO [139], Clark Dietrich [140], SCAFCO [141], and Steeler [142]) [84].

5.5 Other types of Connections:

5.5.1 Welded Connections:

Welded joints offer rigid joints between CFS members. In this case, welding operation requires skilled workers. It is also served with extra care as compared to other joints. Many types of research conducted on laser beam welding (LBW) [85], stainless steel welding [86], and other welded joints [87], [88], are listed in this review but not discussed in details.

5.5.2 Storage Racks Connections:

CFS members are the main components of Storage rack structures. As a result of the similarity between the storage rack systems and the light steel frames, the design parameters have an equivalent value [9]. The behavior of the main members of racks was investigated, in addition to

the assessment of the performance parameters in terms of beam-column connections [34]. Many other studies have been conducted on the Storage Racks Connections from many structural viewpoints [33], [89].

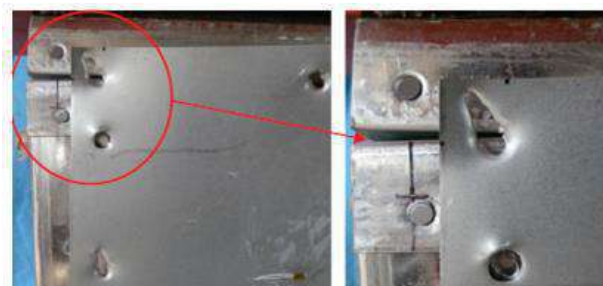


Fig.23: a) Real products. b) Failure mechanisms of SPR connections in walls.

Source: Reference [76]



Fig.24: Failure mode of SPR connections.

Source: Reference [75]

VI. THE BEHAVIOR OF CFS STRUCTURES:

Understanding the behavior of CFS is very critical in order to obtain a safe and economical design. The behavior of CFS structures is more complicated compared with the conventional HRS structures due to 1. The thin-walled nature of the CFS sections which make them be highly influenced by the interaction of different types of buckling (failure patterns). 2. The post-buckling behavior of CFS structural members which is different from HRS structural members. 3. The changes in the mechanical properties of

CFS members due to the cold work of the formation of the CFS sections.

6. 1. Failure Patterns:

6.1.1 Buckling:

In CFS members, buckling is an essential design criterion which should be taken into consideration. Compression, shear or bending loads cause the buckling of CFS members. The basic modes of buckling are [3],[30]:

- Local Buckling: is a buckling mode that involves only the plate flexure regardless of the line transverse deformations or lines of intersections of the adjacent plates.
- Distortional buckling: this buckling mode is essential in the stability when high strength thin steel sections are used. In this buckling mode, a change in cross-sectional shape is involved, excluding local buckling.
- Global buckling mostly occurs in columns and beams without any observation of cross-sectional distortion. Flexural and lateral-torsional buckling may also exist in the member [90].

The previously mentioned buckling modes are also able to interact with each other. Yu and LaBoube's book [15] discussed these buckling modes as well as the thin-walled nature of these cross-sections.

6.1.2 Web Crippling:

Web crippling is an essential failure criterion for cold-formed steel members. The rounded corner of the CFS members is one of the causes of loading eccentric from the web centerline resulting in the occurrence of the web crippling, in addition to the slender and unstiffened webs which differ than the hot-rolled design where the web is often strengthened by stiffeners [3],[30].

6. 2. Post-Buckling Behavior:

Although the CFS members would deform and subject to different types of buckling, the substantial post-buckling load can be taken by these members due to the transverse membrane stresses, which developed with deforming of the plates [16], see figure 25. It is well known that there is a significant post-buckling reservation in the local buckling, a modest post-buckling reservation is in the distortional buckling, and a minimal post-buckling reservation is in the global [16],[11]. Therefore, new thinking is required for the post-buckling capacity, accompanying a new design approach and conducting experiments for validation of these approaches, for example, the effective width method (Winter 1947) [16] or the more recent Direct Strength Method (DSM) [11].

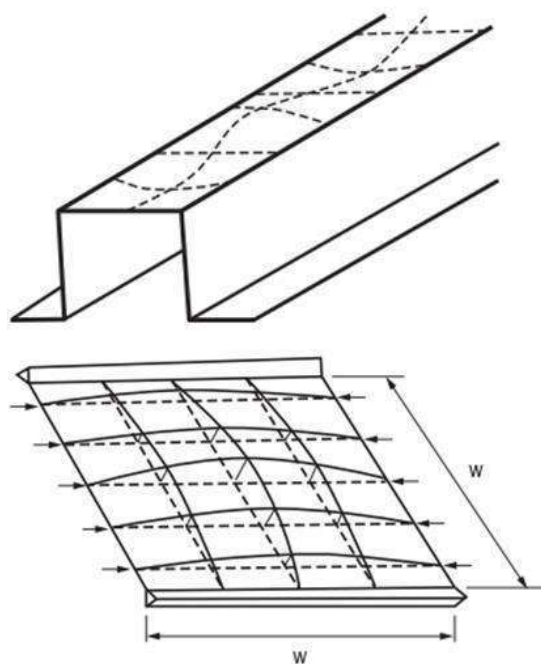


Fig.25: Winter's depiction of local buckling in the compression flange of a hat-shaped cold-formed steel beam and his grid model for explaining how transverse membrane stresses create the source of post-buckling strength in plates under load.

Source: References [16].

6. 3. Mechanical properties:

The manufacturing process and chemical composition of steel strongly affect the structural behavior of steel. In Hot rolled Steel (HRS), design standards accurately provide the mechanical properties of normal and high temperatures. However, the mechanical properties of CFS are different than HRS; that is because of the forming process. Generally, the yield and ultimate tensile strength of CFS are increased because of the forming procedure, but the tensile elongation capacity is decreased. The mechanical properties of CFS are also affected by the available and various cross-sections. In fact, there are three main reasons that change the CFS mechanical properties during the forming, which are: 1. Strain hardening, 2. Strain aging, and 3. Bauschinger effect. Strain hardening is considered as a steel strengthening since the plastic deformation results in changing the crystal arrangement of the materials. When steel is subjected to aging, its maximum load-carrying capacity increases after the elastic range stressing, this is called Strain aging. Bauschinger is considered such a phenomenon in (1887) [3],[90].

Actually, the mechanical properties of CFS are mainly affected by the strain aging and strain hardening. From figure 26, it is obvious that there is increasing in tensile strength and the yield strength after pre-straining and aging

of the steel, but there is a reduction in elongation or ductility [30].

At high temperatures, the fire resistance of CFS is mainly influenced and controlled by the mechanical properties of CFS, such as the yielding strength and modulus of elasticity. Therefore, the affected mechanical properties make the CFS elements more sensitive to buckling. Important guidelines and codes take the effect of fire on CFS structures into consideration by assigning specific reduction factors as temperature increases. These reduction factors of CFS are higher than that of HRS due to the effects of molecular surface metallurgical composition [12],[90].

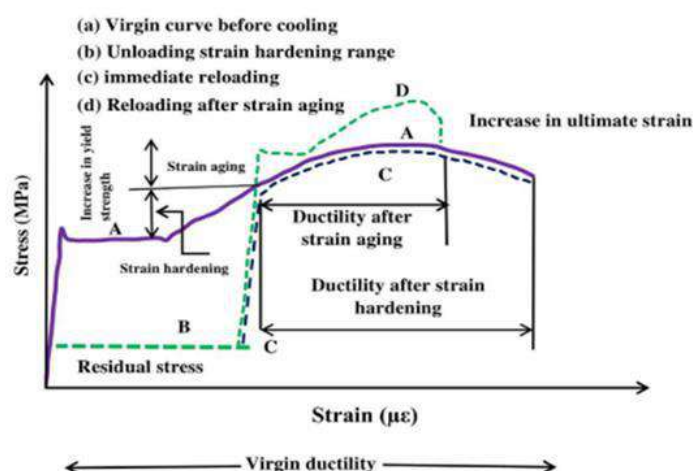


Fig.26: Effects of strain hardening and strain aging on typical stress-strain characteristics of structural steels.

Source: Reference [90].

6. 4. Review of the Related Researches:

Over the past three decades, massive researches have been conducted on the CFS structures due to its increased applications in the construction industry. These studies investigated the reliability and stability of the constructed steel structures. This section reviewed the investigations of the CFS behavior, failure mode of the CFS members, and mechanical properties (strength and stiffness) of the CFS members, as follow:

Martins et al. [91] studied the buckling, and the distortional failing modes of CFS simply supported beams under uniform bending. This article also investigated the factors that influence the distortional post-buckling behavior and ultimate strength, such as the flange-web ratio, lip-flange width ratio, and the critical distortional half-wave number. The results showed that the previous factors, in addition to the end support conditions, play essential roles in the behavior of the analyzed beams.

Zhou et al. [92] established a new formula of buckling by presenting an analytical approach, where this formula can

take into consideration both of the effects of end condition and column length. The results showed that for both fix and pin-ended columns with practical length, this formula successfully estimated the distortional buckling load. Also, the consideration of column length and end condition effect in this formula could make the formula estimate the buckling strength reasonably.

Gardoso et al. [93] studied the distortional buckling critical stress of the lipped channel columns under uniform compression and presented rational explicit formulas. The results showed that some cross-sections are usually not practical in applications. For example, sections that have $bf/bw < 0.3$ usually display very low global buckling critical loads, whereas sections which have $bf/bw > 0.8$ and $bs/bw < 0.1$ do not have a high efficiency against distortional buckling, which causing lower critical loads.

Ajeesh et al. [94] studied the contribution of the buckling modes, including the primary (global, distortional, local) and secondary modes, by presenting a mode identification technique depending on the spline finite strip method (SFSM). The results showed that the proposed technique successfully quantifies the participation of various buckling modes. In addition to the availability of comparison between the mode participation and mode identification with the aid of generalized beam theory (GBT) and finite strip method (FSM).

Martins et al. [95] characterized the post buckling behavior and the ultimate strength of beams subjected to the interaction effects of severe local-distortional (L-D) buckling by carrying out a systematic numerical investigation. The results showed a high qualitative similarity between the local-distortional coupling effects in columns and beams. Also, two types of L-D interaction were discovered – “true L-D interaction” and “secondary (local or distortional) bifurcation interaction.”

Cheng et al. [96] investigated the buckling behavior of CFS beams with channel section and plasterboard protection, and these beams are exposed to fire on one side with uniformly distributed loads. Three phases are involved in this work, namely buckling analysis, pre-buckling analysis, and heat transfer analysis. The results indicated the significance of the temperature variations in fire exposed flange, web, and lip. Also, a different effect was observed on the buckling behavior of the beam between the cases of the temperature variation and the constant uniform temperature on the beam section. When the beam is exposed to the fire only on its tension side, then the compression zone will be reduced, with increasing of maximum compressive stress on the flange, which is not exposed to the fire.

Chen et al. [97] carried out an experimental and numerical investigation to study the structural performance of pin-ended CFS columns with the elliptical hollow section buckled about the minor axis. The parametric study also was performed though out developing a finite element model (FEM) to replicate the main test results. Furthermore, more improvement was proposed by modification of the Direct Strength Method to obtain more accurate design strength predictions. The validation results showed that the model gives an accurate prediction of the behavior of CFS columns with the elliptical hollow section buckled about the minor axis.

Jun et al. [98] studied experimentally the interaction between the local and overall flexural behavior in CFS lipped channels subjected to axial compression. The results were used to evaluate the accuracy of the design procedures in Eurocode 3 predictions by comparing it with the experimental results. It was clear that a combination of the effective width approach with the P–M interaction equation, which was proposed in Eurocode 3 for taking into account the eccentricity of the effective centroid, provided consistent and safe results.

Yuan et al. [99] investigated the distortional buckling behavior of the perforated CFS beam with channel-sections and circular holes in its web. The effects of those holes on the distortional buckling, corresponding critical stress, and the moment of perforated CFS beams were also discussed. The numerical and analytical results showed a decreasing in a critical moment of distortional buckling of that beams with increasing of the hole size, but there was an increasing in the half-wavelength associated with the critical moment with increasing of the hole size.

Xu et al. [100] investigated the influence of corrosion degrees and types of CFS thin-walled on the mechanical properties. The results showed that pitting corrosion has a flat fracture mode, whereas the overall corrosion has various fracture modes, such as staircase, circular, and oblique fracture. Also, it was observed from all the pitting specimens that the necking segment and yield platform disappeared. Whereas only at 36.14% of corrosion rate, the overall corrosion specimens were occurred, in addition to decreasing the strength and elongation by 21%, 70%, respectively.

Kesawan et al. [101] conducted experimental studies to figure out post-fire mechanical properties of CFS hollow sections of different grades and thicknesses. Yield strength, post-fire stress-strain curves, elastic modulus, ultimate strengths, and their reduction pattern were provided by the results. The results showed that the post-fire mechanical properties of CFS hollow sections differ from that of open CFS channel and hot-rolled (HRS)

sections. When the hollow sections exposed to temperatures of 600, 700 and 800 °C, they would be able to retain 74, 66, and 55% of their ambient temperature capacity, respectively. Whereas, the elastic modulus remained with the same value even after heating up to 500°C. After 800 °C, the steel could recover more than 80% of its ambient temperature elastic modulus value.

Li et al. [102] carried out coupon tests to present the material properties of high strength CFS at elevated temperatures up to 1000 °C. Therefore, both steady state and transient state methods were used to obtain elastic modulus, yield stress, thermal elongation, ultimate strain, ultimate strength, and fracture strain as important material properties. It is found that the retention factors of EC3, AISC Specification, and BS 5950 derived for hot-rolled steel (HRS) materials for the yield stress are not applicable for the high strength CFS materials discussed in this research. Furthermore, it is clear that the design proposals for the ultimate strength, elastic modulus, stress at 2.0% strain, and 0.2% proof stress at high temperatures are mostly conservative for both high strength CFS and high strength HRS materials.

Matsubara et al. [103] derived the design rules of CFS members subjected to axial compression after reaching the modes of local-distortional buckling (L-D). A wide range of (L-D) slenderness ratio was taken into consideration to obtain the strong and weak interaction conditions of L-D through the numerical results. The results showed that for the structural design of lipped cold-formed steel columns, the direct strength method is applicable to be applied as a design concept.

VII. DESIGN OF THE COLD-FORMED STEEL STRUCTURES:

As prementioned, most of the CFS members exhibit slender cross-sections and are typically thin-walled. Therefore, the CFS members are more vulnerable to various individual buckling phenomena. In fact, the instability phenomena which take the member geometry and loading into consideration may be critical and leads to complicated design [10],[91]. Moreover, in some codes, the CFS sections are largely restricted to be treated as individual members under typical and ideal conditions. Therefore, it is very necessary and essential to handle the difficulties of the CFS element's behavior by establishing safe and accurate design approaches. [104].

7.1 Design Approaches to CFS Structures:

In past years, many countries have built national design specifications of CFS structures due to the extensive research efforts and product development. Basic design

methods such as Effective Thickness, Reduced Stress, the Q-factor approach, the Erosion of Critical Bifurcation Load approach championed by Dubina for CFS members are currently available in that specifications, but they are not detailed here [10]. In this section, the Direct Strength Method (DSM) and the Effective Width Method (EWM) and will be explained, as they are considered the most efficient and recent used methods.

7.1.1 Effective Width Method (EWM):

The effective width concept is considered as the base of investigating the local and distortional buckling of thin walled members subjected to bending and compression for unstiffened and stiffened members of the design standards and specifications. The effective width method depends on forming the cross section of the element as an isolated cross-section, so this method is considered as an elemental method [3]. In 1932, it was originally proposed by Von Karman et al. [130], and then it was modified by Winter [131]. The main idea of the effective width method is that the effectiveness of the plates which comprise a cross-section is reduced due to the local buckling [3],[10].

• Advantages and Disadvantages of the (EWM):

The effective cross-section 1. illustrates the locations in the model where the carrying load capacity of cross-section is ineffective, 2. clarifies the local buckling effect on the concept of neutral axis shifting and 3. provides sufficient and clear ways to take the local-global interaction into consideration where properties of the reduced cross-section affect global buckling (some standards usually simplify this interaction) [10].

Further, the (EWM): 1. disregards the equilibrium and compatibility of the inter-element (e.g., between the flange and web) in determination of the elastic buckling behavior, 2. incorporation of competing for buckling modes, e.g., distortional buckling can be unsuitable, 3. heavy iteration process is required for determination of the basic member strength and 4. more complicated determination of the effective section associated is needed with the need for more attempts to optimize the section. The EWM is a useful design method, but it is strongly tied to the stability of the classical plate and creates a special design methodology that differs from the design of conventional HRS. Therefore, it may prevent the use of some materials by some engineers in different situations [10].

• Codification:

(AISI-S100 2010) North American specifications for the design of CFS structures and Australian/New Zealand standard for the CFS structures (AS/NZS4006 2005) both consider an effective width method in the design as well as Eurocode 3 (1) Parts 1-3 and 1-5 (EC3-1e3 and EC3-1-5.

Chinese technical code of CFS thin-walled structures (GB50018-2002) [132] also uses the effective width method.

7.1.2 Direct Strength Method (DSM):

The designation “Direct Strength Method” (DSM) was first mentioned in the pioneering work of B.W. Schafer and T. Peköz (1998) [105] related to developing new design approaches for cold-formed steel beams. Twenty years ago, the (DSM) alternated the traditional design methods and became as an effective alternative for CFS thin-walled members. DSM may be considered as one application of methods that are used in structural design depending on generalized slenderness concept [106]. The importance of the DSM to design the thin-walled members in general (not necessarily CFS) and structural systems spread quickly around the world and leads to an abundance of numerical and experimental investigations aiming to validation, codification, and development of the design methodologies based on DSM for various structural problems [107].

The DSM provided a consolidated approach for CFS members design subjected to bending (columns) and compression (columns) exhibiting distortional, global, and local interactive failures [107].

- Advantages of DSM:

After comparing DSM with EWM, four major advantages of DSM can be concluded, all stemming from the concept that viewed the cross-section as a whole. Indeed, DSM (1) automatically takes the wall-restraint effects into consideration, which is different than EWM, where the wall-by-wall approach is used. (2) no cross-section classification or effective width calculations are needed, (3) there is the possibility to provide the strength estimation for members which fail in distortional modes (distortional buckling is considered as an independent limit state), and (4) can directly take into consideration the interactions of the buckling mode. Additionally, the DSM can provide a systematic and rational framework to design the structural systems comprising of thin-walled (not only members) made of different materials (not only CFS) [106],[107].

- Codification:

In 2004, North America (AISI, 2004) codified the DSM, then simultaneously considered in the Australian/New Zealand standard (AS/NZS, 2005). After a few years, it was also adopted in Brazil (ABNT, 2010) [107]. AISI S100-16 also codified DSM by moving DSM provisions

from the Appendix and combine them with the main specification [106].

7.2 Application and reliability of the Design Approaches.

7.2.1 Design of CFS members (Beams and columns):

In this section, the review will show many types of research are implemented to design CFS members in the last few years, particularly with DSM and EWM, but the former has more researches recently. The majority of the new researches in this review, which related to the Design methods, is based on the DSM.

- Beams and Purlins:

Starting with the EWM studies which are related to the buckling design of CFS sections (Beams-Channels), Yu et al. [108] proposed a design method depending on the Effective Width Method (EWM) in order to determine the nominal distortional buckling strength of CFS members shaped as C and Z sections under bending load. More comprehensive limit states were covered by the conventional design approach because of the proposed method. The former proposed method is calibrated by the flexural distortional buckling strength, which predicted by the DSM, and it presented the same accuracy level and reliability of the Direct Strength Method.

Xingyou et al. [109] proposed a method in order to improve the efficiency of the effective width method EWM by using the energy method and deflection theory aiming to find the distortional buckling strength of cold formed steel lipped channel members. In the Chinese Technical code of CFS thin-walled structures (GB50018-2002), a comparison conducted between the effective width method and the energy method to get the post-distortional buckling strength. The comparison results indicated the efficiency of the energy method and concluded that the EWM formula in Chinese code could calculate the post distortional buckling strength, it is also accurate and reliable in evaluating the load-carrying capacities regarding the distortional-buckling and design of the CFS lipped channel members.

In the design of cold rolled purlins, Nguyena et al. [110] studied the design of new cold roll-formed C and Z sections to be used as purlins members, and they are namely as UltraBEAM™2 and UltraZED™2, which were developed by Hadley Industries plc. The results presented a high agreement between the values of the test and Direct Strength design and concluding that the DSM is a sufficient tool to optimize and design of the new cold roll-formed C and Z purlins.

Hadjipantelis et al. [111],[112] investigated the design of Pre-stressed CFS beams. Design failure criteria of the CFS

beam and cable are developed through employing interaction equations integrated with the DSM. Subsequently, a reliability analysis was conducted in order to illustrate that the developed design recommendations are valid to obtain a safe design of the studied prestressed CFS beams.

Anbarasu [113] investigated the design of CFS closed built-up beams which composed of two sigma sections aiming to study the local buckling behavior. The predicted flexural resistances obtained by the current DSM were compared with those predicted by the proposed DSM for built-up beams. The results indicated that the predictions of current DSM are not safe, and they dispersed for slenderness (low and moderate local) which is less than 1.5. The proposed DSM regarding the local buckling is more efficient for prediction of the moment capacities for cold-formed steel closed built-up beams. Many other studies have been conducted on the CFS beams design using DSM such as Kyvelou et al. study [114], Camotim et al. study [107], etc.

- Columns:

Martins et al. [104] proposed an efficient design approach based on DSM in order to investigate the L-D interactive failures of columns. It was also indicated that the distortional design curve of DSM, which is currently codified, can adequately predict the failure loads of columns which subjected to secondary local bifurcation L-D interaction (SLI).

Roy et al. [115] conducted a comparison between the column strengths (back-to-back CFS channel sections) and the design strengths calculated using the Direct Strength Method, AISI & AS/NZS, and Modified Direct Strength Method. Both the experimental and FEA results were higher by 53% than the design standards when λ_c (nondimensional slenderness) was used for calculating the design capacity of those columns.

Chen et al. [97],[116] conducted an experimental and FE study on the elliptical hollow section EHS members subjected to compression loads (no design rule is available or codified currently) (see figure 27). Modification on the Direct Strength Method was proposed in this study, aiming to predict more accurate design strength and reach more improvement of that predictions. As a result, the adoption of the Modified Direct Strength Method design equations to predict the nominal strength of CFS columns with an elliptical hollow section and pin-ended support, and they buckled about the minor axis.

Also, Cai et al. [117] conducted an investigation to design the columns with steel elliptical tubular stub sections. The results showed conservative and reliable values of the strengths, which were predicted by the Modified DSM and

DSM. The Modified DSM provided the smaller scattered and higher accurate predictions over all of these design methods. Therefore, the Modified DSM is mostly recommended in order to design the CFS and HFS (hot-rolled steel) elliptical tubular stub columns.

7.2.2 Seismic Design of CFS structures (Shear walls, Portal Frames):

Generally, the CFS structural systems are used for mid-rise and low height constructions. Shear walls are used in the design of CFS-framed buildings for providing the resistance of seismic or wind loads. From the viewpoint of structural systems properties, CFS-framed shear walls are considered as small systems. However, various studies have been conducted recently to investigate the reliability of CFS-Framed shear walls -for steel structures-in general and CFS structures in particular.

Bian et al. [118] examined the reliability of CFS framed shear walls sheathed with wooden panels. Chung et al. [119] provided modern design and analysis techniques as well as guidelines with practical consideration to investigate the performance of CFS structural systems.

Xie et al. [76], conducted an experimental investigation on CFS shear walls with self-drilling screw connections. They concluded that there is an ability to use the safety factor and resistance factor proposed in AISI (Lateral Design Standard) to design the CFS shear wall with SPR connections for both wind load and seismic load. Jun et al. [51] also investigated an efficient design of CFS frames for earthquake resistance through bolted-moment connections. Also, Shahinia et al. [49] clarified that the DSM could be used to predict an appropriate initiation level for the connection slip moment before introducing the beam buckling moment, particularly in seismic areas. Furthermore, Jun et al. [50] improve the cyclic response of CFS connections subjected to strong earthquakes by identification of the best design configurations.

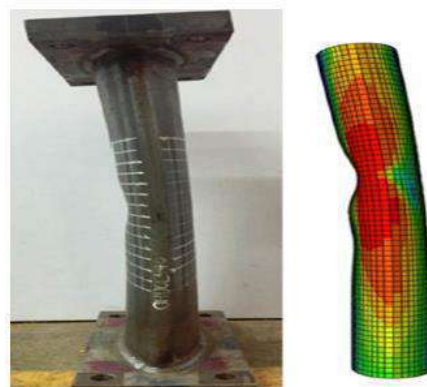


Fig.27: Failure mode of EHS.

Source: Reference [97]

VIII. OPTIMIZATION:

Higher load carrying capacities of the CFS sections can be achieved due to the flexibility of the CFS cross-sectional shape resulting in more efficient members. Therefore, more economical and sufficient design can be obtained by applying the optimization process on the CFS sections. However, the challenges of design issues of CFS elements with buckling behavior (local, global, distortional) can lead to a complex optimization task. Several studies suggested and applied many methods aiming to obtain the optimum design solutions of CFS structural members, for example:

Parastesh et al. [120] used the Genetic Algorithm in order to present a practical optimization method for symmetric CFS beam-column elements. In this study, they investigated the effect of element length (short, long, intermediate beam-column) on the optimization results. The results showed that better design solutions are not necessarily obtained from more complexed shapes. Generally, when the distortional buckling mode is predominant, then increasing the eccentricity will lead to more spread optimum sections, particularly in short and intermediate-length beam-columns elements.

Wang et al. [121] developed an evolutionary algorithm by introducing manufacturing constraints for the optimization of CFS shape profiles. The algorithm considered as “self-shape optimization,” and it uses the Augmented Lagrangian together with the Genetic Algorithm (GA). Column lengths range from (500mm) to (3000mm) were used as well as various numbers of roll-forming bends were investigated and optimized to obtain the optimum cross-sections. The results showed that the effect of introducing manufacturing constraints into shape optimization algorithm is not so essential from the viewpoint of the performance of the resulting section. Also, there was a similarity in the manufacturable cross-sectional shapes.

Wang et al. [122] used Augmented Lagrangian Genetic Algorithm (GA) to optimize the cross-sectional shape of open-section, singly-symmetric, and simply-supported CFS beams and beam-columns elements. No constraints of manufacturing are used. This study optimized beams which are unrestrained or fully restrained against twist and lateral deflection, as well as optimization of unrestrained beam-columns elements is conducted. The results showed that the shape optimization of CFS beam-columns or beams elements depending on the unconstrained algorithm leads to obtain cross-section that can freely be able to converge to any shape.

Mojtabaei et al. [123] studied the optimum design of CFS sections of beams by developing a practical methodology

depends on Population-based Big Bang-Big Crunch method with simultaneously maintaining the following conditions: 1. maximum flexural strength, 2. minimum deflection under ultimate and serviceability load, 3. consider the manufacturing and end-use design constraints in Eurocode. It is shown that the optimized sections depending on serviceability limit state (SLS) can provide up to 44% higher effective stiffness, and the ultimate limit state (ULS) can provide up to 58% higher value of bending moment capacity after comparing with a standard lipped channel beam section with the same plate thickness and width.

Jun et al. [124] used the Particle Swarm Optimization method to optimize different prototypes of the CFS channel section, and the optimization process was with respect to their flexural strength. Particle Swarm Optimization method was determined in Eurocode 3 (EC3) part 1-3, the provisions which were based on the effective width method. From the results, if the material amount is not changed, then the optimum sections provided up to 25% more flexural strength laterally braced CFS beams and 75% more flexural strength for the unbraced beam while they also satisfied the constraints of design and manufacturing.

Li et al. [125] proposed a two-level optimization framework in order to decrease the weight of CFS lipped channels and produce a family of light channels with the minimum number of independent cross-sections. The optimization efforts are expanded to a wide set of axial (P) and bending (M) demands against distortional and local buckling modes only. While Madeira et al. [126] investigated the optimal design of CFS columns to maximize both the local-global and distortional buckling strengths. The optimization problem was solved by using the method of Direct Multi-Search (DMS), where there are not any derivatives of the previous objective functions. Results showed the decreasing in maximum distortional strength due to the maximization of local-global strength.

IX. CONCLUSION:

Significant developments continue to take place in the structural use of Cold-Formed Steel, and many types of research have been growing rapidly across the world revealing the importance of CFS structures with respect to various engineering viewpoints. As this extensive research lead to more understanding of the CFS behavior, efficient design, perfect manufacturing, applications, and improving the design codes, therefore the authors of this paper aimed to review most of the studies conducted on the CFS members recently related to many disciplines which

mentioned before. This paper showed the features of the CFS structures, and it is very useful for interested researchers, designers and students who need to discover many aspects of CFS to get the last updated references. Despite all the advantages of this comprehensive review, but the authors strongly recommend to accomplish more reviews that might have deep details about the CFS structures in general and CFS members in particular, such as special reviews about the CFS manufacturing, connections, behavior, design, and many other important issues. Therefore, if these reviews conducted, it would improve the understanding of each point related to CFS and link many ideas that have been published separately to build more worthy guidelines about the CFS design for higher codification.

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Leprosy in minors under 15: incidence and characteristics of reported cases in the State of Pará in the period 2005 to 2013

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Abstract— *Objective: To describe the incidence and characteristics of leprosy in children under 15 years of age of the cases reported in the State of Pará, Brazil from 2005 to 2013. Method: The descriptive study, with a quantitative approach, was carried out based on data from the Acute Notification Information System, provided by the State Secretariat of Public Health. In the period studied, 4,251 cases of leprosy were reported in the state of Pará in children under 15 years of age, with an annual average of 472.3 cases/year. Results: There was a 15% decrease in the incidence of leprosy in the state, from 24% new cases/100 000 in 2005 to 20.4% new cases/100 000 in 2013. The year with the highest incidence of the disease was 2005 (24/100,000 inhabitants) and the year with the lowest incidence was 2010 (17.1/100,000 inhabitants); most cases were observed among men (52.2%) and individuals with brown skin color (68.9%), living in urban areas (72%), with indeterminate form (35.5%), followed by dimorph (30.1%), with most cases with negative smear (10.3%), zero degree of physical disability (79.5%) and with the appearance of single lesions (44.9%). 2,552 patients (60%) were classified as paucibacillary. Most of the investigated cases did not have nerves compromised by the disease (87.5%). Despite the decrease between the period studied, the incidence of leprosy in children under 15 in the state of Pará is still considered very high. Conclusion: It is necessary to decentralize the care of the disease carrier by implementing prevention activities (primary, secondary and tertiary) and control, training of family health strategy teams and more efficient coverage of health services.*

Keywords— *Leprosy; Mycobacterium leprae; Epidemiology; Minors.*

I. INTRODUCTION

Leprosy is a slowly evolving infectious disease caused by *Mycobacterium leprae*, which has tropism through the skin and peripheral nerves, being the only species that infects Schwann's cells (Silvestre & Lima, 2016). Its incubation period varies from 2 to 10 years, and the main transmission and contamination routes by the bacillus are the upper airways. The diagnosis is based on a classification that takes into account the patient's history

and living conditions, the number of skin lesions and clinical-laboratorial exams (Lastória & Abreu, 2012).

Among the examinations performed are a) dermato-neurological examination to identify lesions or areas of skin with altered sensitivity and/or involvement of peripheral nerves; and b) smear examination, which analyzes the intradermal scrape smear of suspected lesions or obtained from the ear, knee or elbow lobe, stained by

the Ziehl-Neelsen technique (Ministério da Saúde Brasil, 2010a).

Within clinical aspects, the disease causes skin blemishes with loss of local sensitivity and neural involvement. Currently there are three forms of classification of clinical manifestations of the disease: Madrid Classification, Ripley-Jopling Classification and the Operational Classification (C. S. Souza, 1997).

It stands out for early diagnosis, with the aim of starting therapy as soon as possible and preventing disabilities. Currently, the Operational Classification is adopted, which summarizes the clinical characteristics in: a) Multibacillary: patients with more than 5 lesions and/or more than one affected nerve trunk; patients with positive smear, regardless of the number of lesions and b) Paucibacillary: patients with up to 5 lesions and/or only one affected nerve trunk (C. F. D. Souza et al., 2010).

If left untreated, in the long run, the disease can generate anatomical and physiological deformities. Depending on the degree of deformity, leprosy may generate irreversible physical disabilities, i.e. permanent damage that may impede the basic and economically active functions of affected individuals (Sobrinho, Mathias, Gomes, & Lincoln, 2007).

Physical disabilities are classified in grades I and II: a) Grade I: loss of protective sensitivity (upper and lower limbs, eyes); b) Grade II: lagophthalm and/or ectropion, trichiasis, central corneal clouding and reduction of visual acuity, lesions on hands and feet (Haefner et al., 2017).

Due to these characteristics, in Brazil leprosy is considered a bill of review in the list of diseases that are compulsorily notifiable throughout the country and compulsory for research. All diagnosed cases must be notified through a notification and investigation form of the Aggravated Notification/Research Information System (SINAN)(Ministério da Saúde Brasil, 2016).

This rigour in leprosy surveillance is due to its great disabling potential, but is still recurrent in developing countries, such as Brazil, ranking second in absolute number of leprosy cases in the world, second only to India and concentrating 80% of cases on the American continent (Vieira, Aragoso, Carvalho, & Sousa, 2014).

For this reason, in the search for ways of eradicating this bill of review in its various federal units, the Ministry of Health (the highest body in the Brazilian Unified Health System) created the National Leprosy Programme and an Elimination Plan, in which it made a commitment to eliminate leprosy as a public health problem by the year 2015, with a target of reaching less

than 1 case per 10,000 inhabitants (Ministério da Saúde Brasil, 2010b).

Although there are specific public policies and records of continuing decreases in the prevalence and detection coefficients of new cases of leprosy, some regions still call for intensified action to eliminate the disease, this is the case in the North, Northeast and Centre-West regions (Ribeiro, Silva, & Oliveira, 2018).

The states of these regions most at risk for leprosy cases are: Mato Grosso, Pará, Maranhão, Rondônia, Tocantins and Goiás. These areas are justified by a pattern of high endemicity and are considered important in the maintenance of disease transmission, especially in the state of Pará, which ranks first in the national ranking of new cases of the disease (Magalhães & Rojas, 2007).

Data obtained from Sinan over the last ten years show that 50,491 cases were reported in Pará, of which 5,287 were new cases of the disease in children under 15 years of age, which draws the attention of health authorities because it is an indicator of active transmission circuits (Ministério da Saúde Brasil, 2017).

The appearance of the disease among children under 15 is related to the fact that they live in the same physical space as the bearer of the Hansen's bacillus for a long period of time. The carrier of the disease becomes a communicant, and it is essential to break the chain of transmission of the disease through early diagnosis and treatment (Freitas, Xavier, Cortela, & Ferreira, 2018).

In order to reduce this reality, the National Leprosy Control Programme (NLCP) of the Secretariat of Epidemiological Surveillance/Ministry of Health, adopts the reduction of cases in children under 15 as a priority, considering it an indicator of leprosy in PAC More Health (Brasil, 2010a).

SecondBrasil, (2010b), "The detection of cases in this age group is related to recent disease and active transmission outbreaks and its epidemiological follow-up is relevant for leprosy control.

In this sense, this article aims to describe the incidence of leprosy in children under 15 years of age and characterize the cases notified in the State of Pará from 2005 to 2013, and thus contribute to the surveillance of this bill of review in the Amazon region.

II. METHOD

This article is a descriptive, quantitative approach study carried out with data on reported leprosy cases in the State of Pará during the period 2005 to 2012. Data from the Acute Notification Information System (SINAN) and

the results of official statistical studies, provided by the Secretary of State for Public Health (SESPA).

The calculation of the incidence of leprosy per 100,000 inhabitants/year was based on the absolute resident population of the state, estimated by the Brazilian

Institute of Geography and Statistics Foundation (IBGE, 2010). And we consider the parameters established by the Ministry of Health in Chart 1 (Ministério da Saúde Brasil, 2009).

Chart 1 - Parameters inserted in the Programming of Priority Health Surveillance Actions to obtain epidemiological and operational indicators of leprosy in Brazil.

Detectioncoefficient in < 15 years	General population detectioncoefficient	% physical incapacity assessment	% assessment grade 2 of physical incapacity	% of contactsexami ned	% cure in cohorts
Hyperendemic: ≥ 10/100.000 hab.	Hyperendemic: ≥ 40/100.000 hab.	Good: ≥ 90%	High: ≥ 10%	Good: ≥ 75%	Good: ≥ 90%
Too high: 5 a 9/100.000 hab.	Too high: 20 a 39,99/100.000 hab.	Regular: 75 a 89,9%	Middle: 5 a 9,9%	Regular: 50 a 74,9%	Regular: 75 a 89,9%
High: 2,5 a 4,99/100.000 hab.	High: 10 a 19,99/100.000 hab.	Precariou: < 75%	Low: < 5%	Precariou: < 50%	< 75%
Middle: 0,5 a 2,49/100.000 hab.	Middle: 2 a 9,99/100.000 hab.	-	-	-	-
Low: < 0,5/100.000 hab.	Low: < 2/100.000 hab.	-	-	-	-

Fonte: Brasil (2009).

hab: Inhabitant.

The variables studied were the same as those considered by the Ministry of Health of the Sinan Leprosy Investigation and Notification Form:

- sex (male or female);
- race/color (brown, white, black, yellow or indigenous);
- residence area (urban or rural);
- clinical form of the disease (undetermined, tuberculoid, dimorphic or virchowian);
- classification of infection (paucibacillary or multibacillary); skin smear (positive or negative);
- degree of physical incapacity (degree 0, I or II);
- diagnosticyear;
- number of cutaneous lesions and nerves affected;

The descriptive analysis of the data was performed in Epi Info 3.5 and Microsoft Excel 2010

programs, and because it was secondary data in the public domain, the study did not need to be evaluated by the Research Ethics Committee according to the National Health Council Resolution number 466/2012 (Ministério da Saúde Brasil, 2012).

III. RESULTS

In the study period 2005-13, 4,251 cases of leprosy in children under 15 years of age were reported in the state of Pará. These results represent an annual average of 472.3 cases (standard deviation of 69.9 cases).

In the study period considered, there was a 15% decrease in the incidence of leprosy in the state, from 24% new cases/100,000 inhabitants in 2005 to 20.4% new cases/100,000 inhabitants in 2013.

The year with the highest incidence of the disease was 2005 (24/100,000 inhabitants) and the year with the lowest incidence was 2010 (17.1/100,000 inhabitants), according to Figure 1 and Table 1.

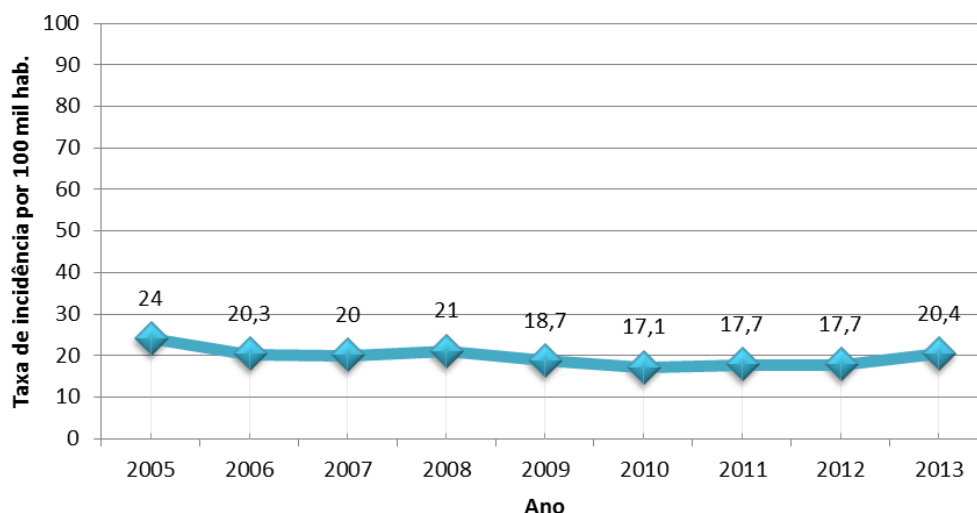


Fig.1: Incidence of leprosy cases reported in Pará, 2005 to 2013.

Incidence rate per 100,000 inhabitants.

Table 1 - Number of cases detected, estimated population living in the state of Pará and detection rate of leprosy patients, by year, 2005 to 2013.

Year	Number cases	of Population	Detection rate % (Per 100,000 inhabitants)
2005	625	2.421	24,0
2006	536	2.427	20,3
2007	478	2.367	20,0
2008	499	2.346	21,0
2009	442	2.400	18,7
2010	404	2.279	17,1
2011	425	2.288	17,7
2012	384	2.242	17,7
2013	458	2.242	20,4
Total	4.251	21.125	19,6

Most cases were observed among men (52.2%) and individuals with brown skin color (68.9%) living in the urban area (72%), with indeterminate form in 1,513 (35.5%) followed by dimorph in 1,282 (30.1%) of the disease, were classified as paucibacillary 2,552 (60%). Most of the cases had a negative smear with 440 (10.3%), with zero degree of physical incapacity in 3,385 (79.5%). In this study, most of the cases investigated did not have nerves compromised by the disease 3,723 (87.5%) and with the appearance of single lesions 1,911 (44.9%).).

Table 2 - Distribution of socio-demographic characteristics and clinics of individuals with leprosy (n=21,125) in Pará, 2005 to 2013.

Variables	n	%
Sex		
Male	2.221	52,2
Female	2.029	47,7
Race/color		
Ignored	99	2,3
White	580	13,6
Black	544	12,7
Yellow	57	1,3
Brown	2.934	68,9
Indigenous	37	0,8
Area of residence		
Ignored	323	7,5
Urban	3.064	72
Rural	844	19,8
Periurban	20	0,4
Clinical form		
Ignored	190	4,4
Undetermined	1.513	35,5
Tuberculoid	893	20,9
Dimorpha	1.282	30,1
Virchowiana	258	6
Unclassified	115	2,7
Classification		
Ignored	3	0,07
Paucibacillary	2.552	60
Multibacillary	1.696	39,8
Degree of physical incapacity		
Ignored	59	1,3
Degree zero	3.385	79,5

Degree I	446	10,4
Degree II	110	2,5
Number of nerves affected		
0 Nerves	3.723	87,5
1 to 3	392	9,2
4 to 6 Nerves	109	2,5
7 to 9 Nerves	24	0,5
10 and more Nerves	3	0,3
Number of cutaneous lesions		
Informed 0 or 99	132	3,1
Single lesions	1.911	44,9
2-5 lesions	1.465	34,4
>5 llesionsesões	743	17,4
Bacilloscopy		
Positive	258	6
Negative	440	10,3
Total	4.251	19,6

IV. DISCUSSION

Brazil is the largest culprit for leprosy endemic in the American continent, being the only country in the Americas where the bill of review is considered endemic (Vieira et al., 2014).

Due to this large number of infected people, leprosy is considered a public health problem in Brazil, and the state of Pará is specifically hyperendemic for this disease, which led this study to be carried out to evaluate the incidence and characteristics of reported cases in the period 2005 to 2013.

Among the results found was a decline in the incidence of leprosy in children under 15 (15%), from 24% of new cases/100,000 in 2005 to 20.4% of new cases/100,000 in 2013.

Studies have shown that in 2011 alone, Brazil had a new case count of 20.56 cases/100,000 inhabitants, and the northern region had the highest incidence among states, with a higher rate than the national one, the state being classified as hyperendemic for leprosy (V. F. M. de Souza, Silva, Valle, Obadia, & Daxbacher, 2011; Vieira et al., 2014).

In relation to the sex of the minors affected, the results showed a small difference between the male sex 52.2% and the female sex 47.7%. Studies of Moura, Fernandes, Bastos, Luna, & Machado, (2013) revealed a higher percentage of cases among females, cases were detected in 61% of female children and 39% in males.

Other studies collaborate with this result by stating that there are no differences according to sex in relation to children, and that these findings show that the

disease is not related to genders, but rather to the risk of exposure to the causative agent (Ferreira & Alvarez, 2005; Imbiriba et al., 2008).

For Arantes, Garcia, Filipe, Nardi, & Paschoal, (2010), the carelessness that men have with their health can also be considered as a risk factor, since men seek little for medical treatment and routine examinations, unlike women, who in addition to the concern with health, perform examinations periodically, in addition to paying more attention to physical and personal appearance.

In relation to race/color, 68.9% of the cases occurred among minors with brown skin, 13.6% among whites and 12.7% in blacks. Study of Santos, Castro, & Falqueto, (2008) identified in its discrete sample a predominance of the brown race 38.9% followed by 37.8% of the black race. These results are in accordance with the 2010 Census data, which found a higher concentration of blacks and browns in the North and Northeast.

Another finding of this study is that the majority of leprosy cases occur in children under 15 years of age living in urban areas and their peripheries (72%). This may be related to the fact that a large part of the population of the State of Pará is still concentrated in these areas, occupying irregularly the spaces, living without housing conditions and physical structure, conditioned by precarious places of basic sanitation, domestic waste collection, also without access to potable water, education and quality information.

A study conducted by Sousa et al., (2013) in the municipality of Ananindeua Pará, revealed that the large number of students diagnosed, came from an area of occupation with or without any sanitary conditions, whose constitution were poorly ventilated residences, small and very close to each other, facilitating the transmissibility of the Hansen's bacillus.

In this perspective, people in unfavorable socioeconomic conditions, with low quality of medical services and residing in places with agglomerations, are possibly individuals at higher risk of acquiring infectious diseases. Still according to the author, this risk is observed in most families that were located in regions of greater social exclusion, who lived in houses with little lighting and ventilation, these factors and conditions being favourable to the spread and transmission of leprosy bacteria (Lopes & Rangel, 2014).

As for clinical aspects, the most reported form was the indeterminate form (35.5%) followed by the dimorph (30.1%), where what was expected would be the indeterminate form followed by the tuberculoid. In the classification of lesions regarding appearance and distribution, the paucibacillary form was the most evident

(60%), with multibacillary being present in 39.8% of cases. Therefore, most of the cases found in Pará between 2005 and 2013 were the indeterminate-paucibacillary and multibacillary dimorph.

According to a study of Sousa et al. (2013), The predominance of the paucibacillary form may indicate that activities for the early diagnosis of new cases are being applied rapidly. The occurrence of clinical forms in this sequence was found in the study of Ferreira e Alvarez (2005), although indeterminate forms of paucibacillary tuberculoid are expected in children.

Vieira et al. (2014) states that MB-shaped individuals have a high spread rate of *Mycobacterium leprae* due to a high load of Hansen's bacilli and can eliminate it in the environment, unlike patients with undetermined forms and tuberculoid.

In a study carried out by Alencar et al. (2008), The clinical form of tuberculoid was the most frequent up to 50% of cases detected in 2006. Unlike the study by Ferreira e Alvarez (2005), who found 56% of patients with the dimorphic form, followed by the undetermined with 30.8% and tuberculoid with 13.2%.

Although the results indicate that the paucibacillary form is the most common incident (60%), the presence of multibacillary case reports in children (39.8%) cannot be considered common, in fact it serves as a warning to local authorities, since multibacillary forms are considered the most contagious and incapacitating. Arantes et al (2010) suggests in its studies that special attention should be given to these children, since multibacillary cases have a 65% chance of developing deformities, especially if changes in neurological functions are identified at the time of diagnosis.

This result suggests neglect of disease control and combat activities in the state of Pará, with regard to the active search for new cases and examinations of its communicators or intradomicile contacts, contributing to the maintenance of the transmission cycle. According to Ferreira e Alvarez (2005), the fact that 62.0% of the cases in its study have intradomicile contacts with leprosy history, is due to the performance of the team of professionals working in the control of the disease in the studied municipality, seeking not only to diagnose the new cases, but also to seek and examine the communicators of these patients, thus preventing the growth of the transmission chain.

As a consequence, permanent sequelae, measured by the degree of physical disability that the disease causes, emerge. In the present work, 79% of the cases were grade 0 and 10.4% grade I, in 7.2% of the cases the physical disability of the patients was ignored or not evaluated.

Imbiriba et al, (2008) states that this is due to the presence of evaluation errors, lack of important records in the medical records and notification forms, or even the absence of qualified professionals in the patients' care units.

Thus, although the proportion of cases of physical disability is not high, it is necessary that this characteristic be recognised as one of the main causes of the stigma process of leprosy in every parent, as the sequelae can damage the lives of these minors with regard to social coexistence and development (Morgado et al., 2017; Santana et al., 2018).

Regarding the number of nerves affected, 87.5% of the cases had no impairment, and only 12.27% had some impairment. The same can be observed in relation to skin lesions, where 44.9% of the individuals had a single lesion, 34.4% with 2 to 5 lesions, and 17.4% with more than 5 lesions. According to a study by Sousa et al, (2013), all data are significant within a studied population, provided that the coefficients used by the National Plan for Control and Elimination of Leprosy, which says about the high endemicity of less than one case /10,000 inhabitants, are considered (Ministério da Saúde Brasil, 2010b).

Therefore, in this study, the state of Pará presented a mean incidence coefficient in children under 15 of 19.6/100,000 inhabitants, according to the data collected, evidencing the need for greater attention from health teams and greater preparation to fight the disease in children.

Ferreira & Alvarez (2005) affirms that it is necessary to decentralize the care of the leprosy carrier, taking the care to more distant regions, training and capacitating new teams of the family health strategy, together with other professionals who work in the municipalities, in order to diagnose and treat these minors early, thus avoiding the growth of the number of cases of the disease in the polarized forms in minors in this age group.

It is believed that the number of leprosy cases in children under 15 is even higher due to under-notification. To Rocha, Lima, Stevens, Gutierrez, & Garcia, (2015), procedures for correcting and updating data in information systems are important as this contributes to the improvement and quality of the information available, especially in cases of leprosy, where the disease is complex and needs follow-up and reliable information.

The author also states that "although discharge is considered at the end of treatment, attention should be broader and incorporate aspects related to disabilities, transmission and occurrence of reactions".

Thus, despite the major public health problems in the state of Pará, this study reveals a drop in the incidence of case numbers of the disease, showing that there has been an advance in the interruption of active transmission circuits, made possible by public health policies aimed at epidemiological control and prevention of new cases.

V. CONCLUSION

The present study showed a reduction in the incidence of leprosy in children under 15 in the state of Pará. Among the characteristics of the cases reported, the most frequent were: most of the cases in males, in grizzly individuals, living in the urban area, with the clinical forms undetermined and dimorphic, classified as paucibacillary, without physical disabilities (grade zero) and with predominance of single lesions and without nerves compromised by the disease.

Therefore, it is necessary to decentralize care to the bearer of the disease by implementing prevention activities (primary, secondary and tertiary) and control, training of family health strategy teams and more efficient coverage of health services.

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The Change of Education with the technology Advancement

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Abstract— With the innumerable changes in the knowledge and technology society resulting from the emergence of the Internet, various communities have emerged and information has been democratized and knowledge better distributed. Technology has advanced so far as to invent the e-book reader. Note the influence and gain with the features that this support offer the user (student), tablet, compared to the printed book. Explain about the influence of this device within the classroom. It showed how coexistence of the two is possible and acceptance and satisfaction by students and readers. In discussing this subject it was observed that both the printed book and the new technologies trends have guaranteed space within the educational environment the tablet and the printed book will walk their paths in parallel without a determined time to their end. The work was not only limited to the printed and digital book but also extended and sought other knowledge gaps, systematization of data and sectoral information. With a brief profile of the book publishing industry and its economic dimensions.

Keywords— Digital Books. Technology. Tablets Printed book.

A Mudança da Educação com o Avanço da Tecnologia

Resumo— Com as inúmeras mudanças na sociedade do conhecimento e tecnologia decorrente do surgimento da Internet, surgiram várias comunidades e a informação foi democratizada, e o conhecimento melhor distribuído. A tecnologia avançou de tal maneira, ao ponto de inventar o leitor de livros eletrônicos. Nota-se a influência e o ganho com os recursos que este suporte oferecer ao usuário (aluno), tablet, com relação ao livro impresso. Explana sobre a influência deste dispositivo dentro da sala de aula. Mostrou como é possível a coexistência dos dois e aceitação e satisfação por parte dos alunos e leitores. Ao discorrer sobre este assunto foi observado que tanto o livro impresso quanto as novas tendências tecnológicas possuem espaço garantido dentro do meio educacional o tablet e o livro impresso trilharão seus caminhos paralelamente sem tempo determinado para o seu fim. O trabalho não se limitou apenas ao livro impresso e digital mais também estendeu e buscou outras lacunas de conhecimento, sistematização de dados e informações setoriais. Com um breve perfil do setor editorial de livros e de suas dimensões econômicas.

Palavras-chave— Livros digitais. Tecnologia. Tablets. Livro impresso.

I. INTRODUCTION

Recent studies point to the lack of a technical and pedagogical training work for teachers, so that it interferes positively in their practice, thus making it clear that continuing education is much more dependent on personal mobilization than on investment.

Between 1992 and 1995 there was a growing recovery of the national economy with the partial creation of new jobs with specialization: public administration, education, commerce and services. Hiring the formal

employment level targeted the dismissal of less qualified employees.

Professional and technological education has generated several modalities of construction of the educational process in its core, but the essential formation has as preponderant element the full exercise of citizenship, thus contributing to its progression in the work.

In this sense, there is a permanent need to seek mastery of stable scientific and technological principles,

enabling lifelong education, resulting in an acquisition of fundamentals and different forms of work, unifying thinking and doing in the construction of intelligent and productive activities.

With the new technologies: informatics, telematics and industrial automation, they reconfigured the labor market, causing a change in the profile of the workforce and, on the other hand, unemployment and informality.

Information and communication technologies (ICT) that have been revolutionizing the world and causing rapid and profound change in society. These change processes include the world of education, the school and its key members: teachers, students, pedagogical coordinators and principals. As a result, new ways of thinking and living with school-wide technologies are being discussed at the government, academia and industry levels.

Therefore, it is the function of the school to be in constant movement of updating, with the critical eye focused on the training of its teachers, not only on the ability of interaction or formal knowledge.

Thus, eager for new methods and techniques, teachers look for training courses; Such training needs are related to the stage of cognitive, moral and personal development.

The theme to be addressed is very broad, thus, it is based on the formation of teachers with a new perspective of continuing education for teaching practices. It will seek to refer to theoretical production in authors guided by historical materialism as a direction in scientific production.

The discussion about research in the field of education, in the last decades has reached a great development, considering that one of the ways for the advances as a practice inherent to nature, allowing in the process of teaching and learning a greater articulation of knowledge.

It is for this purpose that the study will present as a research method the literature review carried out from the available literature on the topic of interest.

II. CHANGE IN SCHOOLS WITH TECHNOLOGICAL ADVANCEMENT

We are at a convenient time and it is worth rethinking Brazilian education at all levels, whether private or public institutions. Seeking to reverse the backwardness of many schools, the federal government launched the program "Digital Education - Policy for interactive computers and tablets", aiming to provide training facilities for teachers and managers of public schools with

the intensive use of information and communication technologies. Communication. According to news from the website of the Ministry of Education, the use of tablet in public schools will start by high school teachers, (598,402 teachers).

With new resources, those responsible for the guidelines that guide the teaching methods in our country believe they provide better conditions for teachers to teach more attractive classes for teens, and prepare them for a better future.

2.1 Teaching technology learning

Despite the pros and cons of using the digital book, the reality is that new teaching resources are available to teachers and students. Based on this principle, the coexistence between the multiple forms of writing and reading is essential.

Chartier (1998) reports that digital media can be linked proposals to maintain written culture with strong educational commitments. "In addition to learning aids, technology circulates texts intensely, openly and universally and, I believe, will create a new kind of literary work or story. Today we have three forms of production, transcription, transmission of text: hand, print and electronic.

The easy access of people in general, including educators, with digital texts these days, often even in the preschool phase. Also according to Chartier (1998), it is worth noting that, "we must take advantage of the new possibilities of the electronic world and at the same time understand the logic of the other form of writing production that brings the reader tools to think and live better".

2.2 The electronic book

To Cunha Cavalcante (2008) the electronic book has several terms e-book, electronic book, interactive book and multimedia book, which represents the book in digital format, and can be read on computer or special device.

The evolution of digital technologies emerged very fast and in the universe of printed books incorporated into the digital universe, giving way to electronic books.

As reported by Mesquita (2008, p. 3), in 1998 the first digital reading devices were launched, which are called e-books, reader device. These devices "allow these books to be read on a portable, high capacity storage liquid crystal flat screen." These devices have several features that differ from the printed book, such as pagination and appropriate reading light. Another mechanism used for reading is the computer monitor screen. Lately many

people have downloaded books and read through the screen of their own computer or notebook.

According to philosopher Lévy (2003, p. 11), “the reader of a book or paper article is confronted with a physical object about which a certain version of the text is fully manifest”. As the digital text does not have radically visible borders, but possibilities to mix, cross, gather texts that are inscribed in the same memory.

The printed book also has a concrete space of information. However the digital book beyond the paper economy ensures agility regarding content updating. Not to mention that the hypertext and interactivity contained in this format allows navigation in any direction, opening new personalized horizons of reading and interaction.

According to Fitzsimmons (2011), the internet provides powerful tools for many educators. Children who studied at home were rather limited by the walls of these houses. They had pencils, paper and textbooks and little else, except perhaps for an occasional local study trip. The internet has put the world at the fingertips of these young people, they can make virtual trips to foreign lands, interact with others and access the latest information on advances in any field of study or interest.

2.3 Digital Book Reader –Tablet

Since the Gutenberg Bible, which marked the beginning of mass production of printed books in the fifteenth century, and the arrival of desktop publishing in the 1980s, the publishing market had not undergone a transformation like now with the emergence of tablets. The launch of the first iPad in mid-2010 marked the beginning of this new era. The Apple tablet was not the first to be invented, but it was responsible for popularization and was imitated outside the world.

E-readers (digital book readers) have been around for over a decade, with the sole function of displaying static, black-screen and bank texts, but a positive factor of e-readers is that it allows them to add at the same time, being able to read, view images and hear sounds. These devices have an audio reading system for electronic text, which allows people with accessibility to understand the text in the case of poor vision, tired eyesight or completely sightlessness.

The tablet as a device for reading digital books and magazines stands out with its color, touch-sensitive screen, brightness control and interactive graphics capabilities for readers.

2.4 Advantages and disadvantages

Tablets are similar to laptops, use a pen for input, are mobile can take note, draw directly on the screen, can convert handwriting to text, this is a breakthrough compared to the laptop. The student can take to a class in the field. Holds and stores multiple books is lighter and less spacious, its battery lasts approximately 10 hours (triple a notebook).

Disadvantage, it has no CD or DVD player, has a space limit and cannot be modified, does not support heavy software tasks, and for some readers, the small screen reading becomes tiresome.

Even with these small obstacles, school tasks have become more fun, fun and practical with the support of a tablet. With a few clicks, students will have access to the required content and a plethora of extra content at any time, no longer having to travel to the computer lab.

2.5 Technology in the classroom

With the change in teaching materials, students' skills will change as well, students of the future will be creative people. At the same time, they will be able to concentrate more, for that it will be necessary to balance both aspects: the immensity of available information, collaboration and contacts, with the capacity of planning, project execution, mental discipline and concentration.

According to Moran (2013) and Bacich; Tanzi Neto; Trevisani(2017), they agree that teachers can use technologies in their disciplines or areas of activity, encouraging students to be producers and not just recipients. They can make content available in virtual learning environments to feel free from the monotonous, repetitive, tiring, and unproductive task of speaking and writing the same subjects for different classes and focusing on more creative and stimulating activities such as mentoring. , ask questions, deepen the basic information acquired and contextualize it. The technologies that unleash the most repetitive tasks, thus allowing concentration on the most creative, productive and stimulating activities.

III. DISCUSSION ON TECHNOLOGICAL CHANGE IN EDUCATION

School management and pedagogical coordination should ensure that teachers know how to deal with technology, and management should also be prepared for possible questioning from students' parents.

Planning is not only valid for this purpose, but for any other decision making in the individual's life or within an organization. To achieve the goals it is necessary to set goals and pass the information to all involved correctly.

According to Las Casas (2019), a vision must be established, that is, an image that the institution hopes to project in the classroom. It can start from a goal setting to be pursued. A vision to achieve optimal student performance, quality learning and understanding of the subjects given.

Tablet versus Printed Book, change often generates insecurity or resistance on the part of those involved, migration should not only be done to save paper and minimize the weight in the students' backpack. Students need to realize the importance of change and the potential of this technology in the method of pedagogical improvement. For this reason, it is essential to elaborate a pedagogical plan that captures students' attention that makes them think, question, discover new ways to study with satisfaction, considering that this tool is part of their generation and is common in their daily lives.

Follow-up is necessary so that students do not lose the main focus and purpose of the equipment.

Dispersion, when using a platform with so many audiovisuals, the student may lose focus of activities. To avoid such situation the ideal is that the teacher clearly sets the objectives to be followed by the students, a pedagogical plan that holds the student's attention.

Also according to Las Casas (2019), an institution or organization is made by people, so nothing more obvious than to implement the process through communication. The first head to make is that of top management. There is also a need for involvement at all levels. One should be concerned with the dissemination of processes within the institution.

As Corrêa (2008) reports the evolution of information technology, the physical book will no longer be sent quickly so that it reaches the deadline, reliably and in good condition, has not been substantially altered by the most contemporary information and telecommunications technologies. More why send the book physically? You can send the information-intensive content of the book and you can travel optical cables at lightning speed and at very low cost. He further states that the market for being information intensive is bound to be substantially changed in the near future.

3.1 Influence of the tablet in the classroom and aspects of improving subject understanding

To evaluate the aspects of performance within the classroom regarding the service applied in teaching and learning, so that it has more meaning, according to Corrêa (2017), it is important to observe the relevant items:

- **Access:** Ease of access. The student through technology, has the practicality to acquire knowledge and keep in touch with a universe of information, ie the world is at your fingertips.
- **Speed:** Speed to start the service. Bringing this situation to the world of technology the student will have their doubts answered in record time, even without the help of the master.
- **Consistency:** Degree of absence of variability between specification and service delivery. In the universe of the technological world there is a wide diversity of information so it is advisable to evaluate the stability, reliability of the source to be consulted.
- **Competence:** Degree of technical capacity of the organization to provide the service. In this case we visualize the figure of the institution that, when hiring the master to perform his function, was concerned to bring into the classroom a qualified teacher to clarify, assist, guide and resolve the doubts of students with competence and security of their knowledge.
- **Service:** Degree of attention given by the contact staff, willingness to understand and assist the customer. Degree of friendliness, education and courtesy of the customer contact staff.

The management of the institution must be attentive to the care of students and parents and the public in general, quality care is something that consolidates the brand of the institution, makes everyone look kindly, generated praise, crucial point for the success of an institution or organization.

- **Flexibility:** Degree of ability to change the service package to fit the customer's expectation / desire.

The institution must always be alert to what is happening in its midst, or better in the world. The institution must be ready for new challenges and paradigm shifts. This is what is currently happening with the change of educational material from print to digital, public and private institutions must train their masters to meet the new generation, with an attractive and innovative pedagogical plan.

- **Security:** Level of personal or good security of the customer who passes through the service. With regard to physical safety, the institution must ensure and inspect in advance any spaces or equipment that may cause accidents to the members of the institution and the general public. In terms of classroom service to students using technology. It is up to the direction of the

institution together with the teachers to plan, determine, delimit what should and should not be researched on the Internet, without impairing the smooth progress of students' teaching and learning.

- **Cost:** Cost to the customer of being a customer. Includes the price, but may include additional costs, such as the cost of access to the process.

The number of schools using tablets should increase considerably and in rapid steps after that. This is what private institutions expect, help with their investments by the government. ”

- **Integrity:** Honesty, sincerity and fairness with which the customer service is treated. As a service provider, its mission is to treat all citizens with respect, transparency and honesty.
- **Communication:** The ability of the service provider to communicate with the customer in a desirable way (intelligible, of adequate frequency and richness).
- **Cleanliness:** Tidiness and tidiness of service facilities.
- **Comfort:** Level of comfort offered by the service facilities.

Since staff and students spend much of their time in a classroom or other part of the establishment, it is no fairer for this institution to provide a comfortable and safe environment.

- **Quality of goods:** Quality of specification, conformity, durability and reliability of material goods that are part of the value delivered package (level of specifications itself): aesthetics, among others.

To Slack (2015), in the organization or institution, the main thing is the power to change the form of competition and, therefore, to change the priority of performance goals. Such changes may be triggered by the movements of competitors or the need imposed on society. Performance objectives are seen as fundamental points for the improvement of the services provided and, consequently, the achievement of greater competitiveness by the institution.

Know how to listen, respect the opinion of others and know how to argue to reach consensus when the points of view differ.

- **Cost:** Advantage in cost do more for less.

In everyday life it is necessary to know how to negotiate, know the product or services to make the best decision without prejudice.

Performance objectives should be pursued by prioritizing the specific needs of the institution's client groups (students) and the actions of competitors.

To Slack; Chambers; Johnston(2015), the content of the strategy is the set of policies, plan and behavior that the institution will have to follow. This strategy is about prioritizing your performance goals, project decisions, planning and control decisions.

3.2 Paperless Future School

It is important to report that countries like South Korea have one of the best education systems in the world. South Korea has succeeded in launching education based on extrinsic models (which happens when you do something because you get something in return, such as money, or because you have to do it, for example, when you have to study for an exam).

The South Korean government invests 5% of GDP in education and parents of students invest up to 20% of family income in the education of their children. The early years of primary school are a priority, a law allocates much of the resources to this stage.

Teachers are evaluated and valued, the average salary of teachers of basic education is approximately \$ 10,000. The workload, students spend on average eight hours in school. The system encourages students to seek first place and perfection.

At the moment, the digital transformation of Korean education is unprecedented, not so much because of the lack of investment by other countries, but because of their educational model.

3.3 Textbook segment

Textbooks make up the largest segment of the publishing market, accounting for more than 50% of the copies sold and revenues in the sector. Private demand accounts for approximately 30% of total market turnover and government purchases for around 20%. But in number of copies sold, the situation is reversed: the government market accounts for a third of demand, while the private market retains about 20% of the total.

The publishing segment focuses on four major publishers in the market, Grupo Abril (Ática and Scipione publishers), Santillana Group (Moderna publisher), Saraiva and FTD, these publishers along with the government, stand out as the main agents this market. Other publishers, such as Positivo, Editora do Brasil, Edições SM and Editora IBEP-Nacional, also stand out.

PNLD(2019) (in millions of copies). The sale of textbooks is determined by the choice made by the teachers, who have decision-making autonomy over books

to be adopted and used in the classroom for three years. These sales become the main focus of attention among publishers, their market reference, especially government purchases. After the publication of the results of the works selected by the Ministry of Education (MEC), Secretariat

of Basic Education (SEB) in conjunction with the National Fund for the Development of Education (FNDE) is the moment of great investment by publishers, for the dissemination of his large-scale national books (Painting 1).

Painting1 - Government sale of the textbook

Teaching stage	Benefited Schools	Benefited students	Total copies	Acquisition value
Child Education	74.409	5.448.222	646.795	R\$ 9.826.136,60
Early Years of Elementary School	92.467	12.189.389	80.092.370	R\$ 15.852.107,23
Final Years of Elementary School	48.529	10.578.243	24.523.891	R\$ 24.516.830,94
High school	20.229	6.962.045	20.835.977	R\$ 51.830.577,40
Grand total	147.857	35.177.899	126.099.033	R\$ 1.102.025.652,17

Source - National Education Development Fund Website(2019)

With complementary content and applications that add usefulness to the teaching and learning potential offered in textbooks. Among other services that publishers offer.

3.4 The book and innovation

Digital books, one of the objectives of this work was to seek to identify their presence and trajectory in parallel to the printed book, a support that constitutes their innovation resulting from technological development. The advancement of digital technology has facilitated the creation of digital content and its various reading media (e-readers, tablets, notebooks, smartphones etc.).

In the scientific, technical and professional books segment, the market is very fertile for the growth of digital book consumption, due to the greater feasibility of merging the use of e-readers and other digital content reading media among its consumers.

In the editorial segment of the textbook, innovations are inserted by demand, by market need. Innovation is introduced as supplementary support services for teachers and students, making it largely possible through the growth of technology, which allows, in this case, the use of the internet as a platform for offering these services.

3.5 Digital Book

The technology of producing printed books is widely known. The publishing industry is facing an innovation that changes the nature of its product and will impact, in various aspects, and in all activities of the production chain. Initially referred to as a digital book, or e-book, such innovation not only applies to the shift to a

new way of presenting the content of print books, but to a radical change that will impact all processes of authoring, production, publishing, distribution, consumption etc.

Publishers will continue to be managers and packers of content in the form of books - print and digital - and services, capable of meeting the demands and needs of the market. At this early stage these new product still resembles a simple copy of the printed book, scanned and displayed on monitors of different types of equipment such as computers, e-readers and tables.

3.6 Copyright

The first copyright law was Law No. 496 of August 1, 1898, and the last update of copyright law was Law No. 9,610 of February 19, 1998, which consolidated copyright law. Where it states that the author has exclusive rights to the work with a term of up to seventy years after his death. It is observed that this law may be limited in view of the current universe of technological innovations.

When it comes to publications in electronic media, "the author has the right to authorize the reproduction of his work in any way he likes, including the Internet" (MARTINS FILHO, 1998). The great difficulty of copyright in this environment is the possibility of copying and dissemination without permission of the author, which would be a scam to copyright. This is what happened with printed books when they were fully xeroxed at universities.

The most difficult control of copyright on the Internet is because this is a very vast universe with no barrier to obtaining the information. For this reason, knowing who is the author of a text or having control of illegal reproductions circulating on the Internet has made this task complex and difficult to perform.

Publishers are currently reproducing books in digital format that sell for less than the printed book, while retaining the rights of authors in general. Even so, there are still illegal reproductions circulating around the network penalizing and hindering the process of copyright control.

Throughout the course of the book and reading and writing practices, technology has played a key role. Along this path from inscriptions on clay tablets, papyrus, parchment, paper, book, computer, CD-Rom, to the emergence of the Internet and ebooks, tablet and others.

We live today in the age of the Knowledge and Information Society, with almost every function and activity of people being directly linked to the computer. It is not news that the book does not follow the same path.

At first the idea that the printed book will disappear will become extremely unacceptable. This is because the book is rooted in the culture of print and the traditional habit of the reader.

As was the case in the past when Gutenberg had no taste for handwritten text, most of which had the appearance of a manuscript, electronic book producers today are reproducing the practicalities of the printed book to the digital book.

IV. FINAL CONSIDERATIONS

The printed book has a trajectory that guarantees a high degree of reliability and stability, has the quality of the record of humanity, one of the advantages over the electronic book, since the electronic books do not guarantee the longevity of its use. But with the advancement of technology this assurance of reliability will gradually be earned by users. It is evident that the printed book will not be replaced. Given that there is room for the two to follow in parallel.

One sector of the publishing market that could be hit by these new trends will be printing. With the arrival of the digital book, another parallel competitor for digital book development emerged, it is the digital programming companies that have special platforms to work with publishers in the creation of digital books.

Regardless of the supply chain, there must be rapid reform and transformation to receive, perform and distribute these tasks as best as possible within the organization.

Publishers need to design a new layout, hire contributors to enable them for media archiving, track, revise, approve, and release for playback. It seems to be practical and simple, but in practice, it is not as easy as it seems. Files lose much of their original formatting, so flowing text books look better than those with many images. Some publishers are choosing to turn the file into PDF and then convert it to ePub format; It is still under discussion whether it would not be interesting to build a specific layout for the digital book. However, the trend in the near future is for publishers to do the entire digital book process internally, but that will require the right technology and platform.

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The use of hyaluronic acid and polymethylmethacrylate in the skin aging process in a comparative analysis (the advantages, disadvantages and adverse effects of each filler)

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Abstract— The dermal fillers are currently a modality of treatment widely sought by those who seek for alternatives to plastic surgery, to delay the signs of aging. These procedures are minimally invasive, capable of attenuating wrinkles and restoring satisfactorily facial volume, although it is imminent the possibility of finding interurrences related to the use of these materials. The present study aimed to do a bibliographical review regarding two of the dermal fillers frequently used in aesthetic medicine, namely hyaluronic acid and polymethylmethacrylate, respectively classified as biodegradable and non-biodegradable implant materials. Thus, given the particularities of the mentioned products, their general characteristics were described, as well as the comparison and discussion on the framing of these implant materials with regard to: the characteristics considered as ideal in a filler, the annual statistics related to the number of procedures, the number of complications caused by hyaluronic acid and polymethylmethacrylate according to observational clinical studies and the types of adverse effects inherent to the use of each filler studied. According to the developed bibliographical study, it was possible to verify comparatively that although there is no filler that meets all the characteristics considered as ideal, the hyaluronic acid is currently the first choice among implant materials because it presents fewer complications, which can be reversed, unlike polymethylmethacrylate, which is neither a biocompatible nor an absorbable polymer, making it difficult and/or impossible to reverse the complications.

Keywords— Dermal Fillers. Hyaluronic acid. Polymethacrylate. Complications.

I. INTRODUCTION

The aesthetic segment is constantly growing and attracts people who are looking for significant news and results. Historically, the first-choice treatment for facial aging caused by the loss of subcutaneous fat and dermal collagen was the lifting, a surgical treatment in which the spare tissue is removed in an attempt to restore the tone characteristics, promoting a younger appearance. Nowadays, thanks to technological and scientific

advances, it is possible to restore the volume of facial contours through minimally invasive aesthetic procedures, offering satisfactory results without the need of a long recovery time [1]. The aging process causes considerable dissatisfaction due to the appearance of ridges, depressions in the face, volume loss and bone remodeling. These changes turn the typical convexities of a young individual into an individual with a face that shows concave, flat shapes. This results in a distorted self-image and weakened

self-esteem, generating frustrations because there is currently an imposition on the part of society, which associates good looks with the sensation of fullness [2]. In this sense, the fillers have been gaining remarkable prominence for presenting excellent results regarding volume restoration, showing great efficacy in reducing expression wrinkles and improving facial contours, contributing to facial harmonization [3].

According to International Society of Aesthetic Plastic Surgery (ISAPS), in 2014, 20 million aesthetic procedures were performed, and Brazil ranked third in the ranking of non-surgical procedures. According to the same research, 51% of the procedures were non-surgical and the most performed were botulinum toxin and skin fillers. ISAPS pointed to botulinum toxin and hyaluronic acid filling as being responsible for 71% of the most non-surgical procedures performed during 2014 [4]. Among the main indications of fillings are: restoration of facial contour loss, treatment of furrows and expression lines, harmonization of cheeks and chin, correction of tear through, rhinomodeling, increase of lip volume, increase of volume of the middle third of the face, correction of facial asymmetry and rejuvenation of the hands [5].

The professional should have great knowledge about the materials used in the fillings, which have different origins. Injectables should be safe and have good results with a low complication rate [6]. Currently, Brazil has several options of cosmetic fillers, which are classified according to origin (animal or non-animal), duration (permanent or non-permanent) or according to source (autologous or heterologous). Although these products have a very significant safety margin, between 2003 and 2008, the Food and Drug Administration (FDA) received 930 reports of filler-related adverse effects, of which 823 were classified as severe [7].

There is still no filler considered as ideal, as some materials have disadvantages compared to others, besides the possibility of adverse effects. The only way to exclude the possibility of complications would be using the body's own tissues and this would only be possible through the cultivation of all tissues or from cell differentiation through the stem cells. It is now possible to grow artificial skin, fibroblasts, cartilage cells and stimulate the growth of blood vessels and nerves, but it is not yet possible to reproduce part of organs formed by various interacting cell types, such as the pilosebaceous system, pulmonary alveoli and endocrine glands [6]. In this paper two types of very frequently used fillers nowadays are addressed, being the hyaluronic acid (HA) and the polymethylmethacrylate (PMMA).

The HA is a type of filler classified as biodegradable or non-permanent, of moderate duration, and reabsorbed by the body within 6 to 18 months, depending on the specifications of each manufacturer. PMMA fillers are classified as non-biodegradable and cause a defense reaction in the body, stimulating fibroblasts to produce collagen to be deposited around non-resorbable microspheres, having permanent effects on the tissue where it is applied [5]. Thus, this paper aims to bring a literature review study on the facial fillers based on HA and PMMA, comparing them as to their advantages, disadvantages and possible adverse effects arising from their dermal administration.

II. LITERATURE REVIEW

A. Anatomy

According to Tamarkin (2004), the skin is basically constituted by two juxtaposed tissues, which are the epidermis and the dermis. Besides these, it is common to observe that some authors consider the stratification of the skin in three distinct layers, including also the hypodermis. The transition between the epidermis and the dermis is named dermoepidermal junction or basement membrane zone [8]. The dermis has a mesodermal origin and is about 30 times thicker than the epidermis, and can be divided into two regions: papillary, which is more superficial and reticular, which is deeper [2]. The dermis is constituted by connective tissue, containing elastic fibers, collagen and amorphous fundamental substance, besides containing blood and lymphatic vessels, nerves, cutaneous attachments and erector muscles of the hair. In addition, at this level of the skin, we also find cells such as lymphocytes, plasmocytes, fibroblasts, histiocytes, dendritic cells and mast cells [9].

B. Wrinkle formation process and its classifications

According to Guirro and Guirro (2004), the formation of wrinkles and skin ptosis begins with the loss of the natural elasticity of the integument, due to the reduction of elastic fibers, stiffening of collagen, reduction of connective tissue functions, depletion of tissue oxygenation and decreased of skin turgor. The same authors classify wrinkles as static, dynamic and gravitational. Static wrinkles are visible regardless of muscles movement and arise as a result of repeated movements throughout life, leading to fatigue in the structures that make up the skin [10].

Dynamic wrinkles, also named expression lines, are not perceived in the absence of movement and are due to the repetition of facial mimic muscle movements. Gravitational wrinkles result from facial aging, which

causes sagging skin, leading to ptosis of facial structures, most notably in the middle third, where the largest number of facial muscle groups is located, tending to suffer more intensely with the gravity action [10].

C. Skin Fillers

According to Filho (2006), there is a great demand for skin filling techniques, as they present fast and satisfactory results, with a minimum recovery time in relation to surgical interventions. The same authors mention that the indications of these procedures are directed to the restoration of the anatomical area, due to trauma and scars or signs of aging, treating grooves, superficial and deep wrinkles, depressions, sagging, loss of contour and facial volumization [11]. For Kede and Sabatovich (2015), the choice of filler should be based on the assessment of the degree of aging, age, treatment area, patient expectation, cost, material durability and professional experience with the product [12].

Vargas *et al.* (2009) emphasize that for a filler to be considered as ideal, it must offer the following characteristics: to be biocompatible, to be safe (approved by ANVISA or FDA), to be low cost, to be free of complications, to have good durability, be able to stimulate autologous collagen production, be easy to store, be simple to apply, offer no risk of migration, be free of allergenic testing prior to use and offer no potential to trigger foreign body-type inflammatory reaction. Based on the above characteristics, the ideal filler has not yet been developed [3].

D. Hyaluronic acid

Monteiro and Parada (2010) mention that hyaluronic acid (HA) is a polysaccharide that contains between 200 and 100,000 repeated units of D-glucuronic acid and N-acetyl-D-glucosamine disaccharides with molecular weight ranging from 5 (five) and 6 (six) million Daltons. These authors describe the structure of HA as a straight, unbranched chain composed of disaccharide units, that is, two polyanionic sugar molecules of D-glucuronic acid and N-acetyl glycosamine joined alternately by β 1-4 glycosidic bonds and their repeating dimers are connected by bonds β 1-3 [13].

According to Bonté and Verdier-Sévrain (2007), HA is the main component of the dermis extracellular matrix being synthesized in the fibroblast plasma membrane and released into the extracellular space soon after its production. In addition to the dermal level, this biopolymer is also synthesized in the plasma membrane of synovial, endothelial and muscle cells. The same authors state that the pattern of tissue distribution varies with age,

with the total amount of HA reduced over the years. In aged skin we found a reduction in the concentration of this glycosaminoglycan in all layers, except the papillary dermis, which maintains its concentration [14].

Oliveira (2009), HA implants may come from animal origin or from biotechnology. When the origin of the product is animal, it is obtained by extracting the rooster crest or the human umbilical cord and if it comes from biotechnology, it is obtained by bacterial fermentation process. Currently, the most commonly used type is HA of non-animal origin, obtained through culture of nonpathogenic human's bacteria, using *Streptococcus equi* or *Streptococcus zooepidermus* [15].

Antônio *et al.* (2015) point out that hyaluronic acid in vivo has a short half-life, is soluble in water and is degraded by enzymatic action by lysosomes containing hyaluronidases and by reactive oxygen species within just one or two days, which would cause a rapid deterioration of this implant if administered to the skin in its native form [1]. In order for HA to have longer lasting results, this molecule has been chemically modified and stabilized through cross-linking agents, making it less soluble, increasing its resistance and improving its mechanical and biological properties, which increases its half-life and enables its use in biomedical, pharmaceutical and industrial applications [16].

In the cross-linking process, polymeric crosslinking occurs, which is a process that increases and stabilizes the molecule through chemical modifications in the structure of HA, with the formation of cross-covalent bonds in the polymer chains of this biopolymer, involving mainly the carboxylic groups. (-COOH) and / or hydroxyls (-OH) of the backbone. Through these groups occurs the cross-linking between the chains through the addition of substances that can act as facilitators of the reaction [17].

The Food and Drug Administration (FDA) approved the commercialization of HA in 2003 and since then, this filler has gained notoriety because this material has the characteristics that are closest to those considered ideal in a filler because it is safe, easy to apply, non-palpable, non-carcinogenic, non-toxic, biocompatible, biodegradable with good durability in the implanted tissue, has no one or low ability to develop foreign body reaction and it is reversible through the use of hyaluronidase [1].

Dayan and Bassichis (2008) injectable HA is slowly reabsorbed by the tissues there are adjacent to the implant site by isovolumetric degradation. Dayan and Bassichis (2008) mention that the maintenance of volume in the areas where HA is injected is due to the arrival of water at the filling site, as the product reabsorption occurs. This hydration mechanism gives the filled skin a natural

look and the local turgor is maintained until the product is completely degraded [18].

Crocco *et al.* (2012), reports of adverse events related to HA use are rare, with cases of complications found in less than 2% of the total procedures performed. According to the same authors, complications related to HA fillings may be recent (less than 14 days) or late (between 14 days and 1 year). Among the recent adverse events can be observed: edema, erythema, bruising, infection, telangiectasis, nodules and necrosis. Late side effects may include allergic reactions, granulomas and scar hypertrophy [19]. Edema and erythema occur immediately after the procedure and are observed in most cases and tend to regress within a week. They usually occur due to local trauma and increased volume due to the introduction of the product into the skin [5]. Bruises are very common complications and result from vascular injury at the time of the procedure, being more frequent in individuals who take anticoagulants, non-steroidal anti-inflammatory drugs, ginkgo biloba, vitamin E, among others. These adverse events tend to improve within five to fifteen days [19].

Infections may be viral, bacterial or fungal in origin and are usually related to natural flora, occurring due to inadequate antisepsis, and may also occur by injections into acne sites and contamination of the product used. They have a turgid appearance, accompanied by hyperemia, itching and hypersensitivity [7]. Telangiectasias may arise as a result of tissue trauma caused by skin expansion at the time of injection or excessive local massage of the product [5].

The nodules appear within the first four weeks after the procedure, may be normochromic, whitish or bluish-gray and usually result from the very superficial application of HA or over-application of the product in each area. Necrosis may occur by injection of the product into the lumen of the artery or by arterial compression. Minutes to hours after application, the patient has persistent pain at the filling site and shortly after ischemia and bluish-gray coloration in the filled area. The most at risk areas for necrosis are those that have terminal or superficial blood vessels, such as the glabella, nose, and nasolabial sulcus. However, it is possible to reverse imminent necrosis from vascular compromises associated to the use of injectable HA through the application of hyaluronidase, since this enzyme is capable of cleaving HA reducing the product viscosity, resulting in increased blood supply in the affected region [20].

Allergic reactions to HA products are present in only 0.1% of all procedures performed and are usually due to the presence of bacterial proteins and endotoxins, which may start on the third day after application and last until

the sixth month. Reactions are usually local, with edema and flushing, and even more rarely, mild systemic impairment may occur [21].

The granulomas are chronic inflammations and palpable nodular appearance, with modified macrophages and multinucleated cells by histopathological examination. They are perceived between 6 and 24 months after the injection of the product and it is believed that they are not due to hypersensitivity reactions to HA, but caused by reactions associated with the presence of bacterial proteins and endotoxins, resulting from the fermentation process of the product [19]. Hypertrophic scars may appear in cases of HA fill, only at the puncture sites, in patients with a keloid history or formation of hypertrophic scars [19].

E. Polymethylmethacrylate (PMMA)

Vieira *et al.* (2006) state that PMMA is a type of thermoplastic acrylic with high physicochemical stability. It is obtained through the polymerization of the methyl methacrylate monomer (MMA), by the addition of polymerization initiators, which are agents capable of forming free radicals upon decomposition. These free radicals are able to capture an electron from the double bonds existing between the carbon atoms of MMA, promoting their breakdown. This process results in a free electron at the carbon atom that has not been reached by the decomposed initiator, which keeps the polymerization from spreading by forming polymer chains formed by the repetition of n monomers [22].

Currently the PMMA has many biomedical applications because it is an inert, transparent and rigid material. Its use in this segment, is present in orthopedics as a bone substitute, in facial maxillofacial surgery as repair tool, in ophthalmology as a basis for intraocular lenses, in neurosurgery and craniofacial repair material, in the manufacture of dentures and other dental materials, such as submucosal esophageal implant for the treatment of gastroesophageal reflux, in prostheses used in cosmetic surgery, in radiology as a radiation shield, in the manufacture of orthoses directed to podology, among other applications [23].

As Avè and Avè (2015) mention, PMMA is an inert and biocompatible polymer and can therefore be applied as a skin implant. For this material to be used for dermal filler purposes, it must be presented as smooth and homogeneous microspheres with a diameter ranging from 20 to 80 μm and must be in suspension in a vehicle for injection of the product to be possible [24].

According to Yamaguchi (2017), this substance has been used as a skin implant since 1989, to fill deep wrinkles and grooves, to treat acne scars and to define the

facial contour. This author mentions that PMMA microspheres are not biodegradable and therefore induce an inflammatory and fibrotic reaction around them, involving the arrival of monocytes, histiocytes and fibroblasts. At the histological level, neutrophils are observed in the first 24 hours after injection and within three days after application, there is a predominance of monocytes, which quickly differentiate into macrophages to try to phagocytose the microspheres. From the sixth to the ninth day after implantation, fibroblasts surround all microspheres, increasing collagen synthesis. Two to three months after filling, the increase in tissue density due to collagen production from the fibroblasts surrounding the microspheres becomes relevant. After four months, there is no more fibrotic reaction present, but the fibrous tissue around the microspheres is able to permanently stimulate the production of collagen fibers [25]. Regarding complications related to the use of this material, Costa *et al.* (2015) describe a low rate of adverse effects related to the use of PMMA, ranging from 0.01% to 3% of the total procedures performed [26].

Although PMMA is considered a safe filler, complications related to host immunology can occur due to the fact that it is a non-biodegradable polymer [27], which in many cases has permanent and hard to treat damages [28]. In the first 72 hours after injection, some reactions such as edema, erythema, bruise and allergies are expected. In addition to immediate onset reactions, PMMA filling may also cause persistent edema, erythema and pruritus, infections, local pigmentation changes, telangiectasias, nodule formation, foreign body granulomatous reaction, necrosis, material migration, material extrusion and scars [29]. Since edema and erythema are early onset reactions related to local trauma, these complications usually disappear within a few days. If erythema persists, it may be indicative of technical mistakes resulting from injections in very surface planes [24]. Bruises are adverse effects resulting from vascular injury, often caused using needles during the technique. These vascular injuries can be prevented using microcannulas in place of needles [3].

Allergy cases may result from the administration of Artefill® (commercial presentation of PMMA), due to the presence of bovine collagen in its vehicle, which may cause hypersensitivity reactions, being recommended, therefore, the skin test of sensitivity before the implant injection [27]. Infections are adverse events inherent to any invasive procedure and may occur when antisepsis is inadequate. Although infections can be viral, fungal or bacterial origin, the latter is the most common cause and the most found pathogens are those that make up the

resident flora [7]. The change of the local pigmentation may be due to hemosiderin accumulation or may result from the inflammatory process, causing post inflammatory pigmentation, being a complication observed mainly in the higher skin phototypes, such as phototypes IV and V [3].

Days or weeks after the procedure, telangiectasis may appear, which are new capillaries, arterioles and venules at the implant site. The appearance of these new vessels is due to local trauma during the filling and expansion of the skin by the applied product [5]. Necrosis cases associated with the fillings occur by intravascular injection or compression of the blood vessel by the implanted product, resulting in vascular occlusion and preventing the flow of blood. Although this complication is inherent to any kind of filler, PMMA is more likely to generate permanent complications, since there are no measures to be adopted for reversal of the clinical picture when this polymer is used [5].

Avè and Avè (2015) point out that nodule formation may result from the quality of the filler (microspheres with irregularities and / or impurities) or from the technical error by the professional (very superficial application, overcorrection or application in very deep planes) [24]. Funt and Pavicic (2013) classify the nodules as noninflammatory or inflammatory. The first evolve with absence of inflammatory process, can be visible, are well defined and do not increase in volume. Inflammatory nodules develop edema, erythema and hypersensitivity, which may be due to hypersensitivity reactions to the implant material or may result from the formation of biofilms, which consist of an agglomerate of filling material surrounded by negative culture bacteria that secrete virulence factors, making them resistant to antibiotics [5].

Foreign body granulomas present as persistent inflammatory nodules, accompanied by reddish plaques and papules with negative culture. It is a defense reaction of the organism in which activated macrophages secreting inflammatory cytokines, surround PMMA microspheres, to prevent migration of the material [5]. Migration of PMMA microspheres may occur by hematogenous, lymphatic or can be by phagocytosis mediated by macrophages. Hematogenous propagation occurs when intravascular injection of the material is performed, being the pulmonary capillaries the most probable destination of the microspheres. Lymphatic propagation occurs when injection is performed into larger caliber lymphatic vessels, being the lungs and local lymph nodes, the most likely destination of the microspheres. In phagocytosis mediated by macrophages, these cells transport phagocytic

microspheres from the implant site to the local lymph nodes [30].

PMMA particles may migrate from the implant site or may extrude the material due to a granulomatous inflammatory response. In these cases, appropriate drug treatment should be adopted and if there is no satisfactory response, surgical removal should be performed. Both material extrusion and surgical excision can lead to unsightly scarring [28].

III. RESULTS AND DISCUSSION

Based on scientific evidences, this paper presents below, comparative tables between HA and PMMA, showing the advantages and disadvantages of each filler regarding their peculiarities, as well as the statistical parameters presented in the mentioned literature. Although there is still no filler material that meets all the characteristics considered as ideal in a filler [11], HA compared to PMMA has greater advantages because it is safe (approved by ANVISA or FDA), biocompatible, simple to use, easy storage, does not offer risks of material migration, is free of allergenic tests prior to use and does not offer risks of foreign-body granulomatous reaction (TABLE I).

Table I: Comparison between HA and PMMA regarding the characteristics considered as ideal in the skin filler materials.

IDEAL CHARACTERISTICS	HA	PMMA
Safe	YES	YES
Biocompatible	YES	YES
Simple application	YES	NO
Low cost	NO	YES
Good durability	NO	YES
Free of complications	NO	NO
Easy storage	YES	YES
No migration risk	YES	NO
Stimulation of collagen production	NO	YES
Free from allergenic tests prior to use	YES	NO
No risk of foreign body inflammation	YES	NO

Source: Adapted from Vargas et al. (2009).

The analysis of the table above allows us to state that HA reaches most of the criteria considered as ideal in a filler, especially regarding to safety criteria, which is the probable reason why this implant has been occupying the first position in the ranking of the most used fillers

worldwide. In addition, the number of HA implants performed annually is progressively increasing, contrary to what is observed with PMMA implants, which presents oscillations in the number of procedures performed between 2011 and 2018, according to annual statistical surveys published by American Society of Plastic Surgeons (ASPS) (TABLE II).

Table II: Comparison between HA and PMMA regarding the number of procedures performed by plastic surgeons, from 2011 to 2018.

YEAR (ASPS)	HA	PMMA
2011	1,303,656	16,836
2012	1,423,136	18,342
2013	1,675,601	17,317
2014	1,802,247	17,344
2015	1,951,692	18,051
2016	2,012,672	17,345
2017	2,091,476	17,639
2018	2,128,923	17,564

Available at: <https://www.plasticsurgery.org/news/plastic-surgery-statistics?sub=2007+plastic+surgery+statistics>

Several clinical studies (TABLE III) point out the complications caused using HA and PMMA skin fillers. Friedman *et al.* (2002) carried out a worldwide survey about the adverse effects caused by non-animal HA fillers and observed 144 complications out of a total of 262,000 procedures performed during the year 2000 [31]. André (2004) evaluated the non-animal HA security degree in a five-year study (from 1997 to 2001), including 4,320 patients. Of this total, 34 complications were observed, being 16 of this total related to immediate hypersensitivity reactions and the other 18 were due to delayed onset adverse reactions [32]. Morris *et al.* (2008) conducted a retrospective study of 145 patients who underwent HA implants in the face. From this total, 6 cases of complications were observed, including: edema (2 cases), vagal vessel reaction during injection (1 case), bruising (2 cases) and herpes simplex virus (1 case). (33)

Bagal *et al.* (2007) observed a group of 72 patients who underwent PMMA facial implants in order to conduct a satisfaction survey about the procedure. However, only 40 individuals returned for reevaluation and only these patients answered to the survey, which revealed 5 cases of complications related to the facial filling, as well as other data inherent to the study [34]. Zielke *et al.* (2008) analyzed 56 patients treated with PMMA and identified 6 cases of complications and the granulomatous reaction was the most prevalent adverse reaction [35-36]. Carpaneda and Carpaneda (2012) accompanied 63 individuals who underwent PMMA

fillings and identified 58 complications, most of them related to late onset adverse effects [36-37].

Table III: Number of complications related to the use of HA and PMMA fillers according to observational clinical studies.

RESEARC H	FILLE R	NUMBER OF PATIENT S	NUMBER OF COMPLICATION S
Friedman <i>et al.</i> , 2002 [31]	HA	262.000	144
André, 2004	HA	4.320	34
Morris <i>et al.</i> , 2008 [32]	HA	145	6
Bagal <i>et al.</i> , 2007 [34]	PMMA	40	5
Zielke <i>et al.</i> , 2008 [35]	PMMA	56	6
Carpaneda and Carpaneda, 2012 [37]	PMMA	63	58

In a percentage analysis of the results obtained in the mentioned researches, it was found in the studies in which HA was used as an implant, a complication rate of 0.05%, 0.7% and 4.1%, respectively, according to the chronological order of publications. In studies using PMMA as an implant, the complication rate was 12.5%, 10.7% and 92%, respectively, according to the chronological order presented. The observation of these data shows a lower frequency of complications related to the use of HA when compared to the use of PMMA. Although the literature indicates a low rate of adverse events related to the use of HA and PMMA fillers, several types of complications may arise due to the use of both skin implants. However, besides being able to present all the complications that are likely to occur with HA, the PMMA can also generate adverse events that are not observed with the use of HA, as shown in TABLE IV [19; 26].

As stated in the table above, most complications can happen to both HA and PMMA. However, some of these common reactions occur more frequently when using PMMA because it is a non-biodegradable substance [11]. Edema, erythema and bruise are adverse events that frequently occur upon the implantation of any filler material, since they are complications resulting from the inflammatory process and possible vascular injuries caused

by mechanical trauma [12]. Infections are adverse events that can occur in any filling technique because they are usually caused by improper antisepsis at the injection site, using non-sterile materials during the procedure, or by product contamination [5]. Allergic reactions related to HA fillings have become less and less frequent since this glycosaminoglycan began to be obtained primarily by bacterial fermentation through a laborious purification process [38]. In PMMA fillers, the rates of allergic reactions are more significant, since there is a wide use of products containing bovine collagen, which commonly provide allergic conditions because it is a non-biocompatible component [27].

Table IV: Types of adverse reactions related to the use of HA and PMMA fillers.

ADVERSE REACTIONS	HA	PMMA
Edema	YES	YES
Erythema	YES	YES
Bruise	YES	YES
Infection	YES	YES
Allergic reactions	*YES	YES
Telangiectasias	YES	YES
Hypertrophic scar	*YES	YES
Changes in local pigmentation	*YES	YES
Nodules	*YES	YES
Granulomas	*YES	YES
Necrosis	YES	YES
Foreign body granulomas	NON- OCCURRENCE	YES
Material migration	NON- OCCURRENCE	YES
Material extrusion	NON- OCCURRENCE	YES
Surgical excision	NON- OCCURRENCE	YES

Legend: * = rare event (when compared to the frequency of the same complications arising from PMMA use). [19; 29].

Telangiectasias may occur by the introduction of any filler material, since the formation of new vessels is due to the stretching of the skin due to the volume offered or by vigorous massage at the site of the procedure. [5]. During the remodeling phase of healing process, the levels of inflammatory cells, fibroblasts, and blood vessels at the affected site tend to emigrate or undergo apoptosis, ending healing. In cases of persistent inflammatory process, with consequent maintenance of increased cellularity, the

formation of hypertrophic or keloid scars is observed [39]. As PMMA fillers commonly generate a much more intense and prolonged inflammatory process compared to HA implants, there is a higher incidence of hypertrophic scars in individuals undergoing PMMA treatment, despite being a complication that is likely to occur with both substances when the individual is prone to keloid formation [19].

The change in color at the procedure site may occur with both PMMA and HA, being a rare event in HA fillings because it is due to a technical error, from the very superficial application of the product, which can cause a whitish or bluish-gray hue on the skin by the Tyndall effect [19]. In contrast, PMMA fillers may produce more often hyperpigmentation resulting from hemosiderin accumulation, due to an exacerbated and prolonged inflammatory process, which commonly occurs with this filler, causing post inflammatory pigmentation [3]. The nodules resulting from HA implants are not usually inflammatory and are associated with technical errors, when the professional injects the product very superficially or when there is excess of material in a certain area [19]. The nodules resulting from PMMA fillers can also result from a very superficial application of the product or may be from poor material quality, when there are irregularities on the microspheres or when there are impurities attached to the polymer particles [24]. As PMMA is a non-absorbable material, these nodules can develop inflammation, caused by hypersensitivity reactions to the implant or by the formation of biofilms around the microspheres [5].

Granulomas consist of palpable and nodular chronic inflammations, presenting modified macrophages and multinucleated cells on anatomopathological examination [19]. As the nodules, granulomas may be due to superficial injections, excessive application of the material or may be caused by irregularities and / or impurities on the surface of the injected particles. These complications are most commonly found in long term fillers such as PMMA but may also occur in rare cases when HA fillers are used [24]. Regarding HA, it is believed that granulomas are not caused by the glycosaminoglycan hypersensitivity reactions, but by reactions associated with the presence of bacterial proteins and endotoxins resulting from the fermentation process of the product [19]. The cases of necrosis associated with fillings occur by intravascular injection or compression of the blood vessel by the product, resulting in vascular occlusion and preventing the flow of blood. Although this adverse reaction is inherent to any type of filler, PMMA is more likely to generate permanent complications, since there are no conducts to be adopted to reverse the picture

when this polymer is used [5]. When the HA is the responsible material of vascular occlusion, it is possible to reverse the condition using high doses of hyaluronidase at the first signs of necrosis [20].

Foreign body granulomas do not occur with the use of HA. It is a defense reaction of the organism in which activated macrophages secreting inflammatory cytokines surround the PMMA microspheres in an attempt to prevent the material migration, forming persistent inflammatory nodules, accompanied by negative culture reddish plaques and papules [5]. The migration of PMMA microspheres can occur through the blood, when intravascular injection of the material is performed, via the lymphatic system, when the filler is injected into thicker lymphatic vessels or by phagocytosis measured by macrophages, when these cells carry the microsphere [30].

The studied literature does not indicate the HA migration because it is a biocompatible and absorbable material. Regarding PMMA, several experimental studies, such as McLelland *et al.* (1997) and Capella *et al.* (1999), reported evidences of PMMA particles migration in the analyzed histological sections [42]. PMMA extrusion may occur when injection is performed in superficial planes (within or near the papillary dermis), which leads to ischemia due to increased tension at the implant site by the rigidity of the microspheres added to granulomatous inflammatory response. Complications at this level require immediate surgical excision due to the risk of secondary bacterial infection, or even mycobacterial infection [43].

IV. CONCLUSION

The aging process leads to the appearance of wrinkles, loss of volume and loss of facial contour. Seeking to improve these tissue changes, there is a significant increase in the demand for dermal filling procedures every year, aiming for a naturally younger looking face. However, by the variety of fillers currently available on the market, among them, the hyaluronic acid and the polymethylmethacrylate, before choosing one or the other implant material, it is necessary to carefully observe each patient's profile, regarding the objectives, indications, contraindications, advantages and disadvantages, and the potential for imminent complications with each filler.

Polymethylmethacrylate is among the most intercurrent filling materials, as it is a permanent polymer, which makes it difficult or impossible to reverse complications when they occur. In addition, the corrections offered by PMMA are long lasting but not lifelong, as this material remains static while the overlying dermis continues to suffer the dynamic changes inherent in

aging. The literature review presented in this paper allows us to state that although there is no filling material free of complications, hyaluronic acid is currently the main choice among implants, as it is an absorbable material and provide satisfactory results with a minimum number of complications, which can be reversed.

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Regression of low predictability periapical lesion through endodontic treatment in a single session: case report

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Abstract— The endodontic treatment aims to heal the periapical tissues after the elimination of infected remains of the root canals systems, providing function to the tooth in oral environment. However, the prevalence of failure in these treatments becomes common, occasioning discomfort to the patient, due to the emergence of extensive lesions in the periodontium and painful symptomatology, consequently. In this way, the endodontic should plan comprehensively, analyzing all the diagnostic possibilities, treatment and prognostic. Basing on this, this study aims to report a case, about these perspectives, in what an extensive lesion in the periapex, of low predictability, regressed one year after conventional endodontic treatment in a single session. For this treatment we opted for radiographic methods and computerized tomography for diagnostic and control of the lesion. Therefore, basing on the therapeutic success of this case, it was verified that a precise diagnostic with an indicated endodontic treatment, can avoid an unnecessary surgical intervention and enable a favorable prognostic long-term.

Keywords—endodontic; apical periodontitis, single session.

I. INTRODUCTION

The endodontic treatment consists in preventing and treating the periapical pathologies to provide a higher function and longevity to the tooth and periodontium. However, these authors emphasize that the prevalence of failures in the endodontic treatment is relatively high, and they can emerge with an inadequate chemical-mechanical prepare, iatrogenic, or reinfection of the root canals system in the direction of crown-apex, when the coronary sealing is unsatisfactory or when there are vertical fractures. In this perspective, failures in the endodontic treatment can causing the emergency of periapical lesions, that are polymicrobial, because it involves a combination of gram-positives and gram-negatives facultative anaerobic and strictly anaerobic bacteria. Thus, the endodontist should plan to base on methods of safe and efficient diagnostic, to choose the less aggressive treatment form and enable therapeutic success [1-4].

Normally, in the dental clinic, the intraoral radiography is the most used method to evaluate the periapical bony repair.

However, that this method gives limited bi-dimensional information about size, extent and location of periapical lesion. Basing on the negative point of intraoral radiography, the conical beam computerized tomography (TCCB) becomes one of the safety methods of diagnostic and follow-up, and it is very used by the dental surgeons [4, 5].

After the analysis of the case and of the possibility of endodontic treatment, it can discuss about what is the better therapeutic. In case of teeth with endodontic failures and periapical lesion, there is the conventional treatment, based mainly in the root re-treatment and the surgical treatment, most related to the less conservative approaches [3-6].

When it is determined the treatment method more efficient, Wong et al. (2015) affirm that the endodontists have different opinion about the number of necessary sessions to the finalization of a case. Some people prefer treatments in single session, while others, multiple sessions [1, 7-9]. Therefore, influenced by the fact that a well done diagnostic attached to an adequate endodontic treatment can favor a favorable prognostic, this study aims to relate a case,

about these perspectives, in what an extensive lesion in the periapex, of low predictability, regresses after conventional endodontic treatment in single session.

II. CASE REPORT

Woman patient, L.B.F 38 years old, was leaved to dental attendance due to the necessity of endodontic re-treatment accomplishment in the 36 element that six months ago was in treatment with a friend, but unsuccessfully. During the anamnesis it was not confirmed none systemic commitment that could interfere in the dental treatment.

In the initial radiographic exam there was observed an extensive lesion radiolucent circumscribed at the periapical region of the 36 element. While in the clinical exam, the patient did not report spontaneous pain, only reported that sometimes when she has an increase of volume in the deep groove vestibular region of the tooth involved. It was not reported pain in the vertical or horizontal percussion, only a bother in the palpation and there was not confirmed mobility. After the analysis of the data from the clinical and radiographic exam, it was requested a computerized tomography (CT) to the patient. With the aid of the complementary exam (CT) it was observed the presence of filling material in the 1/3 apical region (Fig. 1).

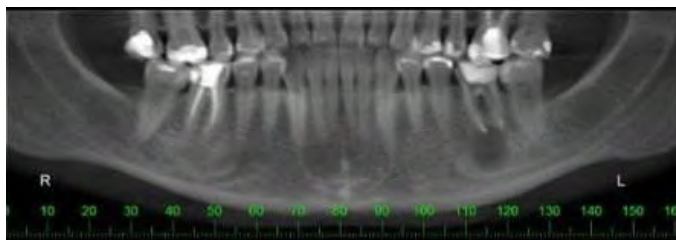


Fig. 1. Initial tomography showing extensive periradicular lesion associated with the element 36.

With previous agree from the treatment plan and when there is not impediment with the systemic health of the patient, it was done the endodontic non-surgical re-treatment of the dental unity in single session. After the antisepsis procedures, anesthesia and absolute isolations, it was done the regularization of the access with high rotation spherical drill KG #1014, followed by refinement of the access with ultrasonic tips coupled to the ultrasound.

The removal of the filling material and the formatting of the canal were done with Prodesing S e Logic (EASY, Brazil) rotary instrument. The prepare of the cervical third and medium was done softly, in brush strokes and with an amplitude limit of three millimeters in relation to the radiographic apex, this prepared was aided by the irrigation and aspiration with 2,5% sodium hypochlorite. The working length was obtained with a C-Pilot #10 manual instrument, 25mm longer (VDW, Munich, Germany) coupled with an ÁPEX foraminal location. To the final formatting of the

canal it was used the LOGIC 35/05 lime (EASY, Brazil) with work longer in 0 related to the apical foramen, in each change of lime of the two systems used it was done foraminal patency with C-Pilot #10 manual limes, of 25mm longer (VDW, Munich, Germany). To the cone proof it was selected the M gutta-percha cone (Dentsply, Pensilvania, EUA), correspondent to the canal formatting instrument.

The working lenght was confirmed with the radiography of the cone proof. The remoting of the smear layer was done with the agitation of 17% EDTA (Fórmula & Ação, São Paulo, Brazil) with the EASY CLEAN tip, actioned in the low rotation pen, during three minutes, in three one minute applications, with EDTA renovation to each application. The final irrigation was done with 2,5% sodium hypochlorite. After the drying of the canal with absorbent paper tips, it was done the filling with AH Plus® endodontic sealer (Dentsply, Pensilvania, EUA), by the technique of vertical compaction.

After cleaning the pulp chamber, a temporary cement Coltosol (Vigodent, Rio de Janeiro, Brazil) plug was placed at the entrance of the canal and the tooth was restored with glass ionomer, and after one week an onlay was performed on porcelain (emax). Then, with the removal of the absolute isolation, the occlusion was checked, and the restoration finished. All treatment was performed in a single session. Immediate and one-year radiographic control after treatment (Fig. 2A and 2B) revealed signs of apical lesion repair through bone neoformation. And for this statement of repair, another CT scan was performed again, verifying the panoramic reconstruction (Fig. 3).

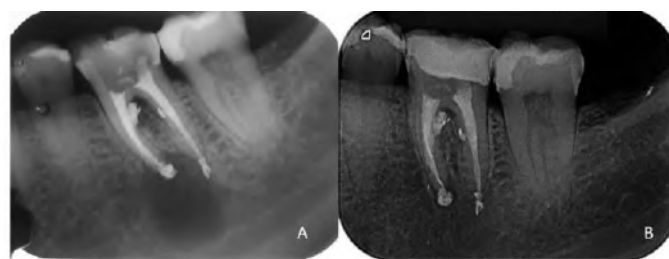


Fig. 2.A) Postoperative immediate radiographic control. B) One-year postoperative radiographic control.

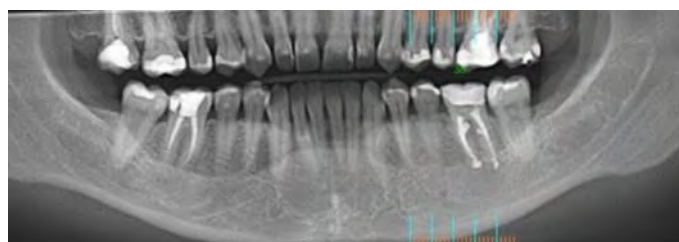


Fig. 3. Control tomography after one year of treatment demonstrating bone repair of extensive periradicular lesion associated with the element 36.

III. DISCUSSION

The favorable prognostic of the reported case of chronic apical abscess suggests that the endodontist may have paid attention to the process of decision making to the therapeutic success in cases of endodontic failure with periapical lesion, because generally these teeth have a bad, questionable, or hopeless prognostic. The predictability of the treatment of these cases, to Fahmy et al. (2016), is based in periodontal, endodontic and restore parameters [1, 4, 10].

The analysis of the teeth periodontal consists in the evaluation of the quantity of insertion loss, in the depth of the probing bag of furcation wrapping. Besides, it should analyse the presence of pulp infection/necrosis and caries. However, even the cases considered hopeless, it can be treated with success, because the retention of a tooth with a bad prognostic is possible if the treatment follows a structured approach based in the oral hygiene of the patient, capacity of restauration of the tooth, and decision of the patient, after clearly clarifications of the case [2, 10].

Besides the analysis by clinical exam, it is known the importance of using methods of safety and trustworthy image diagnostic to favor the clinical decision making. With this, it was used in this case for the postoperative diagnostic and follow-up, the radiographic and tomographic methods. Related to these methods, are reported negative points in the radiographies when affirm that the quantity of details provided in the mesio-distal plane is acceptable, however the superposition of anatomic structures difficult the observation of details in the buccolingual plane [11]. In this form, the intraoral radiographies have limitations in the diagnostic and evaluation of the periapical bony repair after the conventional or surgical endodontic treatment [2, 7, 11].

However, it is highlighted that the radiographic method is one of the most viable to the dentist surgeon and to the patients, is very used in the dental clinic [4]. But, if it is necessary and indispensable, the TCCB may be requested to guarantee the desired success, because it provides tridimensional images of maxillofacial structures, what is used to the evaluation of periapical bony lesions and their repairs after the conventional or surgical endodontic treatment, because it has a higher accuracy in the detection of these lesions related to the bidimensional methods [6, 7, 11].

With the establishment of the diagnostic, the dentist should accomplish the less invasive treatment that may solve the problem, always based in scientific evidences. In this perspective, when still is possible improving the quality of the chemical mechanical prepare and fill of the previous filling material, the conventional approach is the main choose, because it is more conservative in the process of periapical tissue repair [1, 2, 7]. The author emphasizes that the endodontic re-treatment is one of the more common and satisfactory forms of non-surgical treatment, because it

consists in the remoting of filling material, effective debridement and irrigator action in the conducts. Various techniques can be used to remove the gutta-percha, between them there are the use of solvents, heat, mechanical instruments and the combination of these methods [2].

However, though the re-treatment of root canals can give satisfactory results, the lesions cannot heal in some cases, making surgical treatment options required [4]. Thus, the author affirms with Jorge et al. (2015) that the endodontic surgery can be an option to cases where the conventional treatment was not successful, or even when is noted that, initially, that the surgical method is the better choice according to the case characteristics [6, 11, 12].

Basing on these positions, although it was confirmed the presence of an extensive periapical lesion in the reported case, it was opted to the accomplishment of an endodontic re-treatment due to the conservative of the method and the clinical possibility of the procedure. Besides, it was decided to preserve the case to the periodical verification of the tissue repair. As documented, the clinical evolution is satisfactory after one year of the intervention, where is not necessary the surgery accomplishment [13].

The reported case was treated in single session as a fast form of prevent the evolution of the lesion and after the loss of the dental element. In this case, there is many discussions about the number of necessary sessions to the finishing of an endodontic treatment: single or multiple session. The main reasons to the treatment of various visits is the need to a longer time to achieve the treatment, well accepted idea as a safe and common therapy. However, the author affirms that the argument began to be questioned when the use of contemporary endodontic techniques and equipment became common, as enlargement devices, electronic apical locators, nickel titanium files actioned by motor, and others artifices that maintained the treatment success rate and reduces the work time [7, 12].

In one of the studies done by Wong et al. [7] it was evaluated the success rate of 294 teeth endodontically treated in single and multiple session. With the results, it was confirmed that the success rates to the treatment of single visit ($n = 104$) and treatment of multiple visit ($n = 90$) were 88,9 and 87,4%, respectively. Besides, it was analyzed that the prevalence of postoperative pain after one week of single and multiple visit was 21 e 12%, while the prevalence of postoperative pain after, minimally, 18 months one week of single and multiple visit was 0,9 e 1,0%, respectively. Then, this study did not present significant statistical difference between the evaluated questions, concluding that both techniques are satisfactory, but the single session besides guarantees predictable success in the tissue heal, also reduces the necessary time to the treatment satisfying the patient preference [14].

IV. CONCLUSION

The reported case of non-surgical endodontic re-treatment in single session was successful, because it eliminated the infectious processes of the root canals systems that permitted the periapical bony neoformation and unleashed the symptomatology absence. These results occurred due to the cleaning and disinfection of the canal systems, adequate electronic instrumentation, efficient filling and coronary sealing. Besides, it was confirmed that a precise diagnostic, attached to an indicated endodontic treatment, can avoid an unnecessary surgical intervention, enabling a favorable prognostic long-term.

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Wind Farm Planning and its Economic Analysis for Bangladesh in prospects to the development done in China

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Abstract— At present Bangladesh is confronting the issue with power as the production less contrasting with the interest. A lot of power is expended in urban territories particularly by ventures while in rustic or beach front regions a large portion of the individuals are far from its benefits. About 40 million of people are living in the 724-kilometer-wide coastal areas of Bangladesh. In addition, it is astonishing that during the time there is adequate breeze pass up which can deliver a mesmerizing amount of wind power. In any case, step by step the use of wind energy is expanding on the planet which lessens expenses of sustainable power source innovation, improves effectiveness. On this regard China is role model for other developing nations. It would be a decent elective arrangement rather than reliance on petroleum gas. Wind energy is principally potentially in beach front and seaward regions with solid breeze system. Wind energy is fundamental for guaranteeing environmentally friendly power energy for what's to come. The farming place that is known for Bangladesh needs the stockpile of water at perfect time for better yielding. The establishment of windmills will be particularly helpful for working the water supply siphons. This exploration features the plausibility of wind energy and depicts the vital strides to execute and create wind energy division in Bangladesh by utilizing the ideas and research carried out by its friend nation China. Strong strategies, rules, and declaration can be applied to make government, non-government association, and giver associations cooperate to create wind energy segment in Bangladesh.

Keywords— Bangladesh, China, Wind Speed Data, Economic Analysis, Wind Farm Development, Renewable energy.

I. INTRODUCTION

Wind power is the change of wind energy into helpful type of energy utilizing through wind turbines to make power. The power is straightforwardly relative to the wind speed. Petroleum produce are getting condensed step by step. The development pace of mechanical advancement in Bangladesh has loosened down because of the deficiency of energy supply. Wind energy can possibly limit our needs on conventional assets like oil, gas, and coal without doing a lot of harm to nature. With the development rate in GDP approaching to 7% in 2005, Bangladesh is one of the quickest creating economies on the planet. Roughly 51% of Bangladesh's populace, especially in the off-matrix regions, is with no entrance of power. With the inescapable exhaustibility of the non-sustainable power sources and the quickly developing energy request, the strategy creators of the nation in different approaches and institutional courses of

action have moved their concentration to such sustainable power sources like energy.

Bangladesh has a coastal area of 724 km along the Bay of Bengal [1]. Because of huge beach front belt alongside wind speed in certain locales, the capability of wind power is tremendous here [1]. In Bangladesh, power age is for the most part reliant on flammable gas, around 76.74% of power is being created from our gas save [1] and this level of power age utilizes 37% of all out gas utilization [1], while interest for gas utilization is expanding by about 8% every year [1]. We are still a long way behind than its normal development of sustainable power source, for example target 1000-1200 MW to guarantee the jolt for all [1]. As indicated by the paper by [4] sustainable power source and the rest 94% from petroleum products [3]. Another specialist [4] makes reference to about the conceivable capability of sun based photovoltaic and wind energy are evaluated at 50174 MW 4614 MW, separately, while the capability of energy from

biomass and little hydro power plant I evaluated to be 566 MW and 125 MW individually. The significant limitations of sustainable power source referenced in their paper are monetary, money related, political and mechanical. The present issues in regards to sustainable power source strategies can be fathomed with the production of a complete energy technique which would incorporate capable and impartial arrangements [3]. We are as yet falling a long way

behind in the logical utilization of this sustainable power source because of reasons, for example, absence of innovation and skill in this field [4]. Wind power could assume a significant job in tackling power emergency in Bangladesh [6]. A lot of data has been assembled in the previous two years on the wind energy potential along the beach front region of Bangladesh.

Bangladesh Power Capacity by Fuel types	
Fuel Type	Capacity in MW
Natural Gas	6587
Furnace Oil	1963
Diesel	683
Coal	250
Hydro	230
Import	500
Total	10,213

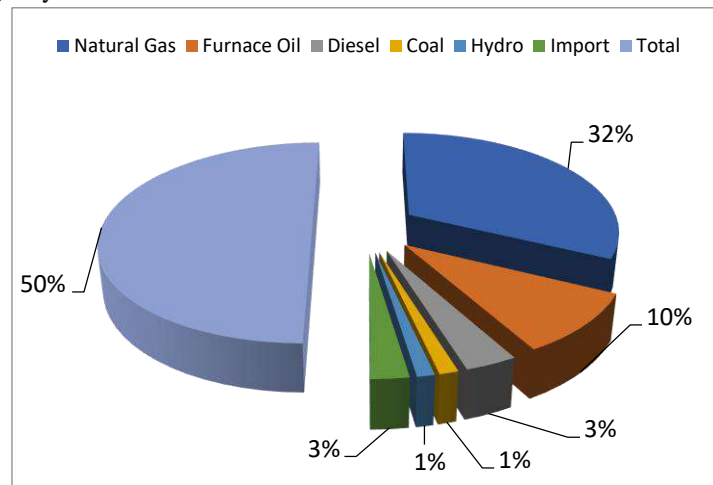


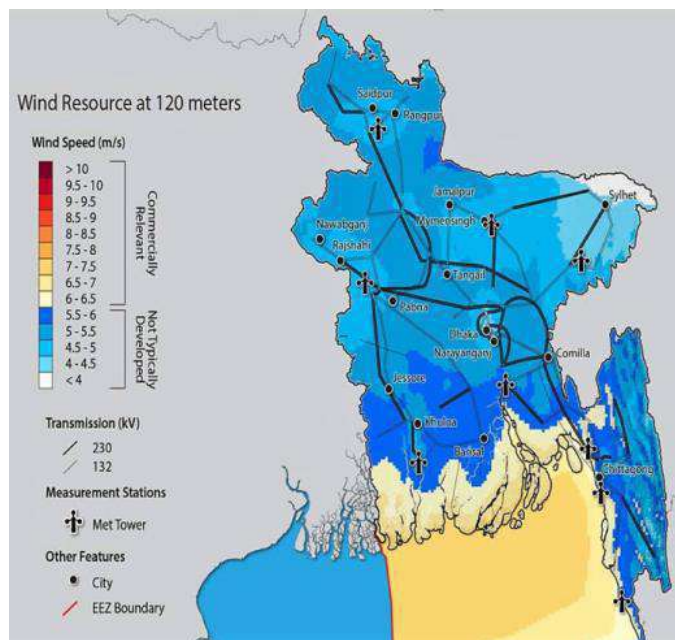
Table & Chart 1: Bangladesh Power production by types of fuel

Different examinations have been led on wind energy and its utility in beach front territories; and talked about the probability of the wind turbine. The wind speed at higher height and the possibility of utilizing enormous wind turbine need further examination. In this paper the present energy situation of Bangladesh is examined first, and afterward the possibility of utilizing wind turbine at seaward just as beach front area is likewise talked about. The current state of wind energy in Bangladesh and different nations on the planet are likewise exhibited to underline the imperative of moving towards wind energy. The target of this investigation is to concentrate on waterfront zones in the Bay of Bengal of Bangladesh coast, break down the deliberate estimations of wind speed and gauge the conceivable power age through the establishment of close to shore and seaward wind ranch to discover wind energy as a feasible answer for relieve the deficiency of electric power age in Bangladesh.

Mode of Research and Data

Bangladesh has absence of solid wind speed information unlike China which uses BeiDou Navigation Satellite System (BDS) and other form of measures [15]. Thus, Bangladesh has for some time been lingered behind to change over wind energy into power by utilizing wind turbines. During this investigation, various papers are

assessed to condense the related data. Additionally, remote detecting wind information is utilized for the Bay of Bengal locale (scope 200N-240N and longitude 87.50E-93.50E) to break down widely the breeze speed quality for the year 1990-2016. Day by day wind speed information (0-10 m normal) is determined from u and v segment of wind [4]. Ferret information representation and examination instrument are utilized to make wind map for the investigation zone.



China is the pioneer of universe of energy it is moving toward the finish of its multi-year plan of Energy Technology Innovation. The arrangement explicitly makes reference to wind energy as a center point, recognizing wind turbines with a megawatt (MW) creation limit of somewhere in the range of 8 and 10 MW as a key innovation. Before the finish of 2020, China plans to have 210 gigawatts (GW) of lattice associated wind energy limit. Its ability toward the start of 2018 drove the world with around 187 GW, contrasted with 89 GW for the US in runner up and 56 GW for Germany in third [10].

Wind energy isn't the main inexhaustible where China is the pacesetter. An ongoing report from the Global Commission on the Geopolitics of Energy Transformation, set up by the International Renewable Energy Agency, indicated China as the nation in the best position to 'become the world's sustainable power source superpower.'

Chinas Perspective

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Capacity in (MW)	12200	16000	31100	62700	75000	91424	114763	129700	149000	163670	184260
Production in (GW)	14800	26900	44622	74100	103000	134900	153400	186300	241000	305700	366000
Capacity Factor	13.8 %	19.2%	16.4%	13.5%	15.7%	16.8%	15.3%	16.4%	18.5%	21.3%	22.7%

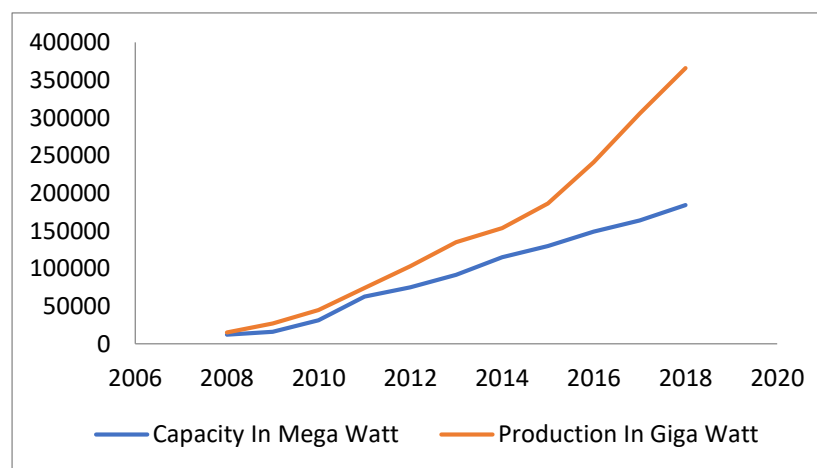


Table & Chart 2: China's Wind Power production in Last 10 years

All signs point towards wind control proceeding to have a focal impact in China's quest for a green future. The two its territory and long coastline are phenomenally appropriate for wind control, and the nation's potential wind control assets

are assessed to be around 2,380 GW (Table & Chart 2). At long last, a main situation in environmentally friendly power energy is helpful for fares of arrangements and innovation, which China is effectively seeking after-for instance

regarding its gigantic Road and Belt foundation venture. Chinese organizations are additionally effectively putting resources into sustainable power source organizations. Later on, efficient power energy will probably be provided by either Chinese equipment or by a Chinese-possessed organization.

China has outpaced every other nation with regards to the generation of renewable, and the equivalent goes for sustainable power source licenses. Starting at 2016, Chinese organizations and associations had 150,000 sustainable power source licenses, equivalent to 29 percent of the worldwide aggregate. For correlation, US organization and associations came in second with a little more than 100,000 licenses. In 2017, Chinese organizations and associations documented a sum of 76 percent of all sustainable power source licenses. Among them are some driven thoughts regarding the fate of energy generation that is truly quite out there. Through the official paper of China's Ministry of Science and Technology, researchers said they are now trying the innovation and expect to have it developed by 2050 [11].

It is another case of the nation seeking after a situation as the world's inexhaustible superpower and when nations like the US have all the earmarks of being pulling ceaselessly from putting resources into sustainable innovation.

Bangladesh Perspective

Bangladesh has a population of 146.2 million and enlivenment of electricity is 59.60%. In 2016 installed electrical capacity was 12229 MW and of which wind energy is 1.9 MW. Bangladesh has potential for wind energy capacity of over 20,000 MW, with wind speed of less than 7 m/sec.

As of late, Bangladesh's first-historically speaking age of power from the wind at a 900 KW plant has directed in new trusts in age of intensity with least cost in the nation. The power plant situated close to the Muhuri Dam in southeastern Feni area, has four separate wind turbines of 225 KW each. Other than a few little wind generators have been introduced by BRAC 11 little wind turbines in different seaside destinations) and Grameen Shakti (two wind generators of 300W and 1 KW at its Chakoria Shrimp farm [9]. Their last quantitative outcomes would be anticipated with extraordinary intrigue. Grameen Shakti has set up four of its wind generators to control violent wind covers set up along the coast. The extension of the capability of wind energy will be essential with the goal for Bangladesh to accomplish its national vision of giving power to the entirety of its populace by 2020[7].

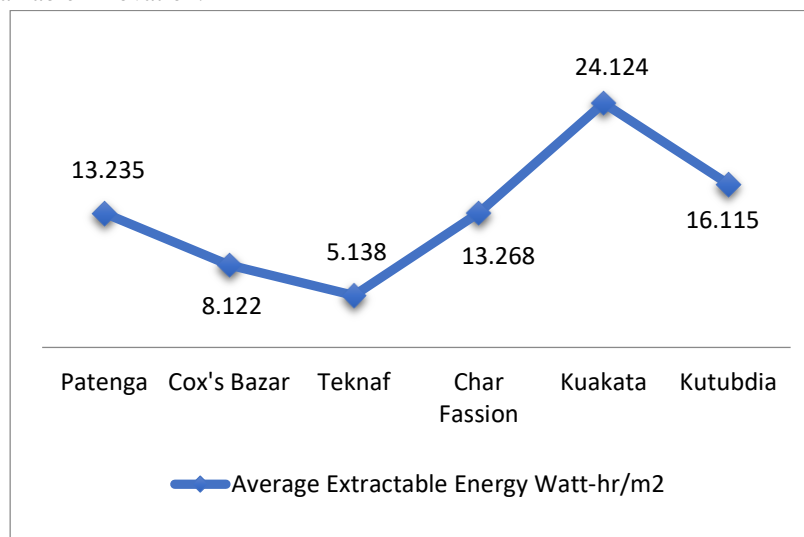


Fig.1: Location wise extractable wing energy in Bangladesh

Bangladesh has an anticipated power request of 10283 MW before the year over 2018. In spite of having an enormous coastline and generally huge region just 100 MW of that tremendous interest is anticipated to originate from wind control sources. Accordingly producing power from the wind

in the beach front territories can be transmitted to different areas of the nation through the high voltage transmission lines. Next to no activity and upkeep will be required during the entire life time of wind turbines and no fuel will be required for creating power from the wind [7]. The

significant issues are the expense related with the usage of the innovation and the absence of data about wind energy and issues identified with getting to pat information from solid and trustworthy sources. Absence of efficient checking and assessment alongside insufficient experience impedes the making of arrangements to back up this segment advancement in this nation. Feeble administrative impetuses have been fruitless in empowering private area interests in sustainable power sources.

II. RESULT AND DISCUSSION

Time arrangement of wind speed (0-10 meters arrived at the midpoint from 2008-2018years is drawn (Figure 2). It demonstrates that the example of wind speed changes marginally from year to year yet on a normal it differs inside 3-4 ms^{-1} , seen from red shading line. The dark shading line shows those 30 days running mean shifts inside 2-6 ms^{-1} .

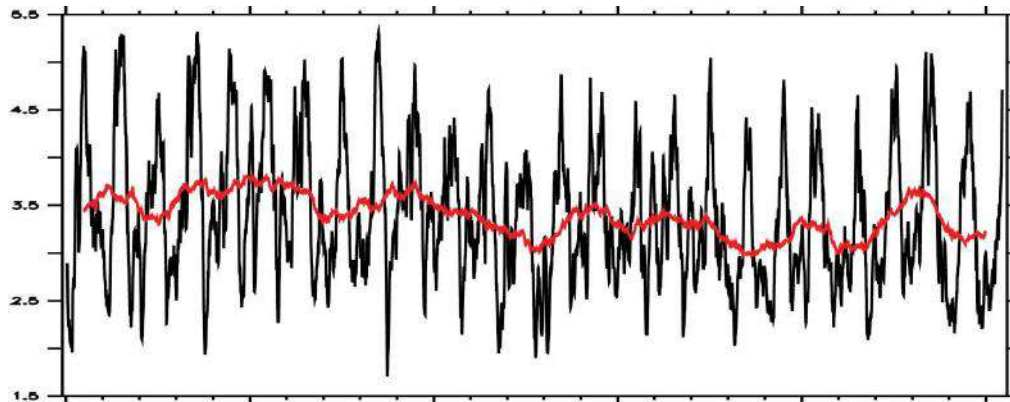


Fig.2: Wind Speed Time Series for past ten years in Bangladesh (2008-2018)

Month to month Climatology of wind speed from 2008-2018years (Figure 2), demonstrates that breeze speed more than 3.2 ms^{-1} for all time exist from the long stretch of April to August while other month it is low. Wind speed tops during the long stretch of June-August of every year.

Climatology of wind speed from 2008-2018years (Figure 1) shows that average breeze speed was more than 3.2 ms^{-1} for all time span from the period of April to August though in one more month it is low. Wind speed tops during June-

August month of every year. From (Figure 3), it demonstrates that seaward wind speed is in every case high during April-August month; different months likewise show higher seaward wind. In this manner from the investigation, we can presume that seaward wind control plant will be extremely compelling for Bangladesh, though beach front breeze plant likewise can be productive to create control during the period of April-August.

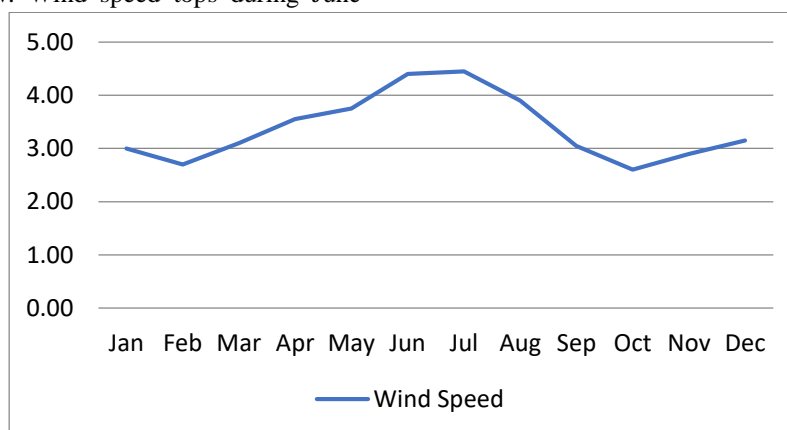


Fig.4: Month Wise Wind Speed Data

This breeze blows having a month to month normal speed from 3 m/s to 6 m/s over Bangladesh from March to

September [9]. When the breeze goes into the V-molded beach front locale of the nation, the speed of the breeze is

improved. During the rainstorm and around one to two months when the storm (7 months, March to September) there is the accessibility of wind as per primer investigations, (from the meteorological division, BCAS, LGED, and BUET). Conversely, from late October to February wind speed remains either quiet or excessively low. The breeze

speed arrives at the top during the long periods of June and July [9]. Park of wind turbines, arranged in beach front regions, can be associated with the power framework.

Generally, electric power includes three following components regarding cost analysis, Capital & Investment cost, Operation & Maintenance cost and Fuel Cost[14].

$$LCOE = \frac{\left[\left(\sum_{t=-n}^{t=-1} \frac{I_t}{(1+i)^t} \right) \right]_{Construction} + \left(\sum_{t=0}^{t=n-1} \frac{F_t + O \& M_t - D_t + T_t}{(1+i)^t} \right)_{production}}{\left(\sum_{t=0}^{t=n-1} \frac{G_t}{(1+i)^t} \right)_{Production}}$$

The fuel cost in wind power generation is null.

$$LCOE_{wind} = \frac{\sum_{t=1}^{t=n} \frac{I_t + O \& M_t - PTC_t - D_t + T_t + R_t}{(1+i)^t}}{IF \sum_{t=1}^{t=n} P_t}$$

- $LCOE$ = Generation cost
- I_t = Investment made in one year
- $O \& M_t$ = Operations and maintenance cost in one year
- PTC_t = Production Tax Credit
- D_t = Depreciation credits
- T_t = Tax Levy
- R_t = Royalties or land rents
- F_t = Fuel Cost
- IF = Intermittence factor
- P_t = Electrical generation capacity in one year
- G_t = Electrical energy generation in one year ($G_t = IF \times P_t$)
- n = Generation period duration
- i = Discount rate.

Especially for wind power, fuel cost will be zero. Economic costs and benefits on the levelized cost to produce offshore wind power prove that terrain plant production cost is approximately double of it. Along this factor other key point for economic arrangements is energy conversation and transmission [14]. The transformation of the vitality of the breeze into more helpful structures should be possible utilizing a rotor fitted with sharp edges or sails (Figure: 5).

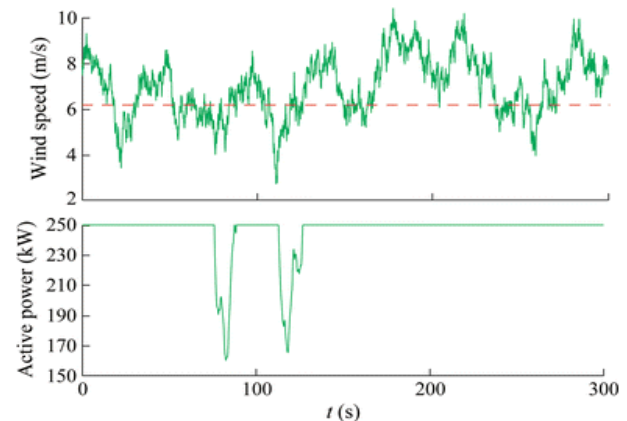


Fig.5: Output power of wind farm with power control capability

The administration needs to genuinely think about what's going on somewhere else on the planet, look for the proper cutting edge innovation and desperately attempt to duplicate

this significant procedure in our nation, especially in the rustic beach front regions in the south, south-west, and south-east. In this unique circumstance, it is cheering to realize that the Bangladesh Power Development Board has started ventures through the marking of an agreement with ReGen Powertech to finish a breeze map for Cox's Bazar, Kutubdia, Khepupara, Feni, and Chittagong. This should empower us to locate the correct spot to take advantage of wind vitality. In addition, the whole wind mappings directed by various associations was in coastal yet it is normal that breeze mapping in seaward will give acceptable outcome with respect to wind speed. Hence, it is foreseen that there is a major possibility to produce wind control in Bangladesh with legitimate consideration.

III. CONCLUSION

The Wind supplies top notch, clean and condition inviting vitality administrations [1]. To encourage further activities, a broad investigation on wind control plausibility ought to be done in various pieces of Bangladesh to pick the most ideal choices for various scale wind control factory. Picking an inappropriate site would give a negative point of view for the future activity plan and could affect to move to one side from this thriving alternative for illuminating the intense power emergency in Bangladesh. Wind turbines require relatively less space than the normal power station. The turbines can be put in the remote area, for example, seaward, mountains. Bangladesh can profit monstrously by participating and sharing any others reasonable mechanical ability and involvement with the gathering of wind assets. The legislature needs to set up certain appropriations and monetary motivating forces to advance sustainable power source advances in the nation. 100 percent personal duty exclusion for any constant square of intensity for a long time in the initial 15 years of activities can be applied. Lower customs and extract obligations for determined hardware can be drilled. The further broad examination ought to be finished by setting up area savvy wind information assortment station at various statures.

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Lean journalism: lean thinking principles and news values applied to Brazilian news startups

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Abstract—This article aims to present the concept of lean journalism as a perspective to investigate news startups in Brazil. We have selected two examples: *Projeto Draft* and *AgênciaLupa*, and performed a qualitative analysis of their manifestos, through which they introduce themselves to the audience, advertisers, sponsors and future partners. Those open letters to the public reveal how Internet-based news companies are defining the present and future of journalistic business models and products, especially in Brazil, and a good part of this revolution, as the manifestos show, is about rethinking methods to produce and manage information as a corporate asset, as well as revisiting as reinforcing classic news values.

Keywords—lean journalism, news startups, lean information.

I. INTRODUCTION

This article seeks to investigate the presence of lean thinking and lean information principles within the organizational culture and structure of news startups in Brazil, and how those two business approaches can contribute to shape new editorial and management standards for those companies.

According to Carlson and Usher (2015), the crisis journalism is currently going through is attributed to economical, technological and social factors, many of them being a consequence of the consolidation of the Internet and its resources for production and broadcasting of information in a network structure, from everyone to everyone. As part of the aftermath of this phenomenon, we can include the polarization of opinions, the rise of fake news, the echo chambers or bubbles, and the decline of journalism's authority – the latest one, we believe, can be seen as a challenge in terms of organizational learning. Conquering a new market, with a new ecosystem, demands changes both on the type of content news outlets release, as well as in the sort of information that flows through those companies and guides their behavior and culture. That being said, this study reaches to the Information Science field as a different and promising environment to ponder over what Brazilian news startups are doing now and can do in the future in order to thrive.

Through this study, we aim to present the notion of lean journalism as a combination of the main aspects of the lean thinking and lean information management methodologies, which can be found or applied to Brazilian news startups, with the news values that have been shaping newsrooms and news professionals for almost 150 years.

We have selected two examples of Brazilian news startups: *Projeto Draft* and *AgênciaLupa*. And by analyzing their manifestos to their audience, we identified their discourse on what digital journalism can be now, and how these companies wish to present themselves as revolutionary on how they make journalism, but without losing touch with the more traditional principles that define journalism in the first place.

II. THEORETICAL DISCUSSION

The theoretical references used in this article are a combination of Information Science and Communications concepts meant to ground this research so that it's able to understand what it means to be a news startup in Brazil, what sort of journalistic content this kind of medium produces, what organizational environment it operates in and how it legitimizes itself before its audience, sponsors and advertisers.

First, we present three key concepts from researches on contemporary digital journalism: post-industrial journalism, hyper-competition and attention economy. The first concept comes from the article published by Tow Center of Digital Journalism researchers C.W. Anderson, Emily Bell e Clay Shirky back in the 2012 *Post-industrial Journalism: Adapting to the Present*:

Post-industrial journalism assumes that the existing institutions are going to lose revenue and market share, and that if they hope to retain or even increase their relevance; they will have to take advantage of new working methods and processes

afforded by digital media.(ANDERSON C.W, BELL, Emily, SHIRKY, Clay, 2012, p.13).

New work methods and procedures were made possible by digital media. That in itself has allowed the emerging of startups in the journalism market. Those companies are designed specifically for the Internet environment and have the web's technological and informational resources as part of their DNA – in other words, they are fundamentally different from the mass media business model that used to rule back in the 20th and early 21st century.

The other two concepts were created by Canadian researchers Jean Charron e Jean de Bonville (2017) and provide strong theoretical bases to understanding the market for post-industrial journalistic companies; the authors explain that the product sold by journalism companies to their advertisers is not the content they create and broadcast – it is, in fact the attention of the audience attracted and kept by that content.

Publicity funding implies the commercialization of time: the time people spend consuming media is sold to advertisers; in exchange, the audience receives editorial content that doesn't come for free, and that is sold for a price below its production cost. (CHARRON, Jean e BONVILLE, Jean. 2017, p. 346).

That market dynamics is what Charron and Bonville (2017) called attention economy. As for the concept of hyper-competition, it defines the circumstances where the new journalism organizations compete: more quotes and statements, more content, speech, information, news and noise being created and flowing. That forces the media market – and journalism as part of it – to expand as never before, so that the previously fixed positions of traditional mass media are now displaced by other journalistic and technological endeavors, or even by amateurs and enthusiasts of certain subjects. In this current scenario, more agents compete for market and financing that doesn't expand at the same rhythm, hence creating hyper-competition not only for journalists, publishers and broadcasters, but for many economy segments.

Hyper-competition can be translated as instability in terms of number, identity and position of players in a particular Market, generating, in turn, a high level of uncertainty and risk for administrators and

investors. It becomes harder for companies that evolve in an uncertain and unstable universe to foresee and adapt to their competitors' new strategies in an efficient way. (CHARRON, Jean e BONVILLE, Jean de. 2017, p. 358)

The new rules for the hyper-competitive media environment now revolve around innovation, which the Canadian authors understand as a fast cycle of designing and implementing new solutions, procedures and products, then followed by imitation and standardization, of those elements by the other competitors and, finally, the exhaustion of the current standards, sparking a new cycle of innovation.

Besides the theoretical points presented so far, other two key notions for this study are lean thinking and lean information. It is by analyzing and understanding contemporary journalism through those two concepts that we can present the idea of lean journalism.

As described by Greef and Freitas (2012), the notion of lean thinking comes from the principles of the Toyota industrial production system that emerged in Japan right after World War II. According to the authors, back in 1996 the lean thinking methodology became a set of directives for business models applicable not only at the factory floor, but at management levels as well. Basically, lean thinking encompasses five aspects:

- **Value:** Value is defined by the customer, it molds products and services that meet their needs and expectations when and how they need it.
- **Value stream:** a sequence of actions that determine what company activities actually improve the delivery of goods and services and which ones can be ruled out, making the entire process more efficient.
- **Flow:** production must be evolving constantly. There must be a mindset that embraces the cyclic movement of design, demand, production, delivery and improvement of products and services.
- **Pull:** means that all production activity is subject to actual demand from the customers. Benefits include less waste along the production line and better control of resources, stocking and storage.
- **Pursuit of perfection:** constant improvement of production activities and of the products themselves are a top priority in order to meet the

customers' needs and expectations as closely as possible

Greef and Freitas (2012) describe how lean thinking techniques can be adapted and used as management tools that go beyond the industrial production realm to embrace trading and service providers. Following the authors' thought process, the notions of value, value stream, pull, etc. can be used to map out the efficiency of production, categorization, storage, retrieval and use of information in any given organizational context as means to improve the information production process so that it can be created, shaped and made available in the most adequate way for those who need it, when they need it – that is the concept of lean information.

Lean information as a business methodology plays a critical role in this article, since journalism is a social and economic activity whose raw material is information in the form of facts, events, people who are sources, as well as documents and data on all aspects of society. Add to that material the knowledge and skillset of professional journalists and you have the product “news” which, in turn, is a specific type of information that permeates society and directs the decision-making process of citizens regarding all aspects of life in a democratic context. Once we perceive journalism as an informational process, it makes sense to use the concept of lean information as a theoretical tool to understand how it works in a volatile environment such as the current post-industrial scenario.

We believe that the concepts described up to this point are sufficient to map out the organizational landscape of contemporary journalism from the perspective of the Information Management and Communications fields.

III. METHODOLOGY

As we mentioned before, we believe that this study benefits from combining from both the Communications and Information Management fields in terms of data collecting and data analysis. The methodology for this study is inspired on the work of Carlson and Usher (2015), where the authors use the term ‘journalism startups’ to refer to journalism companies that are founded on the Internet and whose business models step away from that of major newspapers, radio and television stations, to which the authors refer to as ‘legacy media’.

Those new businesses exist as networks centered on a main website, but, at the same time, present on several platforms for sharing and socialization – meaning Facebook, Instagram, YouTube and Twitter, for instance – the content they make and publish fits the layout and language of each of those platforms without, however,

compromising the journalistic root of the texts, audio and video files, or the ethical and quality standards and procedures that traditionally sustain the authority and reliability of journalistic material.

Based on the methodology used by Carlson and Usher (2015), we gathered the manifestos of Projeto Draft and Agência Lupa. By manifestos the authors refer to online statements and website topics such as ‘mission’, ‘values’ and ‘vision’, as well as press kits that were available for download. Those elements are meant to introduce the startups to the public – they describe how the journalistic enterprises are funded, what they offer in terms of innovation, content and technology, how they differentiate themselves from legacy media and, at the same time, how, by being different, they maintain the core principles of journalism alive and thriving. After selecting samples of Brazilian news startups, we performed a qualitative analysis in order to reveal which lean thinking and lean information methods and techniques define the place of those companies in contemporary media market, as well as their inner structures and production codes.

The second step of this investigation includes samples of factual journalistic content produced by the selected startups. We have chosen the latest material – two articles per media – as it constitutes the most up-to-date examples of how the startups’ manifestoes materialize in actual journalistic routines and finished products.

The methodology we have established for analyzing both the manifestos and the content samples is multidisciplinary, based on the French branch of discourse analysis (DA), particularly on the concept of discursive formation, which derives from Michel Foucault's (2008) discourse theory; it is a relevant concept, as it suggests that there are other elements that give sense to discourse beyond grammar, logic and semantics:

Whenever one can describe, between a number of statements, such a system of dispersion, whenever, between objects, types of statement, concepts, or thematic choices, one can define a regularity (an order, correlations, positions and functioning, transformations), we will say, for the sake of convenience, that we are dealing with a discursive formation - thus avoiding words that are already overlaid with conditions and consequences, and in any case inadequate to the task of designating such a dispersion, such as 'science', 'ideology', 'theory', or 'domain of objectivity'. The conditions to which the

elements of this division (objects, mode of statement, concepts, thematic choices) are subjected we shall call the rules of formation. The rules of formation are conditions of existence (but also of coexistence, maintenance, modification, and disappearance) in a given discursive division. (FOUCAULT, Michel, 2008, p.38)

To prevent the two realms of discursive formation (manifestos and content samples) to become isolated from each other and from the social context they were created in, we also rely on the notion of enunciation institution, according to Dominique Maingueneau (2004). The idea of institution reconnects the actual discourse formations to the concrete circumstances in which they were made.

The introduction of the 'enunciation institution' issue comes to defy the deceiving evidence in the notion that opposes the 'inside' of the text to its 'outside', the conditions that made the text possible. (MAINGUENEAU, Dominique. 2004. p. 53)

Both the discursive institution and the discursive formations it comprises depend on the criteria chosen to enlighten our reading and investigation of contemporary journalism manifestos and content. Even though news startups represent the forefront of innovation in the journalistic field, there are still core qualities and standards those companies abide by so they can still call themselves news outlets. Examples are the news values: a widely debated theoretical set of established elements that determine why and how certain facts and occurrences have more 'newsworthiness' compared to others. A key aspect of news values is that they stem from the day to day demands and situations of newsrooms, as well as the ethics and skills of professional journalists over time, and those two elements are at the root of the decision-making process of journalists then and now, at legacy media companies and startups alike.

For this article, we have selected news values as defined by Tony Harcup and Deirdre O'Neill (2016) as a set of objective traits that can be found on news pieces in general, with few changes depending on the medium and place of origin of the news organization. Those values can, in turn, be applied to the startup manifestos as well as the content samples. According to Harcup and O'Neill, in their

latest study of British press, there are 14 contemporary news values:

- **Exclusivity:** Stories produced or published first by that particular medium. The content results of interviews, letters, investigations, surveys, polls, etc.
- **Bad news:** Stories with negative subjects, such as death, injury, defeat and loss.
- **Conflict:** News that describe controversies, arguments, splits, strikes, fights, insurrections and warfare.
- **Surprise:** Stories featuring surprising, unusual or contrasting aspects
- **Audio-visuals:** Stories that come with appealing photographs, audio or video content, or that can be better illustrated with infographics.
- **Shareability:** Stories that are thought likely to generate sharing and comments via Face-book, Twitter and other forms of social media.
- **Entertainment:** soft news that include sex, showbusiness, sport, lighter human interest, animals. Stories that also provide opportunities humor, clever headlines or lists.
- **Drama:** news about escapes, searches, accidents, sieges, battles rescues, or court cases.
- **Follow-up:** Updates to stories that already are in the news.
- **The power elite:** Stories about powerful people, organizations, institutions or companies.
- **Relevance:** News on groups or nations deemed influential and are culturally or historically familiar to the audience.
- **Magnitude:** Stories perceived as sufficiently significant for involving large numbers of people, extreme behavior or extreme occurrence.
- **Celebrity:** Stories about famous people.
- **Good news:** Stories with a positive tone: recoveries, break-throughs, wins, cures and celebrations.
- **News organization's agenda:** Stories that help establish or that fit the news organization's own ideological or commercial agenda.

The news values listed above were, then, associated to one or more aspects of the lean thinking and lean information methodologies listed previously. By creating analogies and comparisons between news values and lean thinking/information principles, we were able to establish the notion of lean journalism – the contemporary information streams that flow through and out of the news startups, their business intelligence and its editorial policies that orientate decisions from journalistic and

corporate perspectives at the same time, establishing not only what is newsworthy, but the worth of the media companies themselves as agents that are redefining and, at the same time, defending journalism as we know it.

The next step was to associate each value to a lean methodology aspect in a way that places news values along the information production line that characterizes journalism as an economic and social activity. We have established the following categorization, as shown in Table 1:

Table 1: News-values categorized according to the principles of the lean thinking and lean information methods.

Value	Value stream	Flow	Pull	Perfection
Relevance Exclusivity Shareability Audiovisuals Magnitude Good news Bad news Conflict Surprise	Shareability Audiovisuals The power elite Relevance Entertainment Celebrity Good news Bad news	Exclusivity News Corporation agenda Audiovisuals Follow-up, Relevance	Conflict, Surprise Audiovisuals Shareability The power elite Drama Entertainment Relevance Magnitude Celebrity Good news	Exclusivity Shareability Audiovisuals Relevance Entertainment

Source: Rocha and Mummel (2020)

As the table shows, many of the news values repeat themselves across all the stages of the lean methodology, and many of them converge to the stages that depend on the customer of the news product, in other words, the audience. This phenomenon exemplifies the dynamics of attention economy, as journalism has been historically much more susceptible to the public than other economic activities and is even more so now.

Since the value of the news product depends so much on the audience, it makes sense that the news values the audience can perceive play a role in all areas of the lean journalism startup, as well as in the concerns of professional journalists when they investigate and report their stories. As for the internal decision process in these companies, considering they are for-profit enterprises, news values such as shareability, audiovisuals and relevance are present in the value stream and pull production steps, the ones that define the format of the news product and how it will be distributed. Reaching further, generating interaction and going viral can catapult

a news startup to a level of authority and credibility where it can attract more and better advertisers, sponsors and partners.

Still, on the other hand, the number of news values present in the Flow stage of production is remarkably small, considering that this particular stage comprises the actual management of the startup as a for-profit company. We believe news values and company management seem apart from each other because of how the press has established itself as a business activity through time – news values have been conceived as part of the culture and ethics of professional journalists all throughout the legacy media era, and in many occasions they posed as a sort of countermovement against the oppression of the board of directors and the finances department upon the newsroom and its journalists, whose only concern should be public interest and awareness about what happens in a democratic society.

In this sense, news startups are in the process of converting those same news values into assets to be displayed on manifestos where those companies recognize themselves as for-profit, and that they need to pitch themselves to their audience, as well as advertisers and sponsors, so they can attain institutional and financial stability.

This newfound harmony between journalism as a social demand and almost labor of love from journalists to all other citizens, combined with the clear notion that journalism must and can be not only economically feasible, but profitable and innovative, is the base of the concept of lean journalism we aim to define in this article.

In order to identify how lean journalism can happen in Brazilian news startups, we took two examples: Projeto Draft and AgênciaLupa first collected and investigated the discursive formations present in the manifestos the two companies offer to the public on their online platforms. This part of the analysis is based on the work of Carlson and Usher (2015) in their investigation of manifestos from American and European journalism startups as metadiscourse: “which is a specific form of interpretive discourse that looks at issues of journalistic performance, normative assumptions, and appropriate practices. From this vantage point, these statements provide both an assessment about the state of journalism and an assertion about journalistic forms for the future”. In this study, we searched for the combination of lean thinking aspects and news values that, we believe, are at the core of these lean journalism enterprises.

IV. DATA ANALYSIS AND FINDINGS

Projeto Draft is a news startup founded in 2014 by Brazilian journalist and entrepreneur Adriano Silva. Silva has worked in several Brazilian legacy media, such as the Fantastico Sunday-night news and variety show and magazines like *Veja* and *Exame* from the Abril publishing group. Unlike Silva's previous workplaces, Draft pulls away from mass audience, and focuses on a very specific niche: covering the new economy¹ scenario in Brazil, as well as providing media consultancy for people and companies that are or aspire to be part of this segment, or interact with it.

Draft's online platform is centered on the website, but spreads across the most relevant social media: Facebook, Instagram, LinkedIn and Twitter, as well as a YouTube channel; the company also has a press kit available for download, both in English and Portuguese. The actual manifesto can be found on YouTube as a 3 minutes and 42 seconds long video² – more than half of it is dedicated to a thorough explanation of what new economy is and, how it is changing the business environment on a global level and what it takes for people and companies to thrive in this new landscape; only then the video introduces Draft as a news and consultancy company that is in tune with the new economy, as well as describes the startup's editorial line and its mission "to cover the extension of the new economy. Our mission is to register and chronicle the disruptive innovation and the creative business around the world". Themes of coverage include crowdsourcing, crowdfunding, brand content, open source, startups, design thinking and sustainability.

Beyond online, multimedia presence, Draft's manifesto highlights the offline initiatives the company designed in order to actively participate in the Brazilian new economy scene, instead of chronicling it from a distance. The statement lists workshops, books, and open events, events in company (on demand), new business mentoring and global trips as concrete products and services that go along with the classic news coverage.

Draft's manifesto is particularly revealing, as it shows how its creators want to be perceived as more than

multimedia – they want to be seen as a transmedia³ endeavor that expands beyond the Internet realm into concrete actions, but even the non-journalistic features of this company stem from one of the most, if not the most essential news value: public interest. In Draft's case the interest of a specific share of the general public that is part or is interested in becoming part of the new economy in Brazil.

Through Draft's manifesto alone, we can infer that idea of lean journalism is present in the company's DNA. From the usual Internet-based platform to the small full-time team (four people) and many intermittent partners, all of those traits serve the main purpose of any lean production system: to reduce waste and redundancy. In Draft's case, that is done by making the journalistic enterprise itself as small and efficient as possible, so resources and partnerships can be directed towards the offline initiatives that help sustain and showcase the online platform.

We also analyzed the manifesto of AgênciaLupa, the first medium to specialize in fact-checking in Brazil. The platform was created by Brazilian journalist Christina Tardaguila back in 2015 as a way to introduce the methodology developed by the International Fact-Checking Network⁴ (IFCN) into Brazil's journalistic environment. From its early days until 2019, Lupa was funded by Brazilian filmmaker João Moreira Salles, also publisher of the *Piauí* magazine, as part of the *Folha UOL* media group.

The emphasis on fact-checking is the first distinguishing product that Lupa offers to the audience and advertisers, and this product is made according to international standards of excellence. In the lean terminology, that can be translated into adding value to the news product: properly verified information is more valuable to citizens everywhere, especially in times of fake news and post-truth. However, the fact-checking methodology not only validates Lupa before its audience, it also poses as part of the startup's values streams – by having its business tightly connected to the IFCN standards, those same standards offer guidelines to define and optimize how production routines will be and what should be considered when making management decisions, so that Lupa is as efficient (lean) as possible in its mission

¹The term new economy refers to the change in economy starting back in the late 1990's with the rise of service providers, high-tech companies and information as a corporate asset. Presently, the new economy refers to companies that are highly dependent on information and communication technologies focus their products and services on value from the consumer's perspective and establish cooperative relationships with employees, partners and customers.

²Available at:
<https://www.youtube.com/watch?v=JDsU2YMWDVc>

³We used the definition of transmedia by Henry Jenkins as found on his website: "a process where integral elements of a fiction get dispersed systematically across multiple delivery channels for the purpose of creating a unified and coordinated entertainment experience". Although the concept was design to discuss the entertainment industry, we applied it to a news platform due to Draft's activities spreading over a range of online platforms and offline events and initiatives.

⁴<https://www.poynter.org/ifcn/>

to verify what government authorities, data reports and other people of interest say to the public.

Like Draft, Lupa can be perceived as a lean news startup: a team of only 10 full-time professionals and all of them play more than one role and work in more than one project. Another important part of the company's manifesto is the description of the editorial council, to whom the text refers as "journalists we admire", although academics, business and IT professionals are listed as members of the council, which renews its members every two years. Having an editorial council gives Lupa strength and weight as an institution and makes the company more reliable in the eyes of the audience, as well as sponsors and potential advertisers. Authority and credibility are values professional journalists hold dear, and that can be attained and maintained by creating and publishing content that appeals to the news values we have listed previously in this paper.

Also like Draft, AgênciaLupa has projects outside the newsroom and the Internet. The company's manifesto has an entire section dedicated to their newest endeavor: LupaEducação, a brand under which Lupa offers courses and workshops to qualify high school and university students, other journalists, corporate agents, public servants and the general audience to use fact-checking techniques and verify information: "the idea of teaching people how to use fact-checking tools and techniques is completely aligned with Lupa's mission – to strengthen democratic debate and validate information sources through knowledge"⁵. According to the manifesto, since its creation in 2017, LupaEducação has expanded and become one of the company's main sources of revenue. The courses and workshops have qualified over 4.000 people to verify information provided by the media, official authorities and other sources.

Lupa's manifesto is even more effective in showing how public interest and other traditional news values can be reconfigured and placed back into the current context of hyper-competition for the attention of the audience and society as a whole. Lupa has positioned itself as a distinguished player in the media market, in particular the hard news branch – information about politics, economy, culture, technology, the government and all other subjects that have direct impact on the conditions in which Brazilian citizens live. Therefore, that is the most critical type of information when it comes to public interest, to which Lupa serves with its fact-checking coverage and by

sharing the fact-checking methodology everyone who might be interested.

Even though Draft and Lupa are fundamentally different in terms of what they offer, who they want to speak to and what they expect to give to society, we believe both companies are good examples of what we aim to define as lean journalism: a new organizational structure for news companies, where there is more dynamism and these organizations can read and learn from the current external environment, where data and information that comes from society, its groups and institutions, is not just facts and occurrences to be investigated and reported, but also clues and trends on how journalism as a business can reshape and improve itself in order to pursue perfection in its mission to serve society.

V. CONCLUSION

Both Projeto Draft's and AgênciaLupa's manifestos can be perceived as two separate discursive formations and, at the same time, parts of the same enunciation institution, since the institution depends on context – in this case, the context of post-industrial, hyper-competitive journalism. The idea of lean journalism we have advocated for throughout this paper is a way to conciliate practical, production and manage aspects – represented by the five principles of the lean methodology – and the contemporary news values that define journalism as a legitimate service to the public, from informing, to entertaining to educating.

By presenting the notion of news content created according to business management standards, we sought to close some of the gap between journalism as a for-profit activity and the idealized version of journalism as above economic and financial reality. The two startups we analyzed gave us, through their manifestos, some evidence that professional journalists in Brazil are already taking over the challenge of managing the news business and creating solid, viable enterprise models.

The debate on the future characteristics of digital journalism is far from concluded, whether in Brazil or around the world, but we believe the notion of lean journalism represents a step towards investigating new journalistic businesses in a more liberating perspective, that places news and news professionals at the center of a renewal and upgrade process, not just a reaction to the Internet, but a proactive effort to reinvent the profession and its market. The current moment is unstable, yes, but the startups are at the forefront of journalism, transforming it and, at the same time preserving its most essential values and traits as a democratic asset to society

⁵Taken from:

<https://piaui.folha.uol.com.br/lupa/2017/03/28/lupa-eduacao/>. Translated to English by the authors.

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Stamping set modeling to aluminum coins manufacturing through 3D software CAD/CAE

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Abstract —The time-to-response, level of accuracy and its consequent quality required to manufactured goods have demanded from engineers efficient methods to get a reasonable design. Following this trend finite elements methods have been used for years in order to predict design constrains and front loading potential issues prior to the manufacturing. Among several manufacturing processes this paper will highlight stamping process in a high level way and how finite elements simulations can support analysis of displacement and deformation of parts when an external load is submitted. It was used SolidWorks software to generate the meshes and perform the simulation.

Keywords— Stamping, modeling, CAD, simulation, finite elements, SolidWorks

I. INTRODUCTION

Computational tools application to simulate structure behavior have been increasing in engineering field. The reason of that is the design accuracy increase since the behavior data acquisition is independent of prototype construction that generates cost reduction. Furthermore a better material choice and components dimensioning assertiveness can be achieved due to availability of resources and multiple analysis. This work presents the development and outcomes generated from a software CAD simulation of an experimental pneumatic stamping to manufacturing of coins.

II. FINITE ELEMENT SIMULATION

Widely used in structural analysis, independent of geometry complexity, the finite element method is a mathematical analysis based on the part division into a known amount of discrete elements connected by nodes called mesh [1]. The structure analysis can be enhanced by the usage of 3D modeling even the calculation is too complex to be executed analytically. [2] have declared that finite element method corresponds to differential equations calculation which through numerical approximations, it becomes possible to perform complex analyzes of stresses, heat transfer, fluid flow, electromagnetism, among others.

The model of part division is represented in the following picture where it is possible to see the a generated mesh.

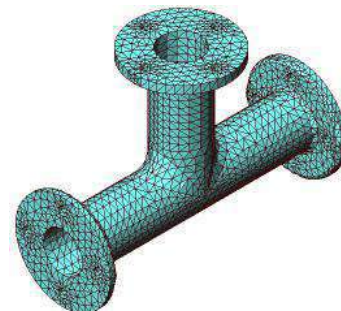


Fig. 1: Mesh representation in a generic part

Mesheres can take different formats such as triangular, tetrahedral, quadrilateral and hexahedral. Finite element software usually has a library of elements for analysis and choice of mesh type [3]. When a deep analysis is required it is possible to increase density to get mesh refinement by increasing the number of divisions which generates element size reduction in regions close to large stress gradients. The criteria to mesh refinement is based on convergence tests where the stress gradients is compared among different zones. When a high level of stress is verified a refinement still need to be made [1].

III. STAMPING PROCESS

According to [4], stamping process consists of a set of operations in which it is possible to obtain a part in the desired geometry, without the production of chips typical in removal material processes. The stamping cutting tools are known as cutting die and are basically constituted by a die and a punch [5]. The following Figure 2 shows a generic stamping die schematics.

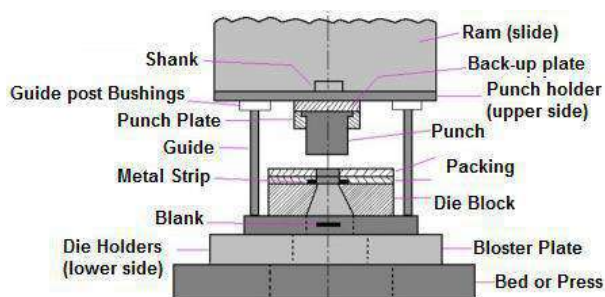


Fig. 2: Generic stamping die schematics

According to Chiaverini [6] to determine the effort required to cut the material, Equation (1) below is used:

$$Q = p \cdot E \cdot \theta_c \quad (1)$$

Q is the force required for cutting (N), p is the cutting perimeter (mm), E is the thickness of the plate (mm) and θ_c is the shear stress (N/mm).

IV. METHOD

To design any structure it is necessary to use the principle of the balance of forces, represented in the Equation 2:

$$\sum F_x = 0 \quad \sum F_y = 0 \quad \sum F_z = 0 \quad \sum M_x = 0 \quad \sum M_y = 0 \quad \sum M_z = 0 \quad (2)$$

They refer to the sum of forces and moments in the X, Y, and Z axis to determine the forces acting on the material. The dimensions of the elements, deflection and stability depend on the internal loads and also on the type of material they are made of. Von Mises was the criteria failure adopted for modeling. It uses the maximum distortion energy theory applied to ductile materials, in this work AISI 1020 steel.

The 3D CAD software SolidWorks was used in this work. The behavior evaluation of the components from the submitted efforts was made through the SimulationXpress feature available in this software. A finer mesh usually results in a more accurate solution. However, as a mesh becomes thinner, the calculation time also increases. The Figure 3 shows the meshes generated by the software of the main components of the experiment.



Fig. 3: Meshes on main components of the experiment

In the simulation were used for the structure, in addition to AISI1020, steel threaded rods M10, plain, pressure washers and nuts, according to DIN912. The structure was composed of a base plate, an upper plate and a movable plate or hammer, as well as threaded bars and guide bars. The shear force required to obtain the final product calculated from the Chiaverinni equation was 1100N approximately. Based on that the base of stamping should be designed to withstand both the impact load and the static loading of the press stamping tool. The hammer was designed to give balance to the movements of the upper set of stamping, at the time of cutting, to avoid misalignment and assure process high quality. The upper part is designed to support a cylinder which characteristics are shown in the Table 1.

Table 1: Cylinder main characteristics

Diameter (mm)	63
Young's modulus (E)	200GPa
Tensile strength (S_r)	420.51 MPa
Elastic limit (S_e)	351.57 MPa
Specific mass (ρ)	7900kg/m ³
Shear modulus (G)	77 GPa
Diameter (mm)	25
Length (mm)	25
Weight (kg)	3.85

Table 2 shows the dimensions of the designed press.

Table 2: Overall dimensions of the designed press

Width (mm)	250
Length (mm)	200
Height (mm)	210

Table 3 shows the characteristics of the base and top plate.

Table 3: Characteristics of the base and top plate

Width (mm)	250
Length (mm)	200
Thickness (mm)	12.5
M10 holes to threaded bars fixture (qty)	4
Ø 8mm holes to linear guides fixture (qty)	4
Base - Oblong hole to tool fixture and material drain (qty)	1
Top - Fixture cylinder hole (qty)	1

Table 4 shows the characteristics of the movable plate.

Table 4: Characteristics of the movable plate

Width (mm)	180
Length (mm)	130
Thickness (mm)	8
Ø 8mm holes to linear guides fixture (qty)	4
Holes to stamping tool fixture (qty)	4

The Figure 4 represents the press assembled based on the listed characteristics.



Fig. 4: Assembled press

In order to carry out the simulation, some simplifications were proposed in the model. The system stems and the upper plate were not considered since the load could be applied from the movable plate. Static analysis and an external load of 1100N were used.

The results obtained were the displacement and deformation of the parts subjected to the application of the load, besides the safety factor distributed throughout the different regions of each one of the pieces.

Displacement and deformation of parts under the load applied were the main outcomes analyzed by the comparison to the yield stress of AISI 1020 steel.

V. RESULTS AND DISCUSSION

The analysis of the base plate shown in Figure 5 has shown a concentration of stresses close to the through holes of the threaded rod and to the stamping tool die fixing holes.

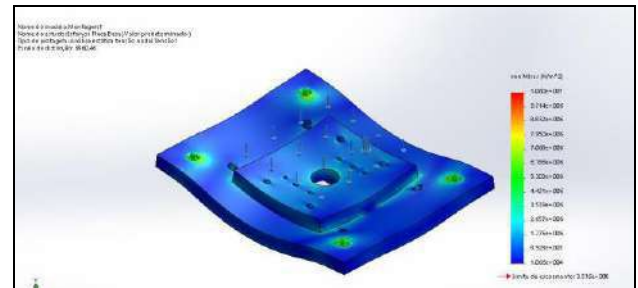


Fig. 5: Bed plate – concentration of stress

The following Figure 6 shows the behavior of the part from displacement standpoint.

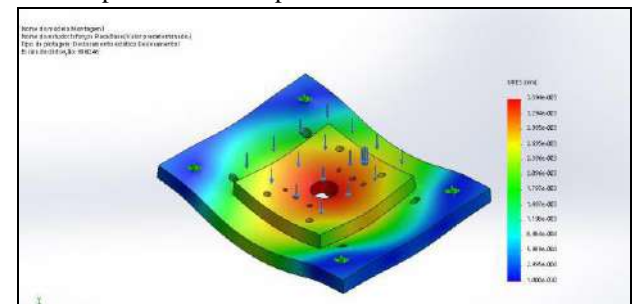


Fig. 6: Bed plate – displacement analysis

The software reproduces the images in a larger proportion in order to allow a better visualization of the displacement. Same happens to the analysis of concentration efforts.

The following analysis was performed to verify the safety coefficient of the part (Figure 7). The red region is the one that suffers the greatest efforts and tensions.

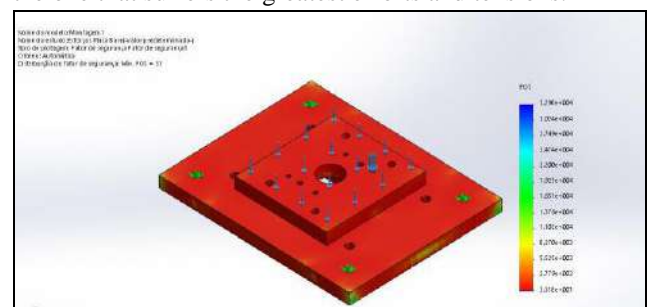


Fig. 7: Bed plate – safety coefficient analysis

It was observed in the upper plate that the highest level of tensions are located near to the passage holes of the threaded base, as shown in the Figure 8.

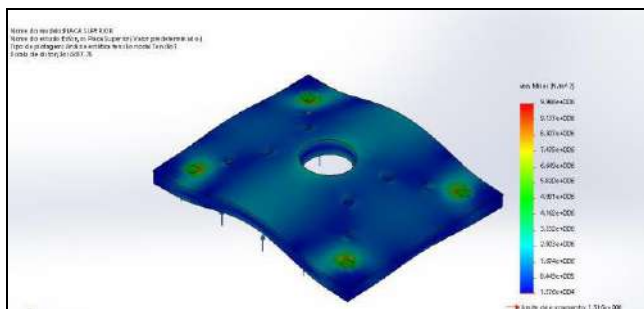


Fig. 8: Upper plate – tension distribution

Figure 9 evaluation shows the variation of the displacement when the upper is under load.

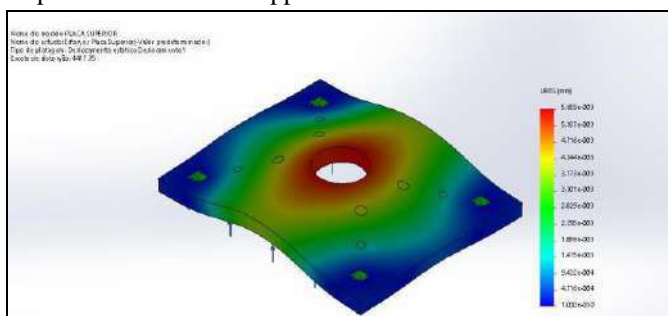


Fig. 9: Upper plate – displacement variation

Figure 10 shows the regions where the maximum and minimum safety factors of the upper plate can be found.

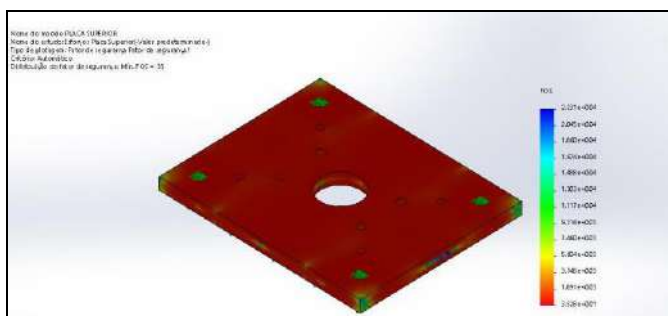


Fig. 10: Upper plate - safety coefficient analysis

Related to the analysis to the movable plate Figure 11 shows the regions that suffer the greatest tensions are located in the center of the part, where are the holes for the fixation of the tool of stamping, fixation of the tip of the rod of the cylinder besides the region of the fixing holes of the guide rod.

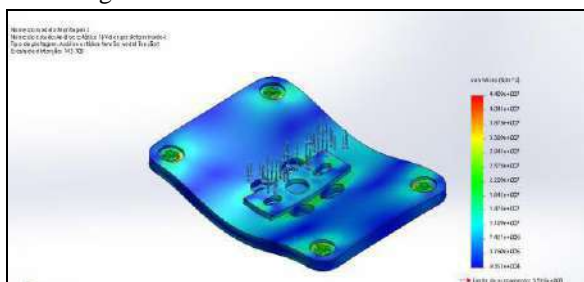


Fig. 11: Movable plate – tension distribution

Figure 12 shows a greater displacement variation in the central region of the part.

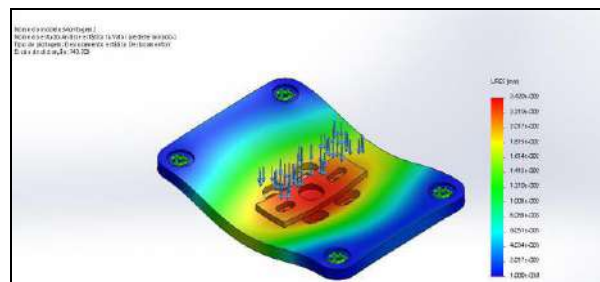


Fig. 12: Movable plate – displacement variation

The safety factor of the mobile plate was analyzed according to Figure 13.

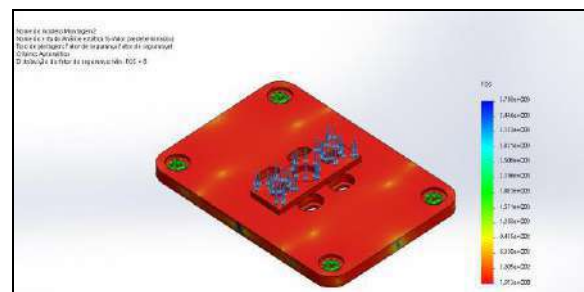


Fig. 13: Movable plate – safety coefficient analysis

The threaded rod is manufactured in AISI 1045 steel, where its mechanical properties are shown in Table 5.

Table 4: Mechanical properties of AISI 1045 steel

Young's modulus	205GPa
Tensile strength	625MPa
Yield limit	530Mpa
Specific mass	7850Kg/m ³
Shear modulus	80GPa

The threaded rods were 10 mm in diameter with load applied of 500N (single bar analysis). Figure 14 shows the strain variation of the rod.

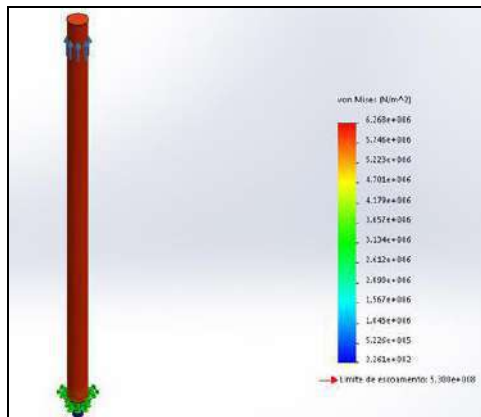
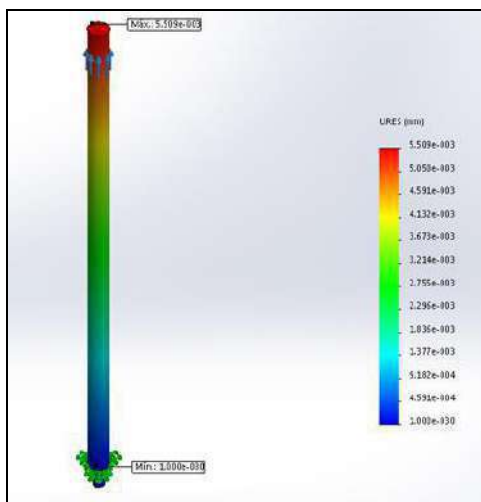


Fig. 13: Threaded rod – strain variation

Figure 13 shows how the rod varies in its displacement.



VI. CONCLUSION

Based on the outcomes from the simulations performed was possible to confirm that the material (AISI 1020 steel) is capable to support the external load applied from material resistance standpoint. The displacements obtained do not represent a significance considering that the highest value founded in the movable plate was around 0,02420mm. CAD design is the base to CAE simulation since the combination of plates from the proposed press interact between it selves distributing the load as soon as it is applied. Finite Elements Methods applied to stamping process evaluation has demonstrated an efficient method considering time-to-response, accuracy level and robustness.

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A Review on Analysis of Tower on Building with Sloping Ground

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Abstract— The construction of tower increasing day by day therefore to minimize the land use construction of tower on building is in trend to reduce the initial cost and also makes it economical but the construction of tower on building is more difficult on sloping ground. Therefore the seismic and wind analysis on building towers plays an important role in the construction of tower on building on sloping ground surface. By using Staad-pro software seismic and wind load is analysed to make the structure safe against earthquake and heavy wind. .

Keywords— seismic analysis, STAAD-PRO, building tower, Response spectrum, Sloping Ground, Step back, Step back set back.

I. INTRODUCTION

In today's world expansion of cities and human colonies increasing day by day that is causing our agricultural lands and villages. To prevent unnecessary use of land high-rised buildings plays an important role. It reduces extra land use and cost. Therefore now a day towers are shifted upon buildings to save land from unnecessary construction. Tower companies are using building for towers they can use buildings as rental or permanent basis for towers.

The construction and safety of these towers are main issue for the Engineers therefore to prevent it from earthquake and wind load analysis is required. The analysis can be done by using several software's they are-

1. E- TABS
2. SAP 2000
3. STAAD PRO
4. CATIA
5. REVIT STRUCTURE

Modeling through this software's helps to find strength of the structure against lateral and vertical loads. Analysis result shows the safety of the structure against lateral and vertical loads. If the structure is situated on steep or sloping ground the analysis of the structure is more important. There are some images of different-different types of buildings-

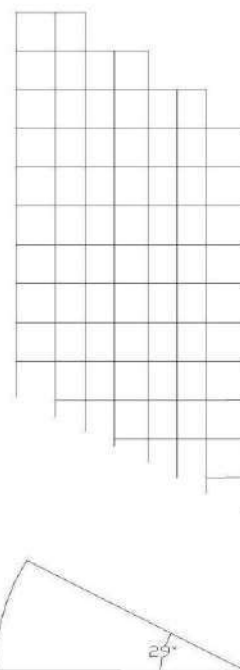


Fig.1 degree building on plain ground

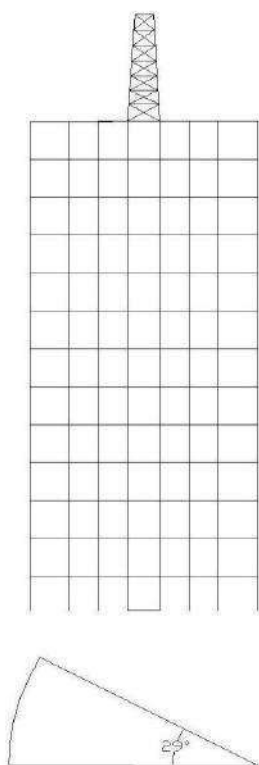


Fig.2: Degree building on step back building

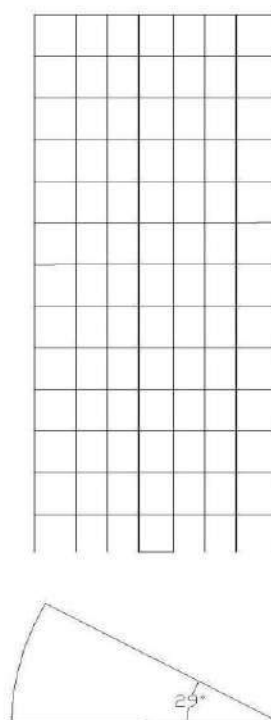


Fig.4: Degree building with tower on step back building

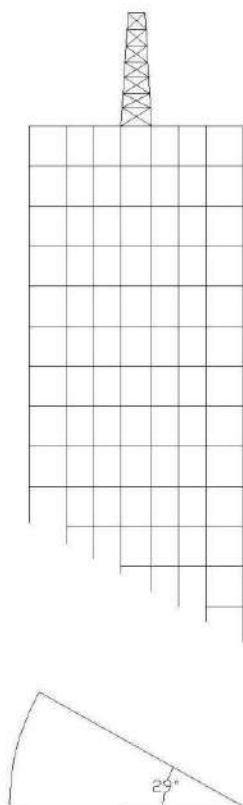


Fig.3: Degree building with tower on plain ground

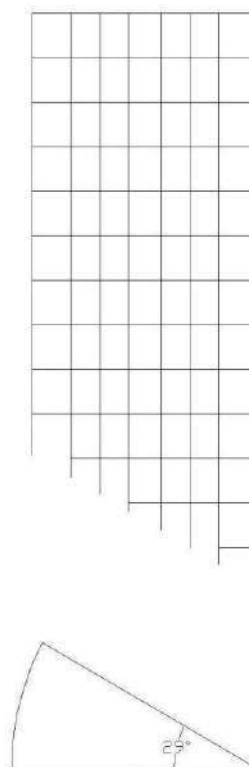


Fig.5: Degree building with tower on Step back Set back building

II. LITERATURE REVIEW

Nitin Bhosale, Prabhat Kumar, Pandey

Mobile communication growth has increased from last three years. Therefore the need of communication towers and buildings is increased. The competition between mobile operators is also increased therefore the need of rooftop antenna has increased from last three years. The operators are adopting rooftop antennas now a day because it cost less than cost of land. In the present study, the comparison is shown in between ground tower members and rooftop tower at the same elevation.

M.A. Barkhordari, G. Ghodrati Amiri, M.R. Vafaei and S.R. Massah

Telecommunication towers are steel structure and their seismic response against seismic loads is different than concrete structure therefore an analysis is carried out against seismic loads on steel telecommunication towers in iran. This analysis is done on four legged telecommunication tower of height of 18 to 67 meters. The Dynamic, shear and vertical reaction of the tower are calculated.

Ghyslaine McClure, Laura Georgi and Rola Assi

In today's modern world telecommunication business at its top and the need of telecommunication rooftop towers increasing day by day because of increasing Teli-users. And they are obviously builit in dense populated areas therefore it safety against seismic loads, lateral loads, wind loads is more important.

The study shows the time history analysis for maximum seismic base shear and also for the overturning moment of rooftop towers by showing correlation between them.

K. Jagan Mohan and C. Preethi

Transmission towers consume about 28 to 42 percent of the transmission line cost. The requirement of electricity is increasing rapidly all over the world therefore to meet its demand economically development of light weight tower is in use. In this paper, the effort is made to make cost effective transmission line by converting the shape and type of transmission line structures. By Using STAAD-PRO software analysis is carried on three towers. The wind load calculation is carried out and repeated again and again for the analysis and design of the towers.

S. R. MASSAH, G. GHODRATI AMIRI, M.A. BARKHORDARI

The telecommunication structures are basic structures now a day all over the world. Therefore it seems important to keep it safe from natural disasters like earthquake and

heavy wind loads. This paper shows the investigation of seismic reaction of four legged self supporting towers. Total ten no. of telecommunication towers are studied in Iran under the seismic and wind effect with the help of Iranian seismic code of practice.

Vafaei,Azlan Adnan, Gholamreza Soltanzadeh, Hossein Shad, Mohammadreza

The design codes say wind load is the major lateral load except for some cases in the design of telecommunication towers. This study shows the seismic performance of total no. of 10 four-legged telecommunication towers. The investigation is done on towers whose height is in between 18 to 67 meters and the origin of investigation is country Iran.

Shailesh S. Goral, Prof. S. M. Barelikar

The telecommunication industry is the fastest growing industry in human society and therefore it catches more attention than any other industry. The earthquake and wind analysis plays an important role in telecommunication structure like towers. Natural hazards like earthquake and wind storms are the major issues for the safety of towers. In this research the staad-pro software is used for the analysis of seismic and wind loads. The square shape plan and different bracing systems has been used in the design of these towers. Non linear dynamic method is used in the analysis of these towers.

Mohd. Arif Lahori, Sagar Jamle

The plain construction land is not available easily now a day's therefore it is shifted on hill sites. On hill sites it is not easy to construct on steep slopes and also it is not easy to maintain structure under seismic loads. The main aim of the paper is to study and analysis and comparison between buildings on plane ground and sloping ground.

Sagar Jamle, Mohd. Arif Lahori

The construction of R.C. structures are commonly assymetrical in shape on slope of mountains. The main aim of the study is to investigate, compare and earthquake analysis of the structure under five different configurations like stept back building 200, regular building, step back building 300 And the response spectrum method is used in it.

Hemal J shah Dr. Atul K Desai

The television towers are constructed for the purpose of transmitting signals from one place to another they also transmit the radio signals and telecommunication signals. Therefore their design and construction are most important

under seismic zones. This study presents seismic response of 4 towers of different height and different bracing system of towers. The SAP 2000 software is used to analyse these towers

III. CONCLUSION

After reading all of the research we can conclude that tower on building saves the extra land cost and if the analysis and modeling of the structure is accurate we can easily find out the safety of the structure against lateral loads and against sliding

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Brief Review of Concepts of Needs in Rehabilitation of Housing Buildings and their Consequences on Living, Comfort and Indoor Air Quality

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Abstract—This paper presents a retrospective on housing policy in Brazil in the last century, addressing regulations, laws, decrees and some technical standards (Brazilian and Portuguese) regarding rehabilitation of buildings to improve the technical performance (thermal, acoustic, luminaire, among other aspects) of the dwellings. In this context, it is observed that indoor air quality is essential to the health of the occupants, since in many countries people spend much of their day inside their homes, a place that due to many social and economic factors does not present satisfactory conditions for maintaining good health. Studies also show that most buildings do not have the minimum conditions necessary for good technical performance according to legislation, in times of remarkable climate change, thus having to raise awareness of the problem in various sectors of society by incorporating strategies or action plans aimed at transformation of environments into smart spaces, favoring the health and well-being of its occupants.

Keywords—Building Rehabilitation, Housing, Indoor Air Quality, Technique Performance.

I. INTRODUCTION

The human being since no longer being nomadic, has sought better conditions of fixation in space through his housing. However, centuries of history have shown its effort in this improvement, directly related to interpersonal relationships, social working conditions, economics, and depending on mastery of techniques and opportunities of its application. The industrial revolution in Europe from the 18th century onwards led a large part of the population to gather in industrial areas, especially in urban areas, making the poor quality of buildings used as housing become the main disease-promoting aspect, the low or almost no health qualities and the proximity between people in the transmission of simple but deadly diseases to the conditions in which they lived. These include respiratory, allergic, diarrhea, health problems aggravated by excessive heat or cold, air pollution, moisture, mold and fungus, as well as pests, insects and rodents that lived with waste and sewage and they were part of the conviviality of people.

This context led public services from European countries such as England, France, Spain and others to start implementing regulations on the health problem, in order

to ensure the minimum necessary for people's living conditions so that they could continue to serve as a workforce to industries.

The aim of this paper is to present a historical approach of some regulations, norms, laws and guidelines related to health conditions and the quality of buildings that occurred in Portugal and Brazil in the 20th and early years of this century, and the influences on the indoor air quality of these buildings, knowing the vast diversity of bioclimates present in the Brazilian territory with their distinct characteristics between north and south, in addition to the urban micro-climates capable of altering the climate in general in Brazilian cities, and possible consequences occupant health.

II. POPULATION GROWTH AND HOUSING PROGRAMS

In Brazil, there was a population jump from 40 thousand in 1886 to 580 thousand people in 1920 in the city of São Paulo alone, an increase of 14.5 times in 34 years, due to the intense migratory flow related to coffee production of the time (BONDUKI, 1994); and despite this population scenario, housing conditions contained

serious social inequalities, which made it impossible for most of the population to access housing, being restricted to the periphery, segregation, degradation of nature and poor quality of life, among other problems intensified with the approval of the law 601/1850 (HOLZ, MONTEIRO, 2008). Urban population growth was observed in the 1940s and 1970s due to the modernization of agriculture and the consequent decrease in the workforce, coupled with the absence of favorable policies to maintain the population in the countryside (MONTEIRO, VERAS, 2017). This trend of increasing urban population is marked, as the urban population went from 31.3% (42 million people) from 1940 to 84.36% (161 million people) in 2010 (IBGE, 2018).

Until the mid-twentieth century the tendency of the entrepreneurial initiative to provide housing conditions for workers in the so-called "working villages" next to the factory, providing control over the social, political and moral way of life of workers, who could count on school, church, warehouse, recreation room, facing their possible revolts, in a model taken by the government as an example to be followed.

State intervention as an activator of Brazilian housing growth occurs with the creation of the building documents of the Retirement and Pension Institutes (Institutos de Aposentadoria e Pensões - IAPs) in 1937 and the Popular House Foundation (*Fundação Casa Popular - FCP*) in 1946. However, the fragility of the system was clear, and with the lack of resources and disarticulation with agencies of other public sectors, it was not possible to achieve effectiveness in this area. Bonduki (1994) mentions that even with limited FCP resources and political problems making the IAPs unfeasible, the production was about 140 thousand housing units, housing about one million people in large Brazilian cities.



Fig.1: Morro da Providência, Brazil's first slum.

Source: Journal O Globo (2017)

With the high inflation of the 1940s, the Government launched the Tenancy Decree-Law in 1942, instituting the freezing of rental values, trying to regularize relations

between landlords and tenants; However, it generated large evictions by the owners, which aimed to rent the property to another family with higher cost. As a result of the evictions, together with thousands of newly arrived migrants in São Paulo, finding housing with compatible value was almost impossible, which led to the formation of the first *favelas*(slum) in São Paulo and Rio de Janeiro (Fig.1). Thus, the alternative was to live far from commercial centers, in unauthorized subdivisions that arose as an option for low-income families.

Santos (1999) notes that the largest Brazilian housing program was the Housing Finance System (SFH), created in 1964, which made it possible to finance over six million new homes in more than thirty years

of existence. However, SFH's performance would depend fundamentally on the ability of the FGTS(*Fundo de Garantia por Tempo de Serviço*: Lifetime Warranty Fund), which was created in 1967) to collect and default on the financed properties, as well as any other long-term financing system that is vulnerable to global macroeconomic systems; until 1979 SFH had no major problems as inflation was no more than 45% per year; but the acceleration of inflation at 100% in 1980 and 200% from 1983, in addition to the high borrower's defaults, substantially changed the situation of the system.

Municipal Law 2371/1982 (BAURU MUNICIPAL COUNCIL, 1982) for example provides basic information on minimum housing areas, minimum compartment sizes (such as bedroom, kitchen room, bathroom, corridors, stairs and access), ceiling height, minimum lighting for each room, size of the minimum ventilation openings in the compartments, minimum height of mandatory location of wall tiles and ceramic floors, sanitary and safety installations and accessibility for both single-family and multi-dwelling buildings, ensuring the minimum necessary for habitability conditions.

Another program with positive results in the National Housing Policy was the so-called "Letter of Credit," which financed about \$ 5 billion from January 1995 through June 1998, benefiting the construction of housing for about 265,000 families; In this system, the citizen proves the family income to receive resources for the acquisition or construction of their housing, thus being a program of spontaneous demand, leaving the State to be the main responsible for the housing problem, only acting as an inductor or facilitator of the process (SANTOS, 1999).

Housing is known to be a very important asset and a right of every citizen, as stated in Article 25 of the Universal Declaration of Human Rights of the United Nations General Assembly (UN, 1948); In Brazil, there are two important legal frameworks of legal guarantees, the

Federal Constitution (BRASIL, 1988), and the Law called the *City Statute*. The Constitution in its Article 7 and 23, includes housing as one of the social rights, and in its Article 182, determines the Municipality, through the Master Plan, to be responsible for the ordination of the city to ensure criteria of application of the social function of property, observing the well-being of its inhabitants and guiding urban policy; Law No. 10257 / 2001, (City Statute) (BRAZIL, 2001), provides for the development of the social functions of the city and property, in favor of the collective good, security and well-being of citizens. This achievement comes a century late when compared to what happened in European cities about the use of urbanistic instruments as a social regulator of the real estate market combined with social policies.

Assuming its commitments to the Istanbul Charter (Habitat Conference II / 1996), the government launches the Brazilian Habitat Quality and Productivity Program (*Programa Brasileiro da Qualidade e Produtividade do Habitat - PBQP-H*) to improve the construction sector in terms of quality and modernization of the sector, since until then the cost medium was high and there was a lack of standardization of the building materials used (BRASIL, 1998). In 2005, in the promotion of housing policies and programs, Federal Law No. 11124 was promulgated, establishing the National System of Social Interest Housing (SNHIS) (BRAZIL, 2005) for the low-income population, and in favor of this phase, launched in 2009, the My House My Life Program (*Programa Minha Casa, Minha Vida - PMCMV*) (Fig. 2) provides conditions for expanding the housing market for low-income families of up to 10 minimum wages, being delivered by December 2018 a total of 4.87 million homes (BRAZIL, 2009a). However, even with this advance, Brazil still has a deficit of 7.8 million homes (BRASIL, 2009b).

In Portugal, having noticed the deterioration of housing conditions and health of the population at the end of the nineteenth century, the beginning of the twentieth century saw the promulgation of regulation on this theme: Health Regulations of Urban Buildings in Portugal, in 1903 (SILVA, 2018), facing the needs of major cities such as Lisbon and Porto due to the industrialization process; Almost half a century later, in 1951, the General Regulation of Urban Buildings (RGEU) was enacted, already observing the details of items related to the healthiness of land, interior arrangements and free spaces, such as lighting and aeration of dwellings, as well as toilets and sewage, drinking water supply and disposal of wastes, fumes and gases, including general fire safety requirements and provision for sanctions, showing concern

for housing quality and consequent improvement of habitability.

In the second half of the twentieth and early twentieth centuries, several other studies were conducted to find safe and adequate systems for the health of housing occupants, including governmental entities observed in other countries, to dictate certification systems for thermal performance qualities, acoustic, luminaire and energy, both residential and commercial and utilities buildings.

Freire (2014) mentions that Ordinance 461/2007 defined in Portugal the Energy Certification and Indoor Air Quality System (SCE) for new and existing buildings, being mandatory to verify and comply with the system; and more recently, Decree Law 118/2013 (Diário da República Eletrônica, 2013) apply the Regulation of Energy Performance of Housing Buildings (REH) defines minimum values of air renovation rate in buildings. It should be noted that this Decree Law 118/2013, although recent, has already received six new amendments: 3 amendments in 2015, and others in 2016, 2018 and 2019, transposing directives of the European Parliament and of the Council on the energy performance of buildings intended wholly or predominantly for residential use.

III. HOUSING REHABILITATION AND INDOOR AIR QUALITY

Noting the need for the quality of buildings, especially the construction and housing characteristics, ISO 6241 (1984), being the first international standard for building performance, was a basis for other standards from other countries, such as the Brazilian Association of Technical Standards, that launched in 2013 the Norm 15575, about Housing Buildings Performance, covering seven user requirements, namely: water tightness; thermal performance; acoustic performance; light performance; health, hygiene and air quality; functionality and accessibility; and tactile and anthropodynamic comfort of buildings (ABNT, 2013).



Fig.2: My House My Life Program.
Source: Brasil (2009b)

Thus, a range of programs, regulations and regulations in the search for plausible solutions to the good condition of housing can be observed; and depending on this housing problem, there is a growing challenge due to the consequences of climate change, recorded by discussion events and promulgations focused on these changes, which directly affect people wherever they are. Events and results such as ECO92, Kyoto Protocol, Agenda 21, among others, indicates problems such as coastal flooding, hurricanes, dengue transmission, cholera, diarrheal diseases, malaria, yellow fever, stress, schistosomiasis, among other diseases, which are consequences in sub or developing countries. In developed countries, common problems are related to air pollution, either stress or hot or cold waves (KOVATS et al, 2003).

Betts and Sawyer (2015) also report problems such as cardiovascular disease, severe climates that cause fatalities, as well as impacts on mental health and damage to families. More recently, environmental degradation, territorial conflicts, scarce water or food have forced populations to migrate, aggravating sanitary and housing conditions in various parts of the globe. Kukadia and Upton (2019) warn of the great population growth of the metropolises. According to studies by the United Nations (2018), 55.3% of people today live in urban centers, and between 2020 and 2030, the forecast is that there will be a jump from 23 to 60% of the world's population living in cities with more than 1 million inhabitants, and warn of the cause of millions of deaths each year due to housing problems. These authors (KUKADIA, UPTON, 2019) further report that the cost of 3.5 million poor housing for England's healthcare system generates about £ 1.4 billion in public health care costs per year, only in the first year.

More recently, dozens of studies on the evaluation methodology of building rehabilitation processes have appeared, aiming to improve these conditions. Thibodeau, Baraille and Sié (2019) observed 41 articles (between 2005 and 2017) compared to ISO 21931-1 (Sustainability in Construction) and ISO 14044 (Environmental Management), EN 15978 (Construction Lifecycle) and Regulation 305 / 2011 (EU). In the same period, Lanzinha (2009) presents research on diagnostic methodology and intervention in buildings regarding their rehabilitation, noting concern about occupant health and indoor air quality. However, if many people work outside, they do not stay in the dwelling for so long. However, Brasche and Bischof (2005) present a study result on the average time people spend indoors (in their homes) in Germany. The survey addressed 5530 single-family apartments and houses, and resulted in an average of 15.7 hours per day /

per person. Among older women over 64, this average exceeded 19.9 hours per day at home.

Nevertheless, in a closer analysis to the internal conditions of the dwellings, Lanzinha (2014) considers that the Portuguese housing system is increasingly showing evidence of advanced state of degradation of most of its buildings, especially the older ones. Since maintenance depends on the economic condition of the owner or condominiums in the case of multifamily buildings, any financial crisis directly affects the rehabilitation business.

Abreu (2010) evaluated the consequences that the deficient conditions and situations of the interior environment of the dwellings have on the health of its occupants. Among the observed dwellings, 73% were old (from the 1960s) and had no renovation work on the building, which can be detected by poor conservation and use. This author also points out that humidity and mold (Fig. 3) were permanently present in 55% of older buildings, and only in 11% of newer buildings.



*Fig.3: Moisture and mold on walls.
Source: Own authorship.*

As physical pathologies are responsible for the interior quality of the building, Freire (2014) evaluates other impacted factors such as indoor air quality, thermal, acoustic and visual comfort, relative humidity, lighting, air velocity, odors, concentration of micro-airborne organisms or dusts, among others.

If indoor air quality in dwellings is so important to occupant health, what about Rosenbaum et al. (2015)? These listed 947 chemical components capable of polluting the home environment, which are present in products such as perfumes, flavorings, cleaning materials, food, tobacco, building materials, glues, varnishes, adhesives, foams, toys, printed matter, shoes, electronic equipment, wood, among others.

However, Kukadia and Upton (2019) show that the understanding of indoor air quality is very complex due to several factors acting as causes and consequent effects, since there is a range of polluting sources, type and

location of the building, place decoration, as well as the mode of use of its occupants. Lifestyle and subjectivity are also observed by Hasselaar (2012) and Freire (2014) citing studies from the World Health Organization.

How people live and what they do inside their homes influence the factors and quality of housing as well as the quality of people's own health. Freire also points out that in the 1970s symptoms were observed in occupants of newly constructed buildings, identified at the time as "Sick Building Syndrome", triggering a comparative series between sick and healthy buildings through chemical content analysis of building materials, a fact that led manufacturers to change manufacturing systems to improve their products, using new materials less harmful to people's health.

IV. POSSIBILITY OF ACTIONS AND PERCEPTIONS

So much is evident that Marcelino and Lanzinha (2017) observe the high degree of interest of residents to detect technical priorities of intervention, especially when there are vulnerable people occupying the space. In their research, these authors found in dwellings in a social neighborhood in Portugal that more than half (55%) are over 61 years old, clearly demonstrating the aging of residents, and that they do not usually move and stay in same housing for decades (83% own and only 17% renters).

Regarding the social neighborhood, Patino and Siegel (2018) indicate that there is no universal definition of social housing, but consider, in the analysis of 49 articles related to the interior quality of the environments, that the increased exposure to bad qualities of spaces Housing interiors are a health concern to their residents as they are more vulnerable because of their age and economic condition. And they cite clear evidence in the literature on disparity in morbidity between nonresidents and residents of this less affluent housing type.

However, even though there are performance standards, decrees and laws regarding the quality of building construction as seen before, Pinto (2016) in his work on housing health noted that when a technical inspection was applied to several existing buildings under study, it was found that most of the cases showed non-compliance with the minimum requirements for approval, especially in relation to kitchens and sanitary facilities, and therefore were not able to be approved under the legislation.

The residents' perception regarding the anomalies found in the dwellings, Marcelino and Lanzinha (2017) also show that the residents can identify several points of

anomalies, such as moisture stains on the walls and ceilings, cracks, degradation, bad smell in the kitchen and toilets, noise from the building and the exterior, excessive high and low temperatures, lack of sunscreens and adequate air currents, even if in many cases they do not make the repairs or installations necessary to solve the anomalies for financial reasons or simply for convenience.

In the same vein, Kovats et al. (2003) analyzed articles on climate change from 1989 to 2002, and concluded that there is a need to raise awareness of the problem in all sectors of society, as they realized that the concept of health impact assessment of people is not yet incorporated into strategies or action plans in many countries.

Technologies capable of holistically integrating diverse disciplines such as Engineering, Architecture, Sociology, Anthropology and Economics, Arts and Leisure already exist (CIB, 2018), and can transform environments into intelligent buildings, which will favor the health and well-being of occupants, whether living spaces or workplaces, with resilience solutions, low energy use, meeting real human demands in every way.

Therefore, the standards of construction and the formation of the working professionals need to be broader and more rigorous, since in the case of a process that will attend people, social issues cannot be suppressed, as well observed by Assi (2002). This author shows that when residents often need to be part of the actions so that they can understand and accept proposed technical solutions, making the process continuous and circular rather than linear as previously seen. Thus, if solutions are of high quality, they will tend to be lasting, especially when it comes to serving people who are in increasing age and therefore increasing the level of demand and risk rating to which they are exposed.

Anand and Amor (2017) clarify that even with an extensive increase in studies on life cycle analysis of built environments, in the order of 929 articles published in the Scopus database between 2011-2015 alone, the subject is too complex and open to interpretation; because there is a difficulty in comparing the results due to different methodologies used by the authors. They will be able to analyze energy use, study site identification, building age, source and complexity of data, among dozens of other parameters, and if in a project or technology, the analysis considers it sustainable, it may not be in another one situation, if different aspects with behavioral parameters of its users are observed.

If every housing project, whether new or rehabilitated, considers these factors, and requires decision-making in favor of people's health, it will become a trend in indoor air pollution mitigation control strategy and improvements,

considerable in people's way of life. An intra-wall social gain that expands to society, as the building being properly cared for and with safe equipment (Fig. 4) and the neighborhood being valued will prevent the loss of cultural identity of cities (LANZINHA, 2014), improving the perception of security, diminishing areas of crime scene in many cities due to the abandonment of central areas by municipal administrators and the population itself.



Fig.4: Recent dwelling kitchen with safe equipment.
Source: Own authorship.

V. FINAL CONSIDERATIONS

Having observed this problem about the quality of housing since the satisfaction of basic requirements of habitability, and the respective need for analysis systems, control, and processes for updating the conditions of manufacture and use of these environments, it can be seen that an effective implementation may occur when there is a large amount of work related to the orientation and participation of users involved in the transformation of housing, associated with government incentives for investments necessary for a correct improvement of physical and constructive aspects, as well as personal behavioral changes related to the use of space.

Still, more effective support and oversight will be required to make the changes real and the results become visible both in people's quality of life and in their own perception, infecting them with confidence and willingness, making people feel the improvement in their health and well-being.

Still, a lot of research work will have to be developed on this theme, so that the parameters are better analyzed, understood, described and explained to those who will put them into practice with the areas involved. Areas include technicians, architects, engineers, designers, labor managers and the users of living space themselves, together with public administrators tasked with meeting the needs of urban growth involving economic, social, ecological, accessibility to transport, and from work to

leisure: minimum requirements for sustainable life in society.

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Determination of efficient Shape of twin tower subjected to Seismic Loading

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Abstract— In this era of multistoried building design and the architectural vision has seen a demanding a new idea. A variety of competitors surrounded by them used to make the structure with their own choices and also the demand of market and the multistoried structure perform as extremely crucial job in innovative and new areas. It should explain the difficulty of manufacture region all along with the architectural and structural point of view. by composite and diverse floor arrangement on similar ground wants the reliability on the structural approach. These types of structure are Twin tower structure used in this contemporary globe. In this investigate, the parameter of evaluation of result such as displacement and storey drift are obtained in requisites of the twin tower multistoried structure located in earthquake Zone-III, earthquake effects are performing on the construction under 5 different Shapes and scrutinize with the assistant of Staad pro design software.

Keywords— Twins Tower, Efficient Shapes, Lateral Loading, Response spectrum analysis, Seismic Effects, Staad pro software.

I. INTRODUCTION

With the help of high rise structure guide the structural engineer to analyze and design as per severe seismic effects. Recent days, Twin towers are vastly in demand due to its architectural and structural design, individual plan along with more space with same foundation support. For that, we should know the efficient point parameters when these kinds of structures are in the contact of seismic loads.

II. OBJECTIVE

This study analyse the different parameters like displacements in longitudinal and transverse direction. After this, storey drift is calculated in both X as well as Z direction. The most efficient SHAPE will be analyzed after all parameters. There are total 5 Shapes of twin tower multistoried building at medium soil condition under seismic forces for earthquake zone III exist.

III. STRUCTURE MODELING

The twins tower has been modeled in design software Staad pro. The twin tower building detail of the multi storey construction are shown in Table a and Table b and shown graphically with the help of graphs. Top view and front view of various Shapes of G+12 building shown by the help of figures. Table 3 shows various Shapes used in this paper up to 12 floor twin with 13 different Shapes.

After than efficient Shapes for each parameter along with its remarks has drawn below each parameters.

Table 1 Details of building

Building configuration	G+17
No. of bays in X direction	10
No. of bays in Z direction	10
Height of building	69.800 M
Dimensions of building	50M X 50M
Size of beam	0.60 X 0.45
Size of column	0.60 X 0.60
Concrete and Steel Grade	M 30 & FE415

Table 2 Detail of loading

Earthquake parameters	Zone III with RF 4 & 5% damping ratio
Period in X & Z direction	0.884 & 0.884 for both direction
Dead load for floor and waterproofing	2KN/m ² & 0.5 KN/m ²
Live load for floor and roof	3.55KN/M ² & 1 KN/M ²

IV. RESULT AND DISCUSSION

These result is observed by the following cases-

Table.1: Maximum Displacement in X direction all 5 Shapes in Zone III

Shape	U	V	X	Y	Z
Displacement in X direction(mm)	333.739	333.739	333.739	333.739	333.739

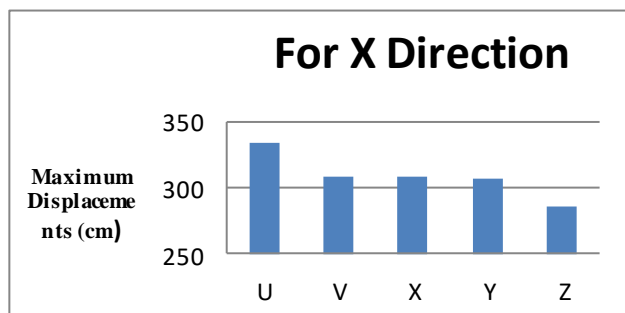


Fig. 1: Maximum Displacement shown in X direction for all 5 Shapes in Zone III

Table.2: Maximum Displacement shown in Z direction all 5 Shapes in Zone III

Shape	U	V	X	Y	Z
Displacement in Z direction(m)	311.785	311.785	311.785	311.785	311.785

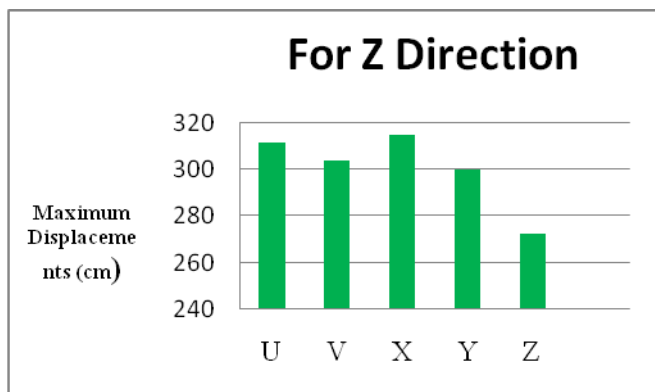


Fig. 2: Maximum Displacement shown in Z direction for all 5 Shapes in Zone III

Table 3: Base Shear shown in X and Z direction for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	17224.46	17224.46	17224.46	17224.46	17224.46
Z Direction	14850.59	14850.59	14850.59	14850.59	14850.59

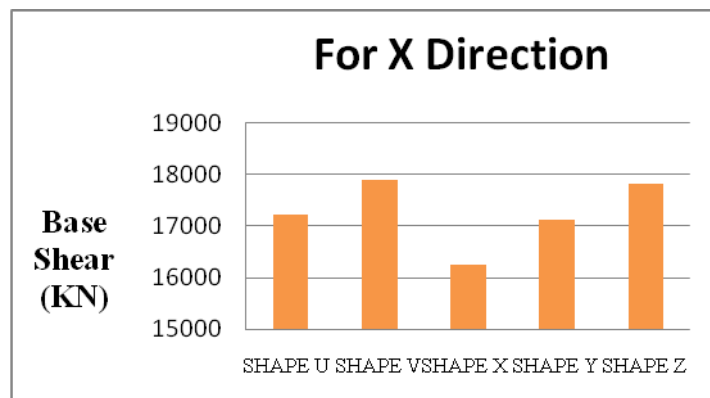


Fig. 3: Base Shear shown in X direction for all Building Shapes

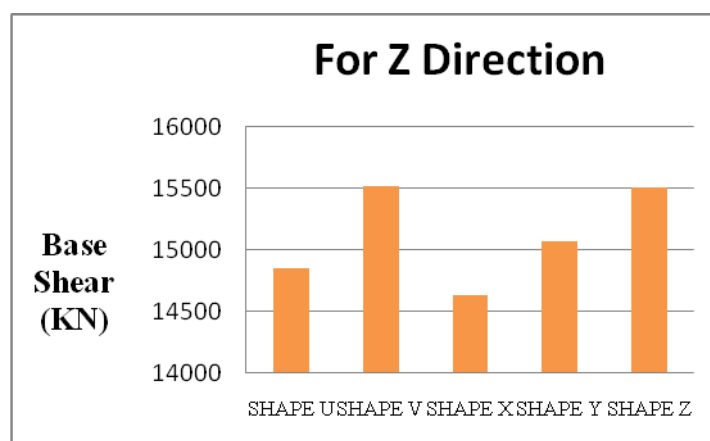


Fig. 4: Base Shear shown in Z direction for all Building Shapes

Table 4: Maximum Axial Forces shown in Column at ground level for all Building Shapes

Shape	U	V	X	Y	Z
Axial Force	11713.396	11713.396	11713.396	11713.396	11713.396

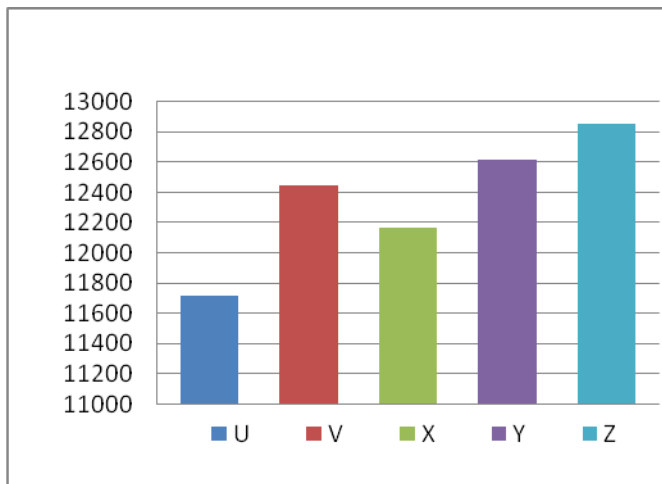


Fig. 5: Maximum Axial Forces shown in Column at ground level for all Building Shapes

Table 5: Maximum Shear Forces shown in Columns for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	341.434	341.434	341.434	341.434	341.434
Z Direction	297.931	297.931	297.931	297.931	297.931

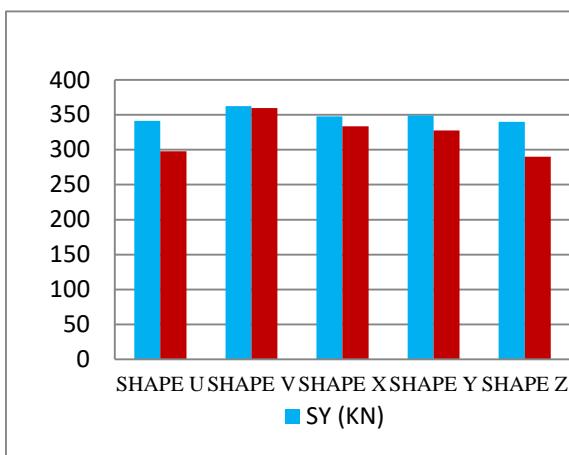


Fig. 6: Maximum Shear Forces shown in Columns for all Building Shapes

Table 6: Maximum Bending Moment shown in Columns for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	587.355	587.355	587.355	587.355	587.355
Z Direction	624.836	624.836	624.836	624.836	624.836

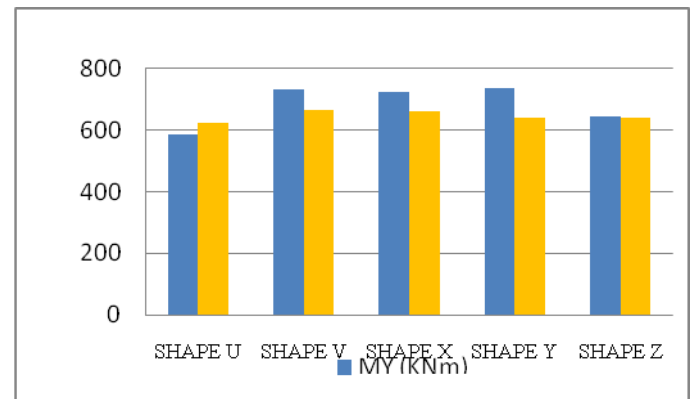


Fig. 7: Maximum Bending Moment shown in Columns for all Building Shapes

Table 7: Maximum Shear Forces shown in beams parallel to X and Z direction for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	276.949	276.949	276.949	276.949	276.949
Z Direction	2.584	2.584	2.584	2.584	2.584

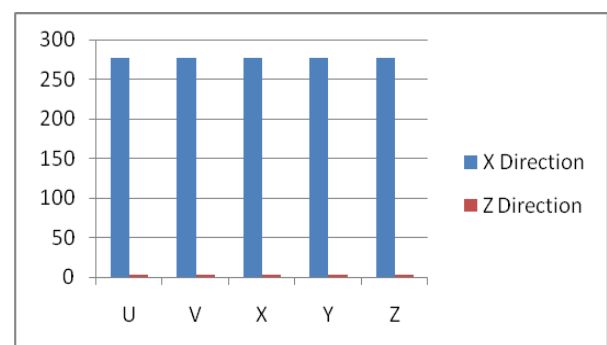


Fig. 8: Maximum Shear Force shown in Beam for X and Z direction for all Building Shapes

Table 8: Maximum Bending Moment shown in beams parallel to X and Z direction for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	12.650	12.650	12.650	12.650	12.650
Z Direction	435.701	435.701	435.701	435.701	435.701

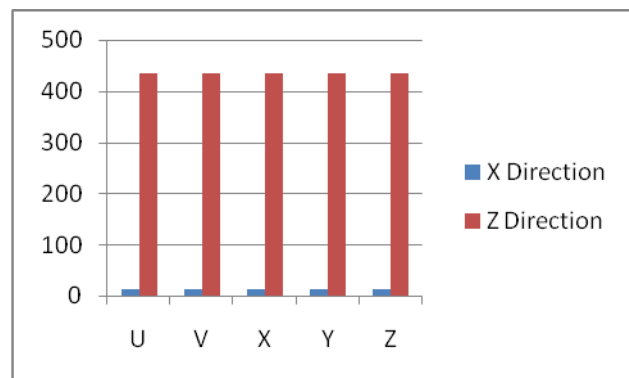


Fig. 9: Maximum Bending Moment shown in beams parallel to X and Z direction for all Building Shapes

Table 9: Maximum Torsional Moment shown in beams parallel to X and Z direction for all Building Shapes

Shape	U	V	X	Y	Z
X Direction	61.761	61.761	61.761	61.761	61.761
Z Direction	32.315	32.315	32.315	32.315	32.315

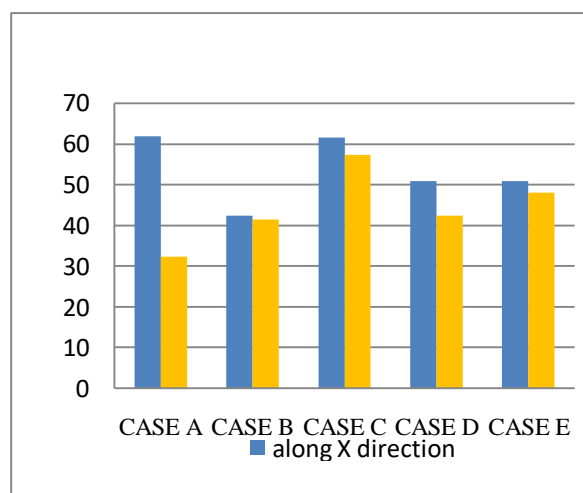


Fig. 10: Maximum Torsional Moment in beams parallel to X and Z direction for all Building Shapes

V. CONCLUSION

The design of twin towers building subjected to seismic effects the analytical results obtained from 5 shape of twins tower multistoried structure. As seen in results the maximum displacement in shape X and Z direction, maximum base shear in shape X and Z, maximum axial force in shape U, maximum column shear force in shape Z, maximum column bending moment shape Z, beam shear force shape U. That means shape Z and U is very efficient cases for twins tower.

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Rating of dispensed prescriptions in the psychosocial Care Center of a City of Bahia

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Abstract— In Brazil, the legislation created to regulate the use of substances and drugs subjected to special control is from Ordinance Number 344 of May 12, 1998, which establishes a standard model for prescriptions in which such substances are prescribed. This ordinance also proposes to eliminate ambiguous, illegible or incomplete prescriptions, as well as the lack of standardization of the nomenclature of prescription drugs, the correct use of the notification model, the use of abbreviations and the presence of erasures, which composes elements that may cooperate to the occurrence of mistakes. To rate prescriptions that are dispensed in a Psychosocial Care Center inside of Bahia. Cross-sectional study, based on the collection of prescriptions and psychotropic drugs notifications, kept at the pharmacy of the Psychosocial Care Center of a city of Bahia, from May 2018 to May 2019. According to the prescriptions analyzed, it was observed mistakes such as illegibility, absence of quantity of medication to be dispensed, absence of the date of issue and prescription out of date, as well as common mistakes by the prescriptive professional such as do not present their specialty. From these data was realized the necessity for more rigorous supervision and attention to the existing data in prescriptions, in order to avoid future problems, which would be minimized if it had the presence or attendance of an effective pharmacist in the service.

Keywords—Prescriptions; psychotropic drugs; pharmacy.

I. INTRODUCTION

According to Danniela (2016), mental disorders are clinical conditions featured by variations in thoughts and emotions or behaviors related to personal distress and / or degradation of psychic performance, triggering detrimental effects, which can affect not only the individual but the family and the community. Thus, the Psychiatric Reform in Brazil was created, which projects well-being and rights for people with mental disorders, so that the individual be welcomed with more tenderness and respect through actions in Psychosocial Care Centers (PCC) (MIELKE et al., 2009; BRAZIL, 2001).

It is worth noting that in recent years there has been a considerable increase in the use of psychotropic drugs worldwide. This factor can be associated with the predominant rhythm and lifestyle that lead the population to experience increasingly stressful and difficult situations such as demands for productivity, heavy traffic, excessive

activity, the increasing number of psychiatric disorders diagnoses in the population, the entry of new drugs in the pharmaceutical market and new therapeutic indications for already existing psychotropic drugs (PADILHA et al., 2014; BRIGIDO, 2008).

Psychotropic drugs are used as the therapeutic resource for patients with psychic disorders, but they are also consumed and prescribed for several situations, such as the anxiety for a promising life because of pressure from society. Studies show that the most consumed psychotropics by the major population are those ones from the anxiolytic class, which are used to treat depression, anxiety, insomnia, stress, among other social issues (NASARIO, 2016; SILVA, 2017). As a result of this, prescriptions increasing and the probable indiscriminate use of psychotropic drugs are relevant obstacles in mental health, because of the risk that these

drugs cause in a short and long time (SARMIENTO, 2017).

In Brazil, the legislation created to regulate the use of substances and medicinal products subjected to special control is from Ordinance Number 344 of May 12, 1998, which establishes a standard model for prescriptions in which such substances are prescribed with methods of specific fill-in forms according to the lists in which the substances participate: A1 and A2 (Narcotic), A3, B1 and B2 (Psychotropic), C1 (other substances subordinated to special control), C2 (Retinoids for systemic use) and C3 (immunosuppressants) (ANVISA, 1998).

This ordinance also proposes to eliminate ambiguous, illegible or incomplete prescriptions, as well as the lack of standardization of the nomenclature of prescribed drugs, the correct use of the notification model, the use of abbreviations and the presence of erasures, which constitute elements that may contribute to the occurrence of mistakes (CARDINAL and FERNANDES, 2014; CARDOSO et al. 2018). Thus, the goal of this work is to evaluate the prescriptions that are dispensed in a Psychosocial Care Center inside of Bahia, in order to verify errors in the prescriptions of psychotropics.

II. METHODS

The present work is a cross-sectional study in which the cause and impact are analyzed at the same time (BORDALO, 2006).

Thus, the prescriptions and psychotropic drugs notifications kept at the pharmacy of the Psychosocial Care Center of a city in the state of Bahia were collected, from January 2018 to October 2018.

METHOD FOR RATING OF PRESCRIPTIONS

Analysis of psychotropic recipes and notifications was performed by observing the following factors, as shown below:

- Characteristics of patient: Name, gender, age and full address;
- Characteristics of the prescription: Institution form containing name, address, specialty, signature or stamp and CRM.
- Characteristics of the prescriptive: Readability, dispatched quantity, date of issue and if the dispensation is within the time limit provided by law (30 days);
- Characteristics of prescription drugs: Name of the drug or substance, according to the Brazilian Common Denomination (BCD) (Ministry of Health, 2003), identification of the list that the psychotropic is involved, pharmaceutical form, dosage and dosage.

ETHICS COMMITTEE

This research was approved by the Research Ethics Committee of the Salvador University by nº CAAE 18994019.7.0000.5033, because data analysis of prescriptions of human beings were performed. Thus, this study follows the Resolution Number 466 of December 12, 2012 from the National Health Council (NHC). Moreover, this study ensures anonymity and respect for the cultural, ethical, social, moral and religious values of those ones involved. Thus, the researchers were committed to the privacy and confidentiality of the data obtained.

STATISTICAL ANALYSIS

Patient data and quantitative prescribing data will be presented like average, standard deviation and percentage. For tabulation and data analysis will be used the program GRAPHPAD Prisma (5.0), with significance level of 5%.

III. RESULTS AND DISCUSSION

From the analysis of prescriptions (n= 431) it was possible to verify the profile of the patients of the CAPS of the studied city, in which 55.92% (n = 241) of the individuals are women and 44.08% (n = 190) are men. Furthermore, 100% of the prescriptions analyzed did not find information about patient's age and address, as shown in table 1.

Table 1. Characteristics of patients

Sex	Address	Age
Feminine - 55,92% (n=241)	Absent	Absent
Male- 44,08% (n=190)	Absent	Absent

The study by Reis et al. (2017) shows the result of the prescription profile of psychotropic drugs in community pharmacy, which presented a women prevalence of 69.85%, which is an equivalent result with the present study. A study elaborated at several Psychosocial Care Centers in the southern region of the country acknowledged that 79% of psychotropic users were women (KANTORSKI et al., 2011). These data reinforce the results found in this present study, which shows the prevalence of women in using of psychotropic drugs. According to Maragno et al. (2006), mental disorders are more present in women, and the most common disorders are depression, stress and anxiety disorders (ANNEQUIN et. al., 2015; MARAGNO et. al., 2006). . Moreover, according to Farias et al. (2016) women have a greater

ability to perceive the signs and symptoms of pathologies and, because that, search medical assistance in advance and practically do not show resistance to adherence to prescribed treatments, unlike men.

Regarding the absence of the patient's address, Cunha (2017) presented a result of 21.88% similar to the present study, in which he observed that there were no patients' addresses in the prescriptions, and thereby did not perform one of the determinations from Ordinance Number. 344, of May 12, 1998 (CUNHA et al., 2017). Another research in a Popular Pharmacy of Brazil in Aracaju / SE, verified that there was no address of the patient or the same one was incomplete in 300 prescriptions analyzed (BARREIRA et al., 2011).

It is noteworthy that patient's address is essential to provide, if necessary, communication between the pharmacist and the patient. Thus, the presence of the address is a facilitator if there are any problems related to the use of prescription drugs (SANTOS PV; CRESPO JM, 2017). Moreover, Ordinance Number. 344, of May 12, 1998, indicates that prescriptions for special control medications must contain the full address of the patient in the identification of the user.

Likewise, Table 2 shows the drugs dispensed in CAPS along with the list of substances subordinated to special control B1 (psychotropic) and C1 (other substances subordinated to special control which are presented in Ordinance Number 344 of May 12, 1998.

Table 2. Medicines dispensed

Medicines	List	Amount	%
Amitryptiline	C1	76	12%
Biperiden	C1	12	2%
Carbamazepine	C1	77	12%
Lithium Carbonate	C1	22	4%
Clonazepam	B1	17	3%
Chlorpromazine Hydrochloride	C1	5	1%
Chlorpromazine	C1	9	1%
Diazepam	B1	161	26%
Phenytoin	C1	6	1%
Phenobarbital	B1	23	4%
Fluoxetin	C1	26	4%
Haloperidol	C1	74	12%
Nortriptyline	C1	7	1%
Promethazine	C1	30	5%
Risperidone	C1	55	9%
Sodium valproate	C1	17	3%
TOTAL		617	100%

It is possible to notice in Table 2 that 67% (n = 416) of prescription drugs are on list C1 and 33% (n = 201) are on list B1. In the study by Tatiana Silva and Aparecida Iguti (2013), accomplished in a Basic Health Unit of a large city of São Paulo state, with 800 prescriptions, the results about the lists of special control substances showed that 78.4% of prescriptions were substances from list C1 and 21.6% from list B1. These data are similar to those ones obtained in this study, maybe because it is a public unit, the frequencies of substances from group B1 and C1 can be taken into account because the National List of Essential Medicines (NLEM). Likewise, the research by Murta et al. (2019) analyzed the quality of medical prescriptions in Montes Claros - Minas Gerais, in which 510 prescriptions were analyzed. The results from lists 21.8% from list C1 and 2.15% from list B1. The information obtained are similar to the current study, proving an equivalent prescription profile.

It can be possible to verify that the most dispensed psychotropics were Diazepam (39.08%), Carbamazepine (18.69%), Amitriptyline (18.45%) and Risperidone (13.35%) and Haloperidol (10.43%).

Diazepam was the most prescription drug in the CAPS of the city of Bahia, recognized in prescriptions on 39.08%. According to Sousa et al (2016) the choice of Diazepam in several public health services in several occurrences happens due to this drug be a drug related to the National List of Essential Medicines (NLEM), which is known for its safety and efficiency, besides having the cost reduction and extensive clinical knowledge. in its various uses.

Therewith, this drug is used in epileptic illness emergencies, and besides that it has clinical suggestion in panic disorder. The prescription of Diazepam corresponds to 50% of the prescriptions of psychotropic drugs in Brazil, showing a permissible overprescription or even indiscriminate use of this drug (BOGER et al., 2017).

A study performed in a CAPS by Santos (2017) observed that Diazepam is the most prescribed drug with 24.6% followed by Carbamazepine and Haloperidol. On the other hand, a study by Cazarotti et al. (2019) in a drugstore in Santa Inés - MA, observed that Diazepam was the second most prescribed drug.

Regarding the present errors in the prescriptions analyzed, errors such as illegibility, absence of quantity of medication to be dispensed, absence of the date of issue and expiration of the prescription were observed. Thus, in this study, a high prevalence of late dispensation (49.8%) from the date of issue was detected, according to table 3, according to Ordinance Number 344 of May 12, 1998, the prescription had operation for a period of thirty days from

its issue and only inside the Federative Unit that granted the notation.

Table 3. Errors in the prescriptions

Items observed in Prescriptions	Amount (n)	%
Unreadable	108	25.6%
Absence of quantity to be dispensed	40	9.4%
Absence of the issue date	64	15.2%
Dispensing out of date	211	49.8%
TOTAL	423	100

Equivalent result to the present research was found in the research by Andrade et al. (2004), who pointed that illegibility was 18.2% for list B and 10.2% for list C. Already Silva et al. (2008) when performing a study at the Pharmacy Carlos Drummond de Andrade School of UFPE - Federal University of Pernambuco identified a result of 6.17% of illegibility.

According to Lopes et al. (2014), undecipherable and ambiguous prescriptions display a higher risk and the possibility of causing side effects. Moreover, according to the authors, unsatisfactory prescriptions of information has the capability of causing unequal dosages empowering for adverse reactions.

Thereby, it is plausible to understand that prescription is overriding for a positive therapeutic result, and it is essential that there is a cohesive understanding so that the prescribed drug be managed by the best way, reducing the recurrence of the pathology to be treated, the non-therapeutic success and side effects, besides that the understanding causes a satisfaction for patient and professional. Based on the understanding of these fundamental concepts, it becomes admissible the perception of the data that guide the medical prescription and its purpose (MURTA et al., 2019).

Since this model of prescription can reduce mistakes as it extinguishes the difficulty in analysis and understanding driven by the illegible letter of the prescriptive and provides that typing mistakes be corrected in the preparation of the prescription with no need for erasures or scribbles which hinder the understanding of the data (TAKAHASHI et al., 2019).

Regarding the absence of the prescription date of issue, a study by Arruda et al. (2012) at the CAPS pharmacy in Araguaína - TO showed that 74% of the prescriptions

analyzed had this absence. According to these authors, the absence of the date of issue in the prescription makes it difficult for the dispensing professional to take notice of the prescription period, having the power of causing damage to an excellent pharmaceutical orientation. Thus, omitting data from this field may lead to fraudulent actions or irrational use of the drug (ARRUDA et al., 2012).

The data presented in this research (15.2%) is higher than the study by Arruda et. al. (2012), because there was a lower error rate regarding to the absence of the date of issue in the prescription. In the research by Pinheiro et al (2016), it was observed that 61.95% of prescriptions had the date of issue, thus an extremely important data in the procedure of a prescription analysis, as it may indicate the continuity of the pharmacological treatment and in different incidents the reuse consequently of great importance to ensure the validity of the prescription.

It is noteworthy that when the prescriptive does not date the prescription, he / she contributes to the action of the patient do not instantly administer the drug on the date of the next appointment, having variations of the symptoms in the time lapse between the appointment and the starting of the drug use (SOARES et al., 2014).

Thus, the information can be pointed out as unnecessary by certain professionals, but it is essential to certify the validity of the prescription, because it consists of a basic reference in order to observe the historical development of the patients and along with the purpose that in each time lapse the medications be dispensed, administered and evaluated (ZANIN; LUZ, 2012).

According to the data, the common errors of the prescriptive professional and according to the total prescriptions observed, 97.8% did not have the specialty of the prescriptive. The result mentions the absence of the prescriptive professional specialty as over to the value acquired in the study by Cunha et al. (2016), in which 84.98% did not include the specialty of the prescribing professional.

A research by Pizzolatti et al. (2017) in Criciúma - SC showed the result of 44.4% of prescriptions without medical specialty, a very expressive result compared to the present study. Besides this, a study by Moura et al. (2018) on analysis of medical prescribing errors in an Emergency Care Unit, showed a result of 9.57% of prescriptions that were identified with no stamps or the CRM number of the prescriber.

In the present study, a result of 0.4% of prescriptions with no medical signature was observed and in a study by Oliveira et al. (2016) presented a result of 100% of the

absence of medical signature, a totally discrepant result when compared to the present study.

It is a total assignment from the doctor the performing of the prescription for the patient and the prescription is the key document that represents this assignment. Thus, the prescription will only be valid if it has the signature of the prescribing professional.

It is noteworthy that there is no legal requirement of the doctor's stamp in medical prescriptions, however it is necessary the signature with readable identification and the CRM, and it is optional to use the stamp, which aims to optimize medical tasks (MADRUGA; SOUZA, 2011). In the present study, 1.8% of prescriptions did not present the CRM of the prescriptive professional. Similar data was found in the study by Lima et al. (2016), which pointed out 4.17%, relative to the lack of identification of the prescriptive. Volpe et al. (2016) when performing a survey in a public hospital in the Federal District, showed that 98.3% of prescriptions without CRM.

It is advised that initially everything that is performed by the doctor must be followed not only by the signature but also by the registration of the doctor in the CRM, when prescribing special control medications becomes essential or the use of the stamp or the use of documents in which be printed the CRM of the prescribing professional (FEDERAL COUNCIL OF MEDICINE, 2014).

Given this context, the present study highlights the mistakes in prescriptions dispensed in a CAPS, which can be avoided following Ordinance Number 344 of May 12, 1998, increasing the importance of pharmaceutical evaluation in the prescription and drugs dispensing.

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Reliability of a Radial Distribution System by developing network reconfiguration in accordance with failure mode

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Abstract— Reliability investigation assumes a critical job in structuring and arranging of radial distribution systems that work for insignificant interference of client end electric loads. Power distribution systems are known as the constituent piece of power systems with the most noteworthy convergence of failure occasions. Despite the fact that the deficiencies in distribution systems have a nearby impact when contrasted with the age and transmission ides, significant possibility acceleration occasions are as a rule all the more every now and again announced from this segment. Mix of new innovations, mechanization and expanded entrance of disseminated age is required to make improving and in any event, supporting high reliability measures a mind-boggling task. Therefore, this paper is planned to glance in to one factor of feeder disappointment and reconfigure in understanding.

Keywords— Reliability, Radial Distribution system, Network reconfiguration, Failure Nodes.

I. INTRODUCTION

Power systems are one of the most perplexing frameworks discovered worldwide and they are required to work with high caliber and reliability. The principal reason for power systems is to give a monetary and solid channel for electrical vitality to move from purposes of age to client areas. The monetary and reliability requirements can be commonly focused, making arranging and activity of power systems an intricate issue [1].

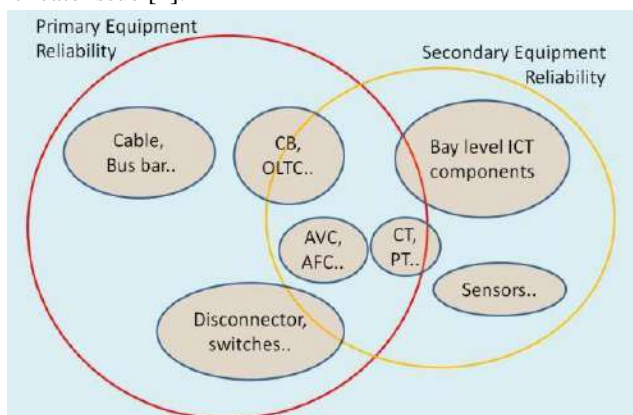


Fig.1: Distribution of component reliability over primary and secondary sides

The distribution system reliability assessment considers the capacity of the distribution system to move vitality from mass inventory focuses, for example, run of the mill transmission system end-stations, and from neighborhood age focuses, to client loads. In the beginning periods of broad power system development, moderately less consideration was given to distribution systems on account of their lower capital escalation when contrasted with a long separation transmission systems. Likewise, the blackouts in distribution systems are relied upon to have a confined impact [1]. Notwithstanding, examination of handy utility disappointment registers and shortcoming measurements uncovers that distribution arranges as a sub-area of the power systems contribute the most to client interferences and disappointment occasions [2-4]. With headways in innovations both coordinated in power systems and utilized in connection to it, a danger of increment in disappointment frequencies in power distribution segments is normal [34]. Presentation and augmentations in system computerization, wide development in power request entanglements because of dispersed age and so forth are contributing elements to this hazard [5]. These headways are required to improve the presentation of power system. In any case, remembering that the included segments are rarely great, the option of a segment which can experience disappointment in this manner

presents an extra danger of disappointment in the system. (Figure 1-2)

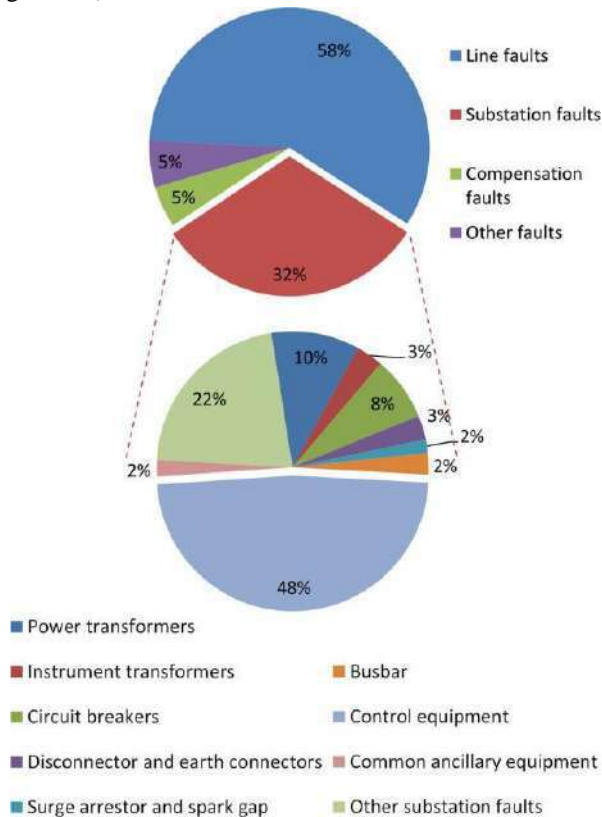


Fig.2: System and Component fault classification

Observing failure and analyzing the impact

The talk here spotlights on the station and feeder engineering at the usage end of power matrix. The consistent tasks and disappointment effects of circuit breakers and individual insurance systems are considered. Here, the term 'disappointment' can show either an inaccessible status of a segment while activity is required or an undesirable mal-activity when no such activity is required [26]. The various potential methods of disappointment in such a situation are dynamic disappointment occasions, uninvolved disappointment occasions, stuck-state of breakers and covering disappointment occasions [27].

Active Failure

Dynamic disappointment occasions are the most widely recognized mode among power system disappointments [27]. Consider a short out deficiency in a conductor part for instance. In such a case, the defective conductor is disengaged from the remainder of the system by the opening activity of an electrical switch liable for the specific insurance zone. In this model, the main broken segment is the conductor which encountered a short out and the

insurance system and the breaker hand-off worked subsequently is intended for.

Passive Failure

While characterizing the term disappointment, one of the potential conditions in thought is an undesirable mal-activity in system where no dynamic disappointment is available to start it [26]. Uninvolved disappointment occasions are such situations where an undesired open circuit happens with no other issue in the system to trigger it. Consequently, inactive disappointments are not described by flaw flows that are detected by assurance systems. The purposes behind aloof disappointment occasions can be physical or material disappointment, bogus hand-off activating from security systems, absence of circumstance mindfulness from human administrator and so on. Consequently, the guilty party segment on account of an aloof disappointment occasion ought to be comprehended from the reason for the occasion, to evade wrong estimations in segment disappointment insights. Despite the fact that there is plausibility of detached activities, for example, dis-connector disappointments rising to cut off because of contact with encompassing parts or ground [28], a regular inactive disappointment occasion just disengages the clients legitimately provided idea the line that got opened.

Covering Failure Modes

This disappointment mode is in the key focal point of the dialog here. Covering disappointments are where a system is encountering halfway or complete disappointment or experiencing a separate fix process and an extra disappointment happen covering with this condition. Such covering disappointments happen in power system activity either because of arbitrary reasons or because of the expanded disappointment hazard forced by the main disappointment or fix circumstance. Presentation of more automation in power system activity and control builds the normal recurrence of these sorts of disappointments. Short disengagements and disappointments covering in orders higher than two segment deficiencies are disregarded, as by and large proposed for these counts [13]. The accompanying area further grows the particular cases considered and the separate causes and highlights of covering disappointment occasions.

Prior Observation

Before the improvement thinking about eagerness to contribute, a base conceivable link length that could associate the hubs in the reference model was assessed, disregarding far as possible and effect of operational blackout cost of links.

The outcome henceforth is a for all intents and purposes non-practical and less dependable development. In any case, it communicates the conceivable least length of link that the

system can have. The comparing absolute link length is roughly 25 km. note that the current system has an absolute link length of round 60 km.

Substation	Total Number of Feeders	Station level SAIFI (failure/customer*year)	Average feeder length per station (km)	Net failure rate for feeder component (failure/yr)	Number of separated busbars	Busbar	Number of feeders per busbars	Busbar level SAIFI (failure/customer*year)
1	43	0.134	1.467	0.02641	4	1	10	0.031163
						2	9	0.028047
						3	12	0.037395
						4	12	0.033950
2	44	0.602	2.047	0.03685	8	5	7	0.095773
						6	7	0.095773
						7	6	0.082091
						8	6	0.082091
						9	3	0.041045
						10	3	0.041045
						11	6	0.082091
						12	6	0.082091
3	48	0.103	1.303	0.02345	8	13	8	0.017167
						14	8	0.017167
						15	4	0.008583
						16	4	0.008583
						17	4	0.008583
						18	4	0.008583
						19	8	0.017167
						20	8	0.017167
4	15	0.271	3.169	0.05704	2	23	7	0.126467
						24	8	0.144566
5	12	0.192	6.062	0.10912	2	25	6	0.096000
						26	6	0.096000
6	18	456	2.156	0.03881	2	27	9	0.228000
						28	9	0.228000
7	30	0.418	4.057	0.07303	2	31	15	0.209000
						32	15	0.209000
8	26	0.451	3.796	0.06833	2	33	13	0.225500
						34	13	0.225500
9	14	0.158	5.513	0.09923	2	35	8	0.090286
						36	6	0.067714

The eagerness to contribute is considered inside the range 10 to half. In useful cases, there consistently exist restrictions in the quantity of ventures and changes that can be made on a working network. Thus, recommending a few changes by constraining the improvement to do so isn't extremely noteworthy. Here the scope of ability to contribute for >50% isn't displayed; however, the program can have any range. In any case, if extension of a current system should be done to another territory, or when another system is being developed without any preparation, such investigation can be utilized if

the hubs of optional station areas are chosen. On the off chance that the reference contextual analysis model was such a situation where there are no current links and the hubs are unblemished, at that point the streamlining gives the proposal as appeared. The decrease is link length and potential course for flaw heightening the system reliability and execution can be improved. Since the investigation here depends on a current system, this case isn't examined further, as it requests an extremely high speculation.(Table & Chart 1)

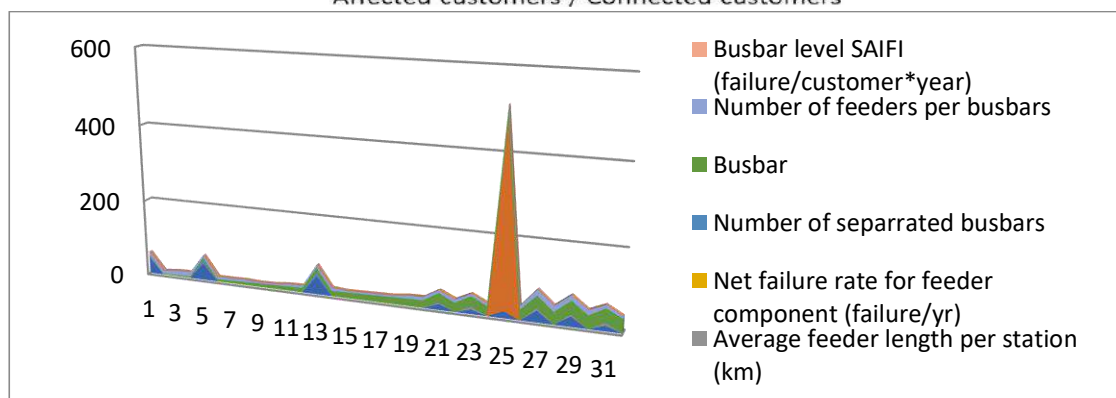
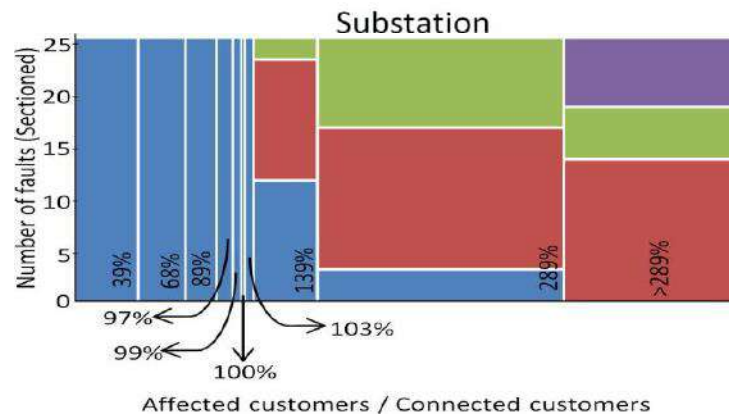
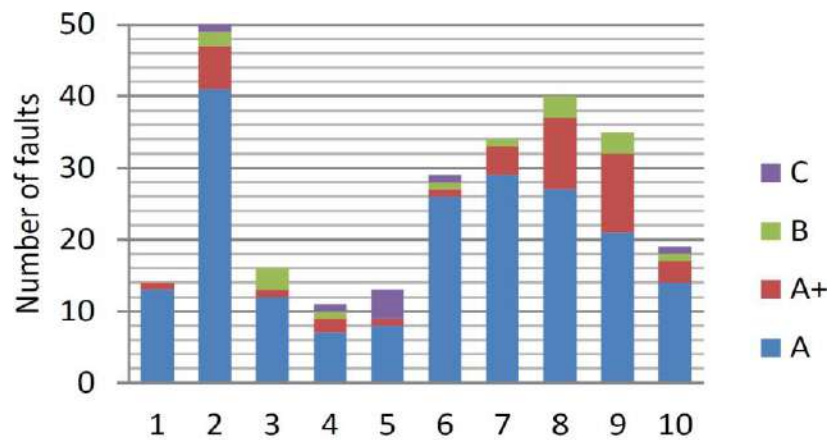


Table & Chart 1: Observation Data Evaluation

Network Optimization

This section talks about the target of utilizing reliability effects of different system designs in arranging successful upgrades in distribution systems. The goal is tended to with a cost streamlining approach in which both the venture for reconfiguration in the system and the normal expense of

blackout in the subsequent recommendations are considered. Advancement is directed on a genuine substation model. The accompanying areas present the reference organize, the improvement model, the arrangement of limitations and the important social conditions. The outcomes and examination of the estimations pursue a short time later.

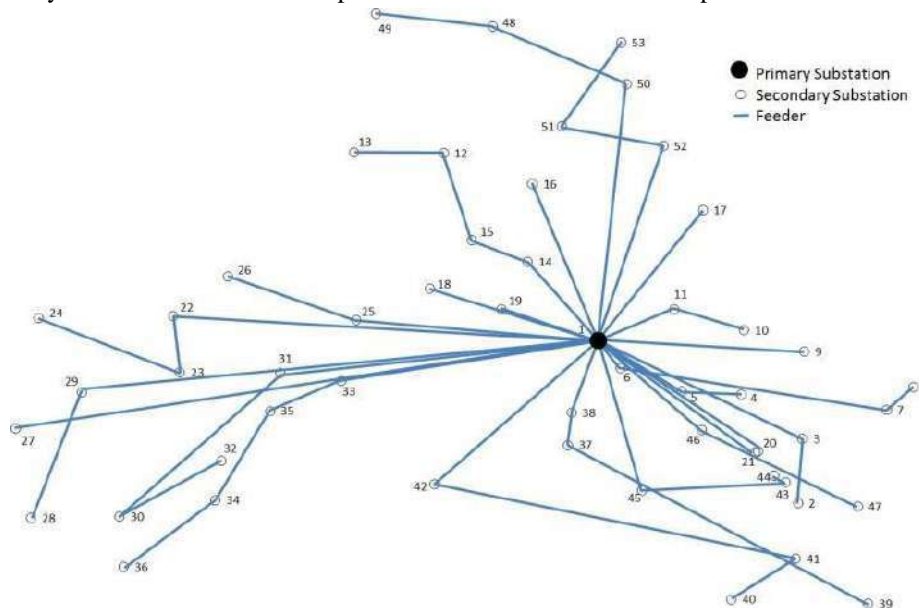


Fig.3: Network suggestion for the reference nodes for constructing from scratch

The reference organize comprises of one essential substation sustaining 52 auxiliary stations through the MV framework. In the current system, there are 24 feeder links having an absolute link of around 60 km, beginning from the essential station and sustaining at least one optional station through the length of the feeder. Certain disentanglements and suspicions are made on the reference model to help the improvement practice and to regard the utility's information security necessities.

The advancement, to utilize the chart hypothesis model, should think about all conceivable link lengths between all conceivable hub associations. From the system, just existing link lengths are known as genuine qualities. Subsequently, a reference model explicit increase factor is determined as a normal, contrasting all current link segment lengths with the two-dimensional separation between particular geographic directions. This duplication figure helps assessing the functional lengths of link required to interface those hubs in the considered system where no genuine connections exist starting at now. This gives a reason for the computation of speculation cost. The duplicate factor acquired from the computation is 1.79. This implies an arrange separation of

one meter in this system requires roughly 1.79 meters of link to associate those directions. (Figure 3-4)

From the revealed pinnacle requests at the auxiliary stations throughout the years, the power request of the sink hubs (the optional station positions) are accepted, which in the considered system fluctuates from 70 to 2400 KVA. In spite of the fact that it is an extraordinary case to expect top requests as hub prerequisites, it enables testing if the power to move limits of the feeder links is continually regarding the potential pinnacles.

Alongside this, from the utility practice, a security edge for the power move limit of the links was determined as demonstrated as follows, preceding settings the requirements of improvement.

Since the system is as of now working in the current express, the stock hub that is the essential substation is accepted equipped for serving the power request of all sink hubs. Innovations, for example, dispersed age and capacity are not considered in the situation as the objective is to enhance setup venture cost that ought to have the option to deal with the system request without different sources than the essential substation.

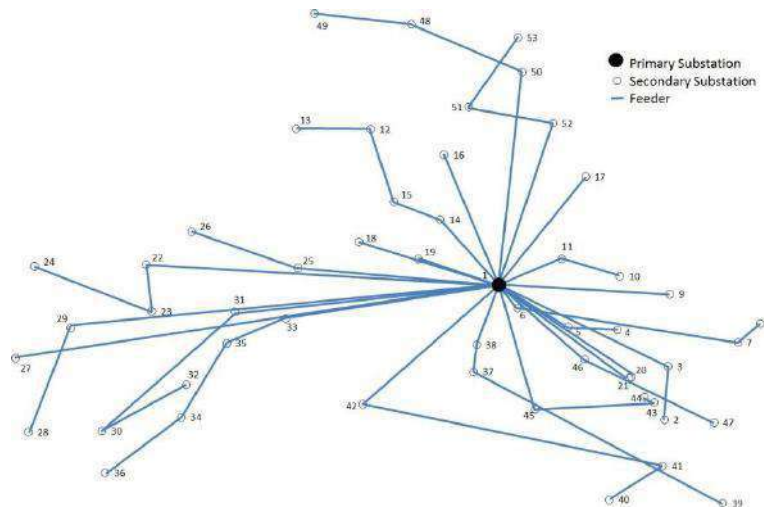


Fig.4: Existing coordinate network structure of the MV grid

II. CONCLUSION AND FUTURE WORK

Evaluation and effect appraisal of corresponded disappointment occasions and consolidated reliability investigation of essential and optional gear is the main target. The distribution of connected occasions related with the joined effect of electrical switch and insurance systems activity is seen from power utility flaw registers utilizing examination of possibility acceleration. The immediate estimation model proposed for utility application depends on level of possibility heightening, looking at the associated clients in the various feeders with the quantity of clients influenced by different blames in feeder conductors. The plan of distribution systems fluctuates broadly, and thus the demonstrating can be improved from system explicit ways to deal with more speculation strategies, improving comprehension from legitimately accessible disappointment related information.

The estimation practice is trailed by an exact measurement approach where layouts of hypothetical models utilizing RBD were defined to deal with distribution lattice execution insight and information. The investigation subsequently directed on genuine contextual investigation uncovers the separate distribution of concealed bogus stumbling probabilities. The portion of insurance system issues among the all-out number of recorded issues was seen as in the cope of 36% in the considered system. These outcomes are tried and confirmed. The down to earth variety scopes of corresponded disappointment probabilities in systems with different degrees of automation were watched. The capacities and count precision of the connected disappointment likelihood computation apparatus created can be upgraded by

considering system explicit pattern plots. The bend fitting the ideal gives progressively precise readings of issue heightening probabilities where there is opportunity to get better.

The second goal of the venture report is the utilization of system topologies in figuring system reliability and subsequently the examination of potential upgrades in design of the system. The investigation considering system reliability sway was done to mention significant objective facts. The streamlining incorporated the requirements, for example, load request t client hubs, power move limit of the current system, and so on. The pattern of number of new link establishments required with expanding speculation cost was seen alongside enhancing the absolute link length to be introduced. This examination helps spending plan compelled basic leadership, in organizing exchange venture alternatives. The reconfiguration model was done dependent of existing systems with hubs previously decided. The advancement can be improved to have the ability to recommend ideal situations for the position of optional station transformers if such activities are of huge bit of leeway. It can likewise be reached out to deal with non-radial design. Despite the fact that these are right now uncommon in distribution systems, this capacity would advance the extent of the apparatus to transmission systems arranging, incorporation of disseminated age and so forth. Thus, the expansion and advancement of the works talked about in this venture report have huge worth and application in system reliability improvement.

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Performance Analysis on the Flats Project in Maluku I with the Earned Value Method

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Abstract— Flats Construction Project in Maluku I at Nania Village, Ambon City is a construction project that built to answer the needs of the community. Flats Construction Project in Maluku I at Nania Village, Ambon City was carried out on May 20, 2018 and was scheduled to be completed on November 20, 2018. However, in the implementation until November 30, 2018 the progress of the work had only reached 69.79%, so that the adenddum was extended by 50 days until with 30 December 2018. The purpose of this research is to find out the schedule performance and cost performance in Flats Construction project in Maluku I at Nania Village, Ambon City using the Earned Value concept. The method used in this study is the yield value method. The yield value method can be used as a performance measurement tool that integrates cost aspects and time aspects. The data collection techniques used in this study are the interview method, observation method and literature method. The variables contained in this study are two types of variables namely the independent variable namely time and the dependent variable namely cost. The data analysis technique uses the earned value method. From the results of the analysis at 9th week, 14th and 21st schedule performance index (SPI) <1 which means that project performance is slower than the planned schedule so that the project has a time lapse with a weight of 21.30% of the 180 workday planning schedule and cost performance index (CPI) <1 which means the actual cost (ACWP) incurred is greater than the value of the work obtained (BCWP) so that the project experiences a fee deviation of Rp.159,787,216.18 from the RAB of Rp.16,796,733,000.00 (Contract Value).

Keywords— Earned Value, Schedule Performance Index, Cost Performance Index.

I. INTRODUCTION

Flats Construction Project in Maluku I at Nania Village, Ambon City is a construction project created to answer the needs of the community. This project has a building area of 61.25 m x 12.75 m (780.94 m²) consisting of 4 floors and 1 basement. The number of units contained in the Flats Construction Project in Maluku I at Nania Village was 58 Unit Type 36 (52 General Units, 6 Disability Units) with a budget value of Rp. 16,796,733,000.

Flats Construction Project in Maluku I at Nania Village, Ambon City was carried out on May 20, 2018 and was scheduled to be completed on November 20, 2018. However, in the implementation until November 30, 2018 the progress of the work had only reached 69.79%, so that the adenddum was extended by 50 days until with 30 December 2018.

This delay certainly has an impact on the planned costs and time. One of the costs and time control so that the project is still implemented and completed well is using the earned value method.

II. LITERATURE REVIEW

2.1 Earned Value Method

Earned Value Method is the concept of calculating the amount of costs according to the budget in accordance with the work that has been carried out or completed (budgeted cost of work performed). When viewed from the amount of work completed this concept means to measure the amount of work units that have been completed at a time when judged based on the amount of budget provided for the work. With this calculation, it is known that the relationship between what has actually been achieved physically and the amount of budget spent (Iman Suharto, 1995).

$$\text{Earned Value} = (\% \text{ completion}) \times (\text{budget}) \quad (\text{eq.1})$$

Notes :

- 1.% of completion achieved at the time of reporting.
2. The budget in question is the real cost of project.

2.2 Cost Varians(CV) And Schedule Varians (SV)

Cost Variance is the difference between the value obtained after completing work packages with the actual costs incurred during project implementation.

$$\text{Cost Variance (CV)} = \text{EV} - \text{AC} \text{ or}$$

$$\text{CV} = \text{BCWP} - \text{ACWP} \quad (\text{eq.2})$$

If the CV:

1. Negative (-) = Cost Overrun
2. Zero (0) = according to cost
3. Positive (+) = Cost Underrun

Schedule variance is used to calculate deviations between BCWS and BCWP.

Schedule Variance (SV) = EV - PV or

$$SV = BCWP - BCWS \quad (\text{eq.3})$$

If the SV:

1. Negative (-) = late from schedule
2. Zero (0) = on time
3. Positive (+) = ahead of schedule

The criteria of the two indicators above both SV (Schedule Variance) and CV (Cost Variance) are tabulated by ImanSoeharto as follows:

Table.1: Integrated Variance Analysis

SV	CV	Information
Positive	Positive	Work is ahead of schedule and costs are less than the budget
Zero	Positive	Work on schedule and costs less than the budget
Positive	Zero	Works faster and cost according to budget
Zero	Zero	Work according to schedule and budget
Negative	Negative	Work is completed late and costs are higher than the budget
Zero	Negative	Work is carried out according to schedule and costs are higher than the budget
Negative	Zero	Work is completed late and costs are within budget
Positive	Negative	Work is completed faster with costs above the budget

(Source: ImanSoeharto, 2001: 23)

2.3 Cost Performance Index (CPI) And Schedule Performance Index (SPI)

Cost Performance Index (CPI) is a cost efficiency factor that has been incurred can be shown by comparing the value of physically completed work (EV) with costs that have been incurred in the same period (AC). This CPI value shows the weight of the value obtained (relative to the overall project value) against the costs incurred. A CPI of less than 1 indicates poor cost performance, because the costs incurred (AC) are greater than the value obtained (EV) or in other words waste occurs.

Schedule Performance Index (SPI), a factor of performance efficiency in completing work can be shown by the comparison between the value of work that has been physically completed (EV) with planned expenditure of

expenses based on the work plan (PV). The SPI value indicates how much work can be completed (relative to the whole project) to the unit of work planned. SPI value less than 1 indicates that job performance is not as expected because it is not able to achieve the planned work targets. Project managers often want to know the use of resources, which can be expressed as a productivity index or performance index. This performance index consists of Cost Performance Index (CPI) and Schedule Performance Index (SPI).

Cost performance index (CPI) = EV / AC or

$$CPI = BCWP / ACWP \quad (\text{eq.4})$$

Schedule performance index (SPI) = EV / PV or

$$SPI = BCWP / BCWS \quad (\text{eq.5})$$

Table.2: Analysis of Performance Index

Index	Value	Information
CPI	>1	Actual costs incurred are smaller than the value of the work obtained (BCWP)
	<1	Actual costs incurred are greater than the value of the work obtained (BCWP)
	=	Actual costs incurred are equal to the value of the work obtained (BCWP)
SPI	>1	Project performance is faster than planned schedule
	<1	Project performance is slower than the planned schedule
	=	Project performance is the same as the planned schedule

(Source: ImanSoeharto, 2001: 237)

2.4 Projected Cost Expenditures and Project Completion Period

Making cost estimates or project completion schedules based on indicators obtained during reporting will provide a hint of the Estimated At Completion (EAC) and Estimated At Schedule (EAS). Cost estimates or schedules are useful because they provide early warning about things that will happen in the future. If the remaining work is considered to have the same performance as at the time of reporting, the Estimate Temporary Cost (ETC) is:

$$ETC = (BAC - BCWP) / CPI \quad (\text{eq.6})$$

$$EAC = ACWP - ETC \quad (\text{eq.7})$$

Whereas Estimate Temporary Schedule (ETS) is:

$$ETS = (\text{remaining time}) / SPI \quad (\text{eq.8})$$

$$EAS = \text{end time} + ETS \quad (\text{eq.9})$$

Notes :

BAC (Budgeted At Completion)

SPI (Schedule Performance Index)

CPI (Cost Performance Index)

ETC (Estimate Temporary Cost)

EAC (Estimate At Completion)

ETS (Estimate Temporary Schedule)

EAS (Estimate At Schedule)

III. RESEARCH METHODOLOGY

3.1 Research Sites

This research is located in the Flats Construction Project in Maluku I at Nania Village, Ambon City.

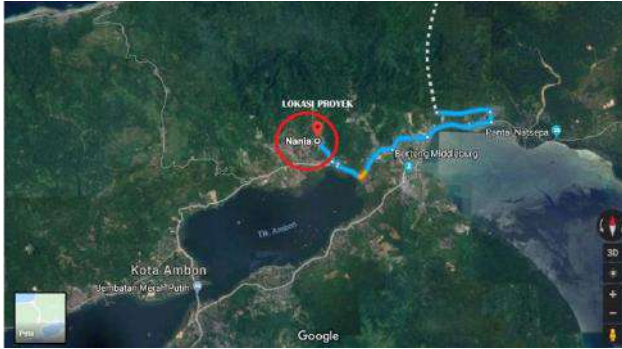


Fig.1: Research Location Map

3.2 Flowchart of Research

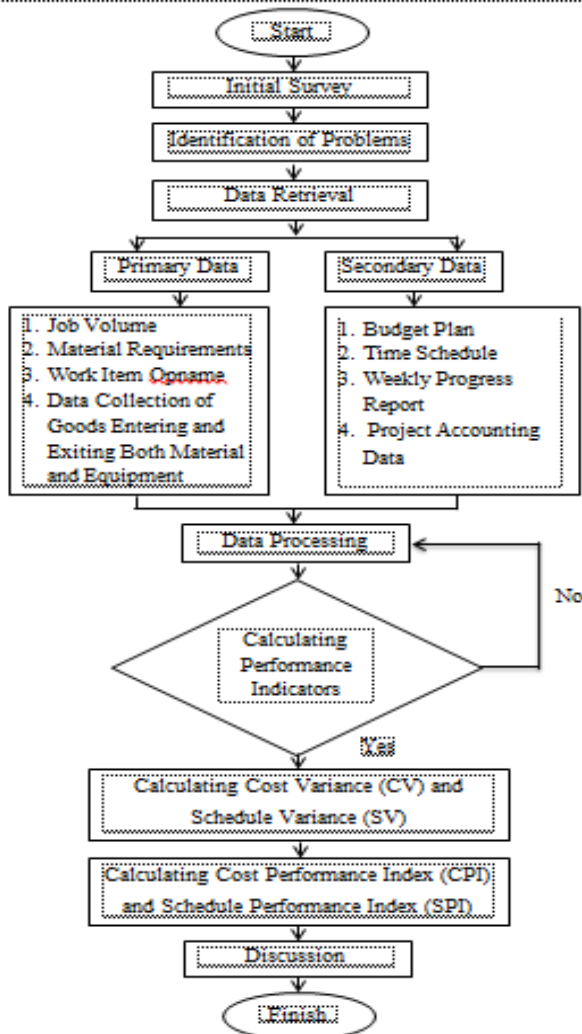


Fig.2: Research Flow Chart

IV. RESULTS AND DISCUSSION

4.1 Calculations of Actual Cost Of Work Performed (ACWP)

ACWP value at the time of reporting:

1) In the 21st week reporting Rp.9.656.660.054,38

Table.3: Actual Costs on Week

NO	Work Item	Total Cost (Rp)
1	Preliminary work	
	The cost of the preliminary work	191.776.375,00
	The cost of mobilization / demobilization work	30.900.000,00
2	Standard structural work	
	Cost of elevation basement floor structure work -3.5	210.318.056,23
	Cost of first floor work / ground floor elevation 0.00	1.277.874.351,88
	The cost of the second floor elevation work is +3.35	1.032.839.132,71
	The cost of the third floor elevation work is +6.55	935.908.245,18
	The cost of the fourth floor elevation work is +9.75	965.856.567,80
3	Non standard work	
	Lower non structure work costs	1.418.783.172,09
	IPAL septictank work	276.800.710,80
4	Standard architectural work (pair work and wall plastering)	
	First floor / ground floor work costs	406.234.595,28
	The cost of the second floor work	350.075.568,50
	Third floor work costs	317.602.568,50
	Fourth floor work costs	115.770.968,50
5	Costs for roofing and roofing tanks	5.075.512,81
	Ceiling work	
	First floor / ground floor fee	66.390.181,44
	Second floor fee	84.903.260,34
	Third floor fee	84.903.260,34
6	Fourth floor fee	84.903.260,34
	Floor job	
	First floor / ground floor fee	98.620.049,32
	Second floor fee	93.625.548,14
	Third floor fee	93.625.548,14
7	Fourth floor fee	93.625.548,14
	Utility work	
	First floor / ground floor fee	22.977.250,00
	Second floor fee	51.039.400,00
	Third floor fee	52.039.400,00
	Fourth floor fee	46.139.400,00

8	Entrance work	
	Spouse's work and painting costs	18.098.208,82
	Mechanical work	
	Cost of dirty water installation	178.140.489,00
	Firefighting work costs	134.057.827,50
9	Electrical work	
	Cost of electricity supply work	69.772.000,00

(Source: Project Data)

Table.4: ACWP Values

Week	%Cumulative	ACWP Value (Rp)
1	0.22	36.400.000,00
2	0.74	123.481.375,00
3	1.30	218.176.375,00
4	1.93	324.183.366,30
5	3.10	521.053.681,90
6	4.67	783.993.827,03
7	6.32	1.061.271.933,09
8	10.12	1.699.959.547,09
9	11.40	1.914.777.603,32
10	13.78	2.315.160.139,41
11	17.20	2.888.327.463,45
12	18.11	3.042.459.513,54
13	22.94	3.852.713.445,71
14	26.46	4.443.811.075,04
15	33.30	5.592.871.090,98
16	35.65	5.987.337.183,30
17	37.44	6.287.964.703,63
18	48.64	8.169.506.998,73
19	52.08	8.747.891.434,24
20	55.74	9.362.448.989,23
21	57.49	9.656.660.054,38
PPN		965.666.005,44
JUMLAH		10.622.326.059,82
DIBULATKAN		10.622.326.000,00

(Source: Project Data)

4.2 Calculation of Budget Cost of Work Schedule (BCWS)

BCWS values at the time of reporting:

1) In the 21st week reporting

BCWS = % Plan Progress / 100 x Contract Value

BCWS = 77.84 / 100 x 16.796.733.000,00

BCWS = Rp. 13.075.394.589,87

For the calculation of the following week can be done in the same way as above, here are the results of the BCWS calculation from week 1 to week 21.

Table.5: BCWS Calculations

Week	% Cumulative Plan	BCWS Value (Rp)
1	0.26	43.935.085,06
2	0.62	104.427.568,87
3	0.98	164.920.052,69
4	1.24	208.855.137,75
5	3.00	503.455.859,80
6	4.75	798.056.581,85
7	6.60	1.109.214.702,65
8	10.50	1.762.914.519,55
9	12.91	2.168.154.422,67
10	17.32	2.909.440.535,21
11	19.75	3.316.717.521,43
12	26.86	4.512.139.347,02
13	31.98	5.371.514.963,18
14	36.97	6.210.550.341,83
15	41.95	7.045.785.077,77
16	46.65	7.834.879.005,44
17	53.47	8.981.593.490,96
18	59.48	9.991.187.753,16
19	65.00	10.918.413.595,99
20	71.01	11.928.007.858,18
21	77.84	13.075.394.589,87

(Source: Analysis Results)

4.3 Calculation of Budget Cost of Work Performed (BCWP)

BCWP values at the time of reporting:

1) In the 21st week reporting

BCWP = % Actual Progress / 100 x Contract Value

BCWP = 56.54 / 100 x 16.796.733.000,00

BCWP = Rp.9.496.872.838,20

For the calculation of the following week can be done in the same way as above, here are the results of the BCWP calculation from week 1 to week 21.

Table.6: BCWP Calculations

Week	% Cumulative Actual	BCWP Value (Rp)
1	0.22	36.952.812,60
2	0.72	120.936.477,60
3	1.24	208.279.489,20
4	1.94	325.856.620,20
5	3.22	540.854.802,60
6	4.37	734.017.232,10
7	6.00	1.007.803.980,00
8	9.43	1.583.931.921,90
9	10.69	1.795.570.757,70
10	13.12	2.203.731.369,60
11	16.53	2.776.499.964,90
12	17.60	2.956.225.008,00
13	22.35	3.754.069.825,50

14	25.84	4.340.275.807,20
15	32.16	5.401.829.332,80
16	34.63	5.816.708.637,90
17	36.01	6.048.503.553,30
18	46.01	7.728.176.853,30
19	50.01	8.400.046.173,30
20	54.20	9.103.829.286,00
21	56.54	9.496.872.838,20

(Source: Analysis Results)

4.4 Calculation of Cost Variance (CV)

CV values at the time of reporting:

1) In the 21st week reporting

$CV = BCWP - ACWP$

$CV = \text{Rp.}9.496.872.838,20 - \text{Rp.}9.656.660.054,38$

$CV = \text{Rp.} -159.787.216,18$

For the calculation of the following week can be done in the same way as above, here are the results of the CV calculation from week 1 to week 21.

Table.7: CV Calculations

Week	BCWP Value (Rp)	ACWP Value (Rp)	Cost Variance (CV) (Rp)
1	36.952.812,60	36.400.000,00	552.812,60
2	120.936.477,60	123.481.375,00	-2.544.897,40
3	208.279.489,20	218.176.375,00	-9.896.885,80
4	325.856.620,20	324.183.366,30	1.673.253,90
5	540.854.802,60	521.053.681,90	19.801.120,70
6	734.017.232,10	783.993.827,03	-49.976.594,93
7	1.007.803.980,00	1.061.271.933,09	-53.467.953,09
8	1.583.931.921,90	1.699.959.547,09	-116.027.625,19
9	1.795.570.757,70	1.914.777.603,32	-119.206.845,62
10	2.203.731.369,60	2.315.160.139,41	-111.428.769,81
11	2.776.499.964,90	2.888.327.463,45	-111.827.498,55
12	2.956.225.008,00	3.042.459.513,54	-86.234.505,54
13	3.754.069.825,50	3.852.713.445,71	-98.643.620,21
14	4.340.275.807,20	4.443.811.075,04	-103.535.267,84
15	5.401.829.332,80	5.592.871.090,98	-191.041.758,18
16	5.816.708.637,90	5.987.337.183,30	-170.628.545,40
17	6.048.503.553,30	6.287.964.703,63	-236.101.803,73
18	7.728.176.853,30	8.169.506.998,73	-441.330.145,43
19	8.400.046.173,30	8.747.891.434,24	-347.845.260,94
20	9.103.829.286,00	9.362.448.989,23	-258.619.703,23
21	9.496.872.838,20	9.656.660.054,38	-159.787.216,18

(Source: Analysis Results)

4.5 Calculation of Schedule Variance (SV)

SV values at the time of reporting:

1) In the 21st week reporting

$SV = BCWP - BCWS$

$SV = 56.54\% - 77.84\%$

$SV = -21.30\%$

For the calculation of the following week can be done in the same way as above, here are the results of the SV calculation from week 1 to week 21.

Table.8: SV Calculations

Week	% BCWP	% BCWS	% SV
1	0.22	0.26	-0.04
2	0.72	0.62	0.10
3	1.24	0.98	0.26

4	1.94	1.24	0.70
5	3.22	3.00	0.22
6	4.37	4.75	-0.38
7	6.00	6.60	-0.60
8	9.43	10.50	-1.07
9	10.69	12.91	-2.22
10	13.12	17.32	-4.20
11	16.53	19.75	-3.22
12	17.60	26.86	-9.26
13	22.35	31.98	-9.63
14	25.84	36.97	-11.13
15	32.16	41.95	-9.79
16	34.63	46.65	-12.02
17	36.01	53.47	-17.44
18	46.01	59.48	-13.47

19	50.01	65.00	-14.99
20	54.20	71.01	-16.81
21	56.54	77.84	-21.30

(Source: Analysis Results)

4.6 Analysis of Earned Value Indicators, Cost Variance (CV) and Schedule Variance (SV)

Following are the results of the analysis of the results value indicators presented in graphical form as below :

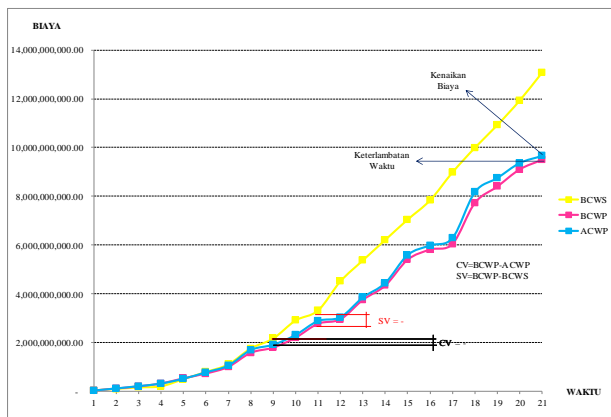


Fig.3: S Curve Graph of Earned Value

From the calculation of CV (cost variance) and SV (schedule variance) above, it can be analyzed as follows:

SV	CV	Information
Negative	Negative	Work is completed late and costs are higher than the budget

The analysis can be seen in *Table.1: Analysis of Integrated Variants* (ImanSoeharto, 2001: 23).

4.7 Calculation of Cost Performance Index (CPI)

CPI values at the time of reporting:

1) In the 21st week reporting

$$CPI = BCWP / ACWP$$

$$CPI = 9.496.872.838,20 / 9.656.660.054,38$$

$CPI = 0.98 < 1$ means the actual cost (ACWP) incurred is greater than the cost of real field plan work (BCWP).

For the determination of the cost performance index (CPI) can be seen in *Table.2: Analysis of Performance Index* (ImanSoeharto, 2001: 237).

For the calculation of the following week can be done in the same way as above, here are the results of the CPI calculation from week 1 to week 21.

Table.9: CPI Calculations

Week	BCWP Value (Rp)	ACWP Value (Rp)	Cost Performance Index (CPI)
1	36.952.812,60	36.400.000,00	1.02
2	120.936.477,60	123.481.375,00	0.98
3	208.279.489,20	218.176.375,00	0.95
4	325.856.620,20	324.183.366,30	1.01
5	540.854.802,60	521.053.681,90	1.04
6	734.017.232,10	783.993.827,03	0.94
7	1.007.803.980,00	1.061.271.933,09	0.95
8	1.583.931.921,90	1.699.959.547,09	0.93
9	1.795.570.757,70	1.914.777.603,32	0.94
10	2.203.731.369,60	2.315.160.139,41	0.95
11	2.776.499.964,90	2.888.327.463,45	0.96
12	2.956.225.008,00	3.042.459.513,54	0.97
13	3.754.069.825,50	3.852.713.445,71	0.97
14	4.340.275.807,20	4.443.811.075,04	0.98
15	5.401.829.332,80	5.592.871.090,98	0.97
16	5.816.708.637,90	5.987.337.183,30	0.97
17	6.048.503.553,30	6.287.964.703,63	0.96
18	7.728.176.853,30	8.169.506.998,73	0.95
19	8.400.046.173,30	8.747.891.434,24	0.96
20	9.103.829.286,00	9.362.448.989,23	0.97
21	9.496.872.838,20	9.656.660.054,38	0.98

(Source: Analysis Results)

4.8 Calculation of Schedule Performance Index (SPI)

SPI values at the time of reporting:

1) In the 21st week reporting

$$SPI = BCWP / BCWS$$

$$SPI = 56.54 / 77.84$$

$SPI = 0.73 < 1$ means that project performance is slower than the planned schedule.

The schedule performance index (SPI) can be seen in Table.2: *Performance Index Analysis* (ImanSoeharto, 2001: 237).

For the calculation of the following week can be done in the same way as above, here are the results of the CPI calculation from week 1 to week 21.

Table.10: SPI Calculations

Week	% BCWP	% BCWS	% SPI
1	0.22	0.26	0.84
2	0.72	0.62	1.16
3	1.24	0.98	1.26
4	1.94	1.24	1.56
5	3.22	3.00	1.07
6	4.37	4.75	0.92
7	6.00	6.60	0.91
8	9.43	10.50	0.90
9	10.69	12.91	0.83
10	13.12	17.32	0.76
11	16.53	19.75	0.84
12	17.60	26.86	0.66
13	22.35	31.98	0.70
14	25.84	36.97	0.70
15	32.16	41.95	0.77
16	34.63	46.65	0.74
17	36.01	53.47	0.67
18	46.01	59.48	0.77
19	50.01	65.00	0.77
20	54.20	71.01	0.76
21	56.54	77.84	0.73

(Source: Analysis Results)

4.9 Cost Estimates and Final Project Schedule

Calculation of cost and time estimates according to the reporting week:

1) In the 21st week reporting

$$ETC = \frac{BAC - BCWP}{CPI}$$

$$ETC = \frac{16.796.733.000,00 - 5.401.829.332,80}{0.98}$$

$$ETC = \text{Rp.}11.586.625.717,89$$

$$EAC = ACWP + ETC$$

$$EAC = 9.656.660.054,38 + 11.586.625.717,89$$

$$EAC = \text{Rp.}21.243.285.772,27$$

While the estimated time of completion of all work:

$$ETS = \frac{\text{Remaining time}}{SPI}$$

$$ETS = \frac{83}{0.73}$$

$$ETS = 114 \text{ Days}$$

$$EAS = \text{Time's up} + ETS$$

$$EAS = 147,00 + 114$$

$$EAS = 261 \text{ Days}$$

V. CONCLUSION

Based on the analysis using the earned value method in the Flats Construction Project in Maluku I at Nania Village, Ambon City, the following results were obtained:

- 1) From the results of the analysis at 9th week, 14th and 21st schedule performance index (SPI) <1 which means that project performance is slower than the planned schedule so that the project has a time lapse with a weight of 21.30% of the 180 workday planning schedule.
- 2) From the results of the analysis at 9th week, 14th and 21st cost performance index (CPI) <1 which means the actual cost (ACWP) incurred is greater than the value of the work obtained (BCWP) so that the project experiences a fee deviation of Rp.159,787,216.18 from the RAB of Rp.16,796,733,000.00 (Contract Value).

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Opening Area Effect of Shear Wall in Multistorey Building under Seismic Loading

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Abstract— To reduce the overall cost of the project, it is highly recommend reducing the cost in different manner. To make economic structure, the cost cutting should be done in every construction stages. The dual systems in building structure consist of structural walls and moment resisting frames. The walls are made up of RCC, which is a costly material used. The purpose of current study is to explore the reduction in shear wall area in multistorey building to reduce cost. Total 5 buildings framed in Staad pro software abbreviated as SA, SB, SC, SD, SE supposed to be situated at Seismic Zone III. Post parametric analysis results shows that, the reduction in shear wall area should be adapted to a certain limit up to 20 % for cost cutting.

Keywords— Deduction Area, Earthquake Effects, Opening Area, Shear Wall, Response spectrum, Wall Area Reduction, Wall Deduction Ratio.

I. INTRODUCTION TO SHEAR WALL

The shear walls are designed not only to stand firm against gravity or vertical loads (loads due to its self-weight and other living/ moving loads), but also from lateral loads of winds and earthquakes. The walls are structurally incorporated with floors/roofs and other lateral walls running crossways at right angles, thereby giving all the three dimensional stability to the building.

The walls have to resist the uplift forces due to the pull of wind. It has to resist the force that aim to push the walls over. The walls also have to resist lateral forces of wind that try to push the walls in and drag them away from the building. Shear walls are quick to build as the method implemented for construction is concreting the members using the formwork. The walls do not need extra finishing or plastering.

II. CLASSIFICATION OF SHEAR WALL

There are many types of reinforced concrete shear walls:-

1. Simple rectangular type shear wall
2. Coupled shear wall
3. Rigid frame shear wall
4. Framed walls with infill frame
5. Column supported shear wall
6. Core type shear wall

III. CONCEPT OF OPENING IN SHEAR WALL

Cantilever shear walls always act as coupled shear walls consist of openings and have connected with coupling beams.

Multistoried buildings may have openings in rows which are essential for doors, ventilations, openings and windows in both internal and external walls.

As per architectural point of view, the opening has provided.

As per structural engineering point of view, the opening has to be decided within the limit to secure the structural resisting components by adverse seismic effects.

Shear walls are especially important in high-rise buildings subject to lateral wind and seismic forces. Generally, shear walls are either plane or flanged in section, while core walls consist of channel sections.

Opening in shear wall can be provided in:-

1. Structure generally provided with any type of shear walls.
2. Structure generally provided with Shear walls around lift areas.
3. Shear wall components in Dual System buildings.

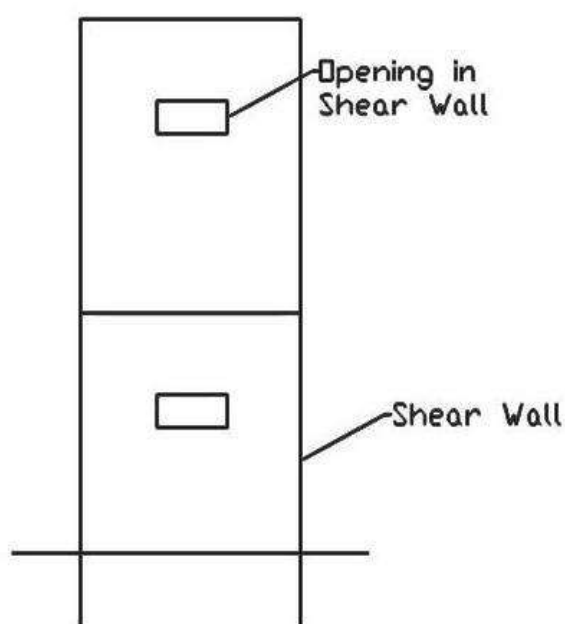


Fig. 1: Frame having very small opening of Shear wall

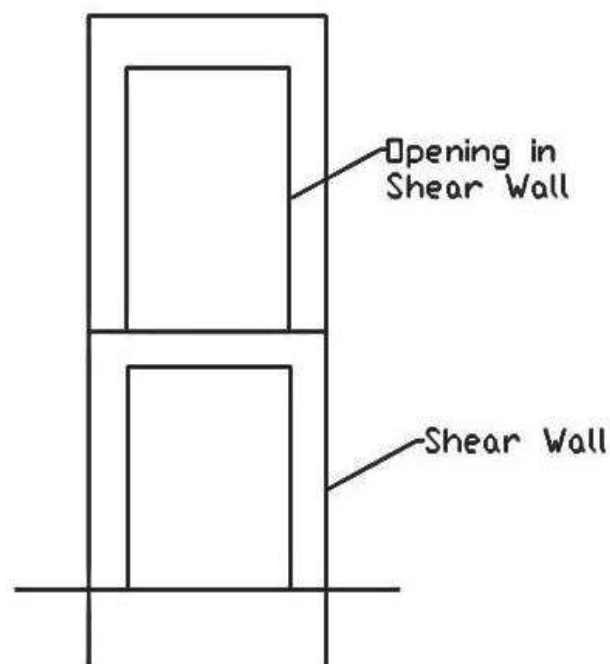


Fig. 3: Frame having very large opening of Shear wall

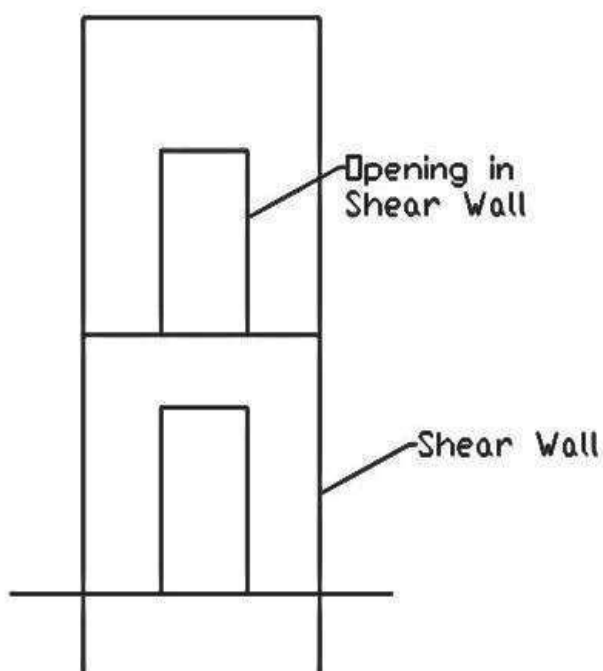


Fig. 2: Frame having medium opening of Shear wall

To counteract the seismic forces and to maintain the rigidity of the structure, outriggers and belt supported system is used.

IV. OBJECTIVES OF THE PRESENT STUDY

1. Use of response spectrum method in with and without opening dual configuration multistoried structure.
2. To take five different buildings, comparing them among each other by using Response Spectrum Method of dynamic analysis using Staad pro software.
3. To calculate maximum displacement and drift values and then comparing all the 5 buildings.
4. To compare base shear, time period along with mass participation factor shows dynamic response result of the 5 dual configuration buildings.
5. To explore the possibilities of overall structural resistance by minimal use of shear wall area.
6. To determine maximum Axial Forces and Shear Forces in columns at ground level for various buildings.
7. To show the variation of maximum Bending Moments in columns for all five multistoried buildings.
8. To investigate maximum Shear Forces in beams parallel to X and Z direction.
9. To study and compare maximum Bending Moments in beams along X and Z direction.

10. To evaluate maximum Torsional Moments in beams along X and Z directions.

To obtain the best building with opening threshold criteria, all buildings are thoroughly observed and compared their parametric values.

V. LIST OF MODELS FRAMED FOR ANALYSIS OF STRUCTURE

Various models are framed for analysis and assessment of structure to accomplish the aforesaid objectives of the current study.

Table 1: List of buildings framed with assigned abbreviation

S. No.	Buildings framed for analysis when Shear Wall used at corners	Abbreviation
1.	Building with 100 % shear wall area used	SA
2.	Building with 88.88 % shear wall area used	SB
3.	Building with 85.80 % shear wall area used	SC
4.	Building with 80 % shear wall area used	SD
5.	Building with 66.66 % shear wall area used	SE

Table 2: List of buildings with used and deducted Shear Wall area

S. No.	Abbreviation	Wall Deduction Ratio	Bay Size	Deduction Area (L x B)	Percentage Deduction
1.	SA	-	5 m x 4 m	0 m x 0 m	0 %
2.	SB	5 / 9	5 m x 4 m	0.55 m x 4 m	11.11 %
3.	SC	5 / 7	5 m x 4 m	0.71 m x 4 m	14.28 %
4.	SD	5 / 5	5 m x 4 m	1 m x 4 m	20 %
5.	SE	5 / 3	5 m x 4 m	1.66 m x 4 m	33.33 %

VI. DESCRIPTION OF SEISMIC PARAMETERS TAKEN FOR ANALYSIS

Table 3: Data assumed for analysis of structure

Constraint	Assumed data for all buildings
Soil type	Medium Soil
Seismic zone	III
Response reduction factor (ordinary shear wall with SMRF)	4
Importance factor (For all semi commercial building)	1.2
Damping ratio	5%
Fundamental natural period of vibration (T_a)	$0.09 \cdot h / (d)^{0.5}$
Plinth area of building	925 sq. m
Floors configuration	G + 18
Height of building	79.50 m
Floor to floor height	4 m
Depth of foundation	3.5 m
Beam sizes	550mm X 600mm
Column sizes	650mm X 700mm
Slab thickness	180 mm (0.18 m)
Shear wall thickness	280 mm (0.28 m)
Material properties	M 30 Concrete

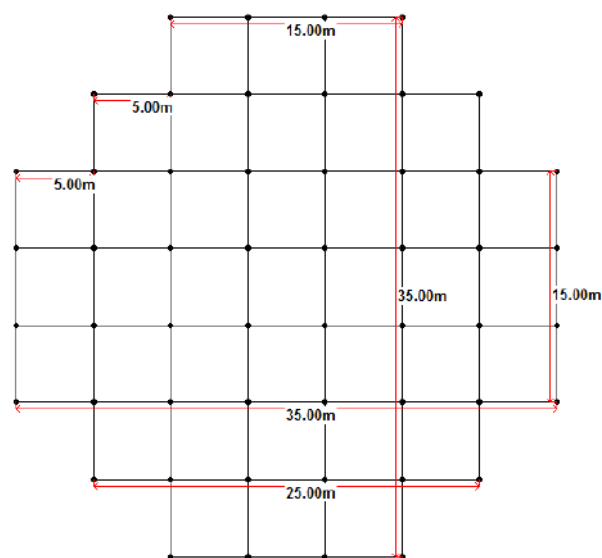
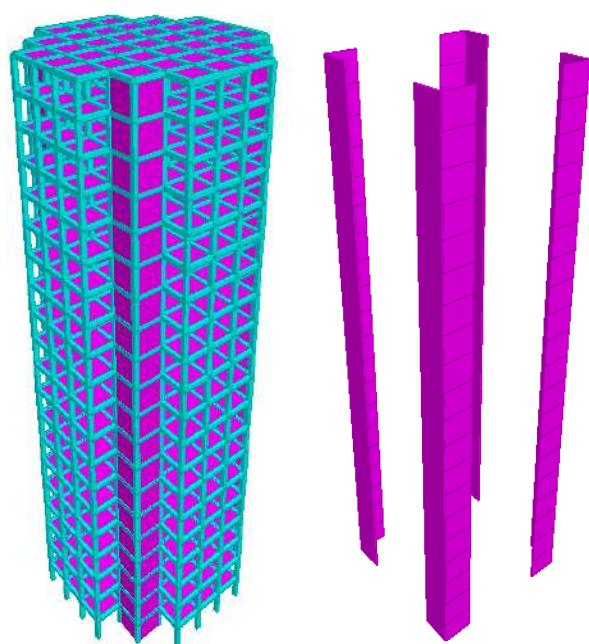


Fig. 4: Plan of all buildings

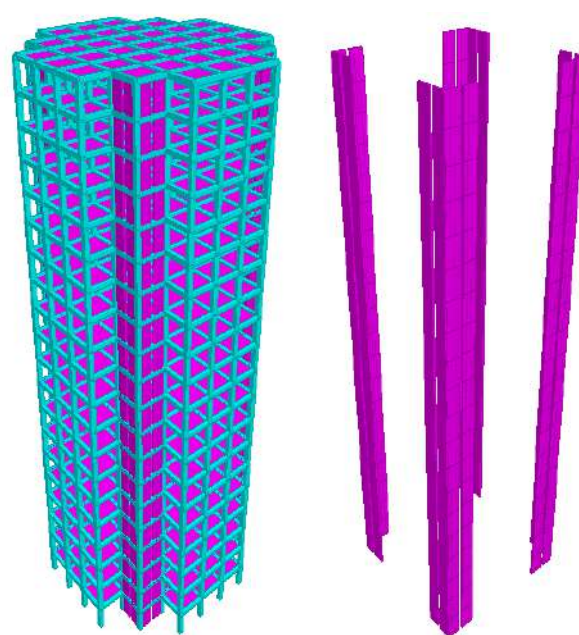


(a)

(b)

Fig. 5: (a) 3- D view of building SA: Shear wall with no opening

(b) Shear wall without opening

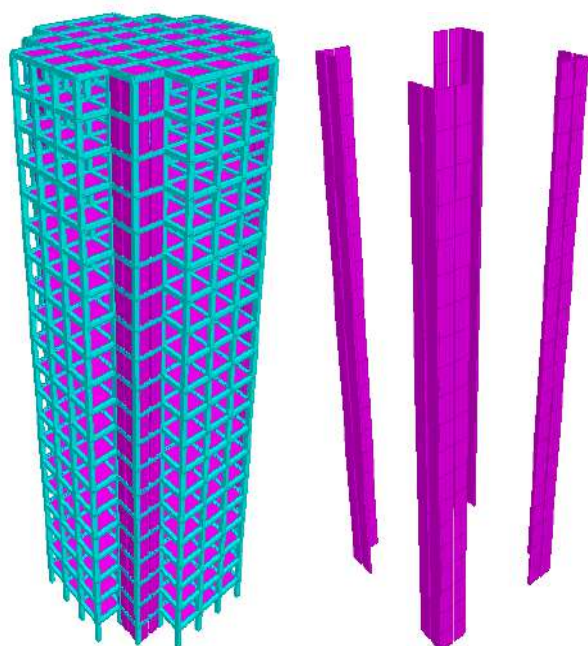


(a)

(b)

Fig. 7: (a) 3- D view of building SC: Shear wall with no opening

(b) Shear wall with 14.28 % opening

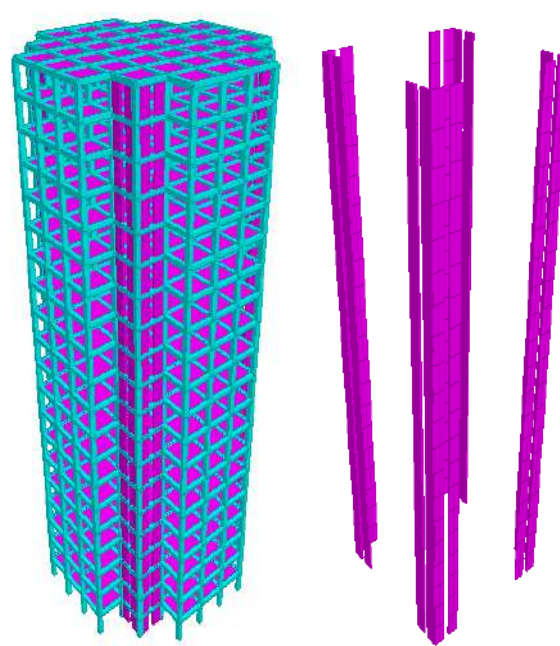


(a)

(b)

Fig. 6: (a) 3- D view of building SB: Shear wall with opening

(b) Shear wall with 11.11 % opening



(a)

(b)

Fig. 8: (a) 3- D view of building SB: Shear wall with opening

(b) Shear wall with 20 % opening

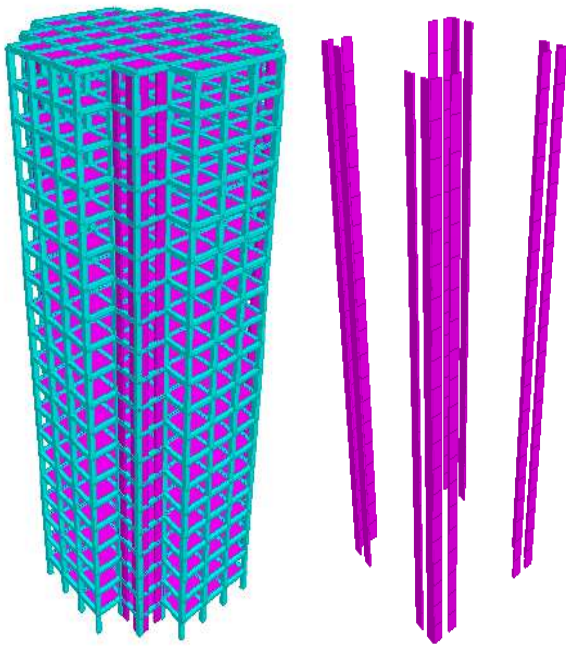
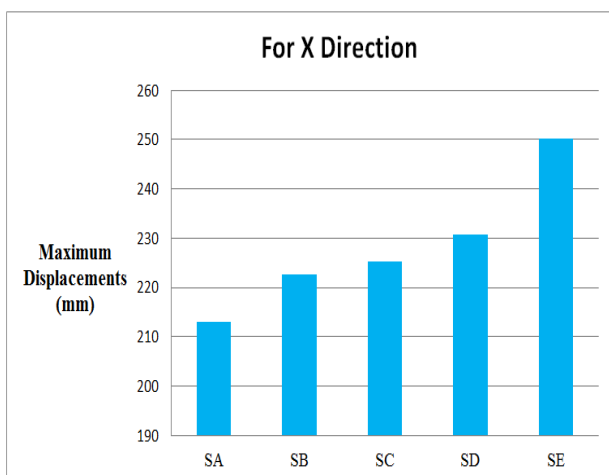


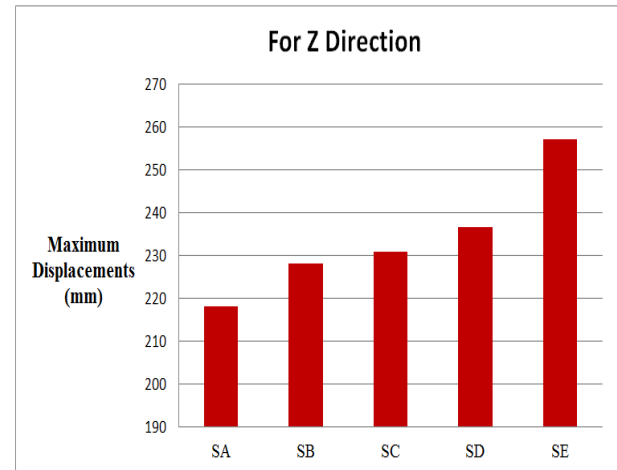
Fig. 9: (a) 3- D view of building SB: Shear wall with opening
 (b) Shear wall with 33.33 % opening

VII. RESULTS ANALYSIS

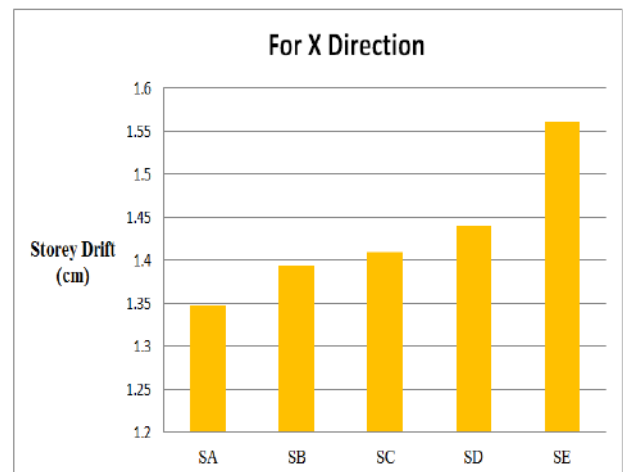
For the stability of the structure, parameters such as the nodal displacement in both seismic directions, storey drift in both seismic directions, beam stress values, time period and mass participation factors obtained by application of loads and their combinations on various cases of the multistorey building. Tabular result of each parameters and its optimal case is discussed with its graphical form below:-



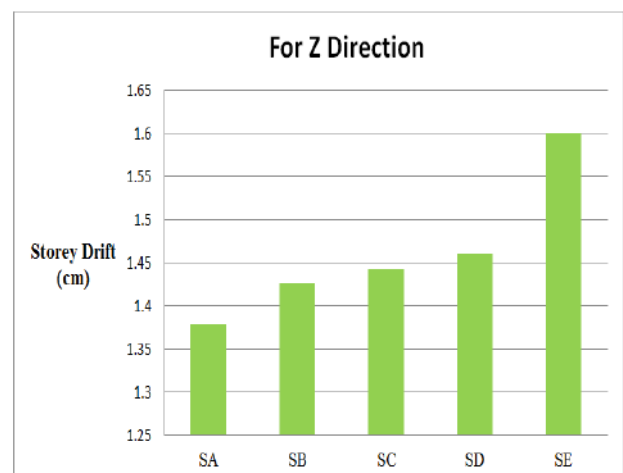
Graph 1: Maximum Displacement in X direction for all 5 Buildings in Zone III



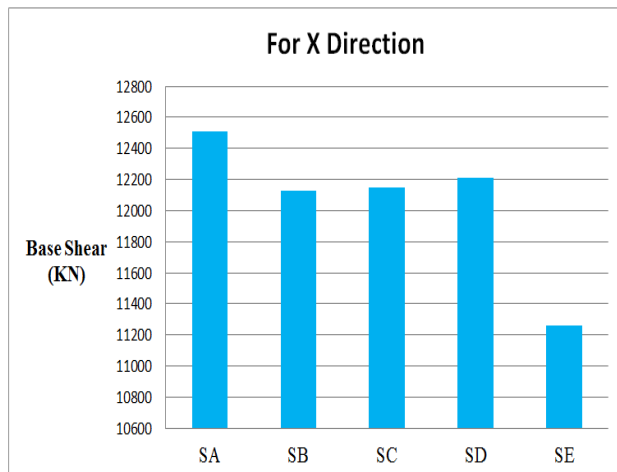
Graph 2: Maximum Displacement in Z direction for all 5 Buildings in Zone III



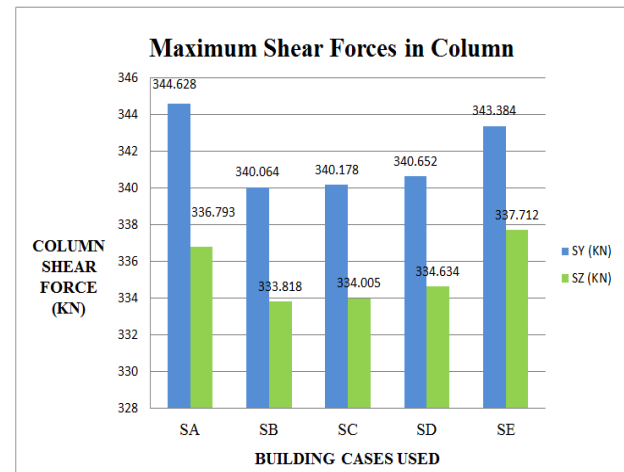
Graph 3: Storey Drift in X direction for all 5 Buildings in Zone III



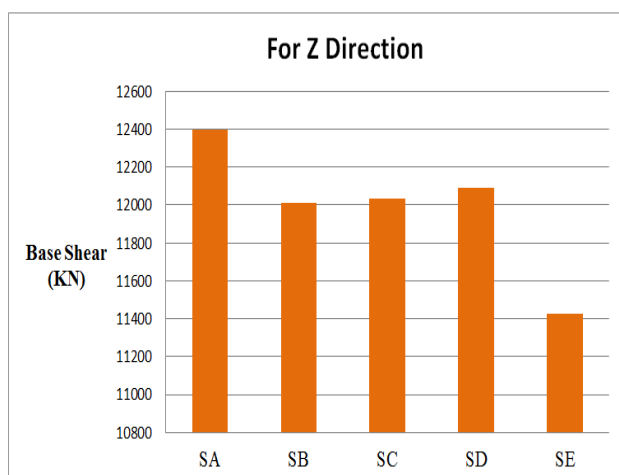
Graph 4: Storey Drift in Z for all 5 Buildings in Zone III



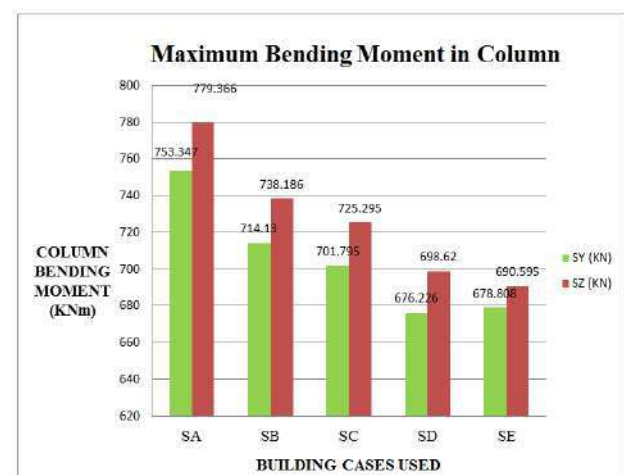
Graph 5: Base Shear in X direction for all 5 Buildings in Zone III



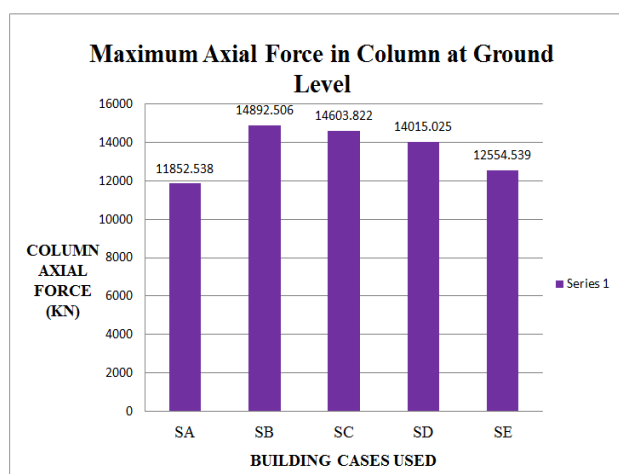
Graph 8: Maximum Shear Forces in Columns for all 5 Buildings in Zone III



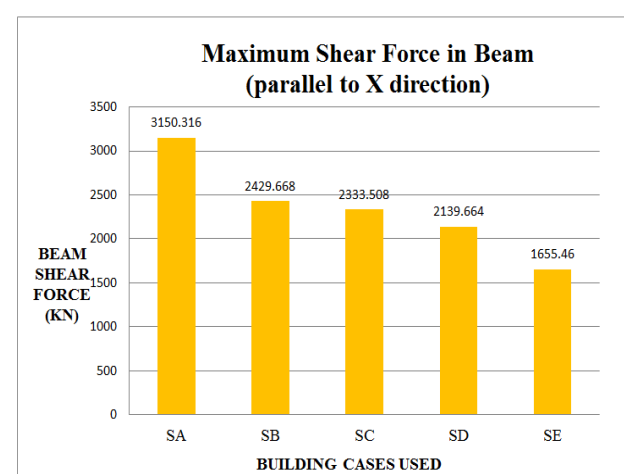
Graph 6: Base Shear in Z direction for all 5 Buildings in Zone III



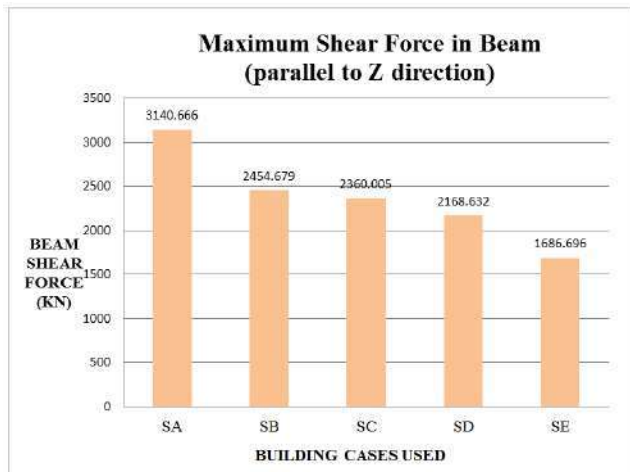
Graph 9: Maximum Bending Moment in Columns for all 5 Buildings in Zone III



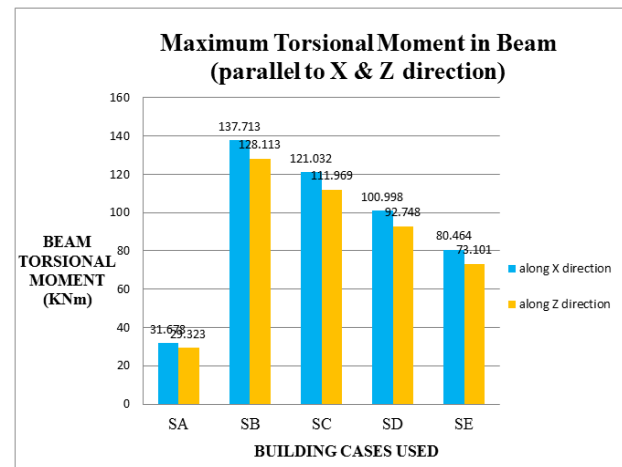
Graph 7: Maximum Axial Forces in Column at ground level for all 5 Buildings in Zone III



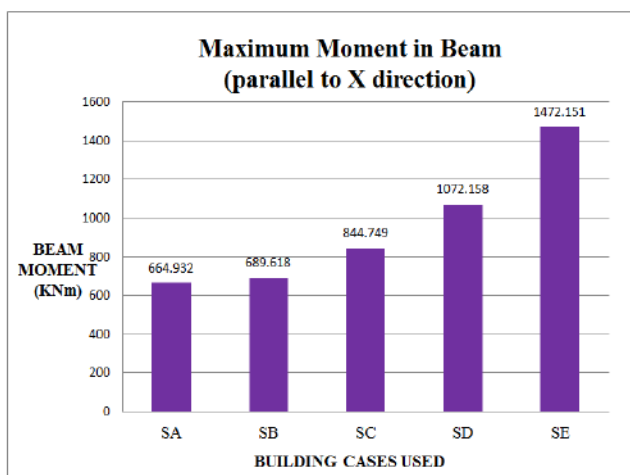
Graph 10: Maximum Shear Forces in beams parallel to X direction for all 5 Buildings in Zone III



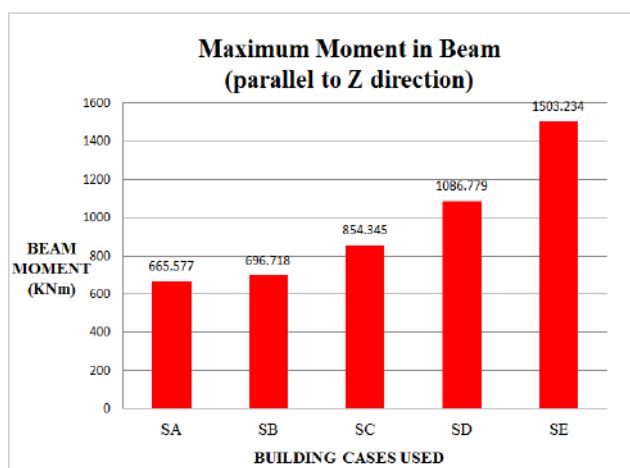
Graph 11: Maximum Shear Forces in beams parallel to Z direction for all 5 Buildings in Zone III



Graph 14: Maximum Torsional Moment in beams parallel to X & Z direction for all 5 Buildings in Zone III



Graph 12: Maximum Bending Moment in beams parallel to X direction for all 5 Buildings in Zone III



Graph 13: Maximum Bending Moment in beams parallel to Z direction for all 5 Buildings in Zone III

VIII. CONCLUSION

1. Displacement in X direction and Z direction increases and when it crosses the limit of 20 %, the structural components fails and it needs increase in dimension. Building SD will be economical.
2. The Storey Drift will behave same as displacements in both X and Z directions, first it shows incremental values and at certain height, it again decreases. Indian Standardization limit is $L/250$ i.e. 0.004, when applied to the structure, all buildings behaves safe except SE, fails from 35.5 m height. For this parameter, building SD will be safe and efficient.
3. Base shear values decreases as the weight of the structure decreases when cutting the percentage area of shear wall. For this, in both X and Z directions, building SD shows the best parametric values at 20 % shear wall opening.
4. Values of Maximum Axial forces in column decreases when shear wall area decreases, but column fails when axial force values are lower beyond 14015.025 KN limit and therefore building SD shows the safest value for axial forces.
5. Shear forces in column in both Y and Z direction increase with reduction in Shear wall area, the members fail beyond building SD values. Hence building SD shows the safest values for shear forces in column.
6. The Moment values in column decreases from building SA to SE and beyond building SD, the member fails. Hence building SD shows the safest values for bending moment in columns.
7. Beam in both X and Z direction shows least values of shear forces in building SD and beyond this, the beam fails.

8. For moments in beam in both X and Z direction, the values increases gradually and beyond the limit, it seems that up to building SD, the structural components are safe and beyond this, the beam fails.
9. Torsion in beam shows limiting parametric values up to building SD when there will be deduction in shear wall area.

Total 5 different buildings used in this work. The main focus in this work is to show how the values differ from each other when decreasing the shear wall area.

It is found from above study that when there will be excess use of opening beyond the 20 % limit, the stiffness of the structure will be less and the structural components will fail. Due to load transfer criteria of the members 20 % wall deduction is sufficient. Building SD with 80% coverage performs best of all.

ACKNOWLEDGEMENT

I, Prafoolla Thakre, M. Tech. Scholar, would personally like to thank **Mr. Sagar Jamle**, Assistant Professor, Department of Civil Engineering Oriental University Indore, for his valuable guidance from the commencement of the work to the completion of the work along with his encouraging thoughts.

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Production and nutritive value of silage corn in different reproductive stages

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Abstract— Corn has been the most used crop for whole plant silage, due to its high potential for dry matter production, high energy and great adaptability to different growing regions. Due to the great importance of the culture for this purpose, the region of the Far West of Santa Catarina, due to the presence of one of the largest dairy basins in Brazil, demands the supply of this food to the animals mainly during the season of forage. Thus, the objective of this work was to evaluate different hybrids and to identify the optimal corn cutting time for silage production that provides a greater economic return to the system. The experimental design used was a randomized complete block design in a 2x4 factorial scheme, allocating different maize hybrids (P30F53 VYHR®; P32R48 VYHR®) to the main plot and the reproductive stages (R2, R3, R4, R5). The experiment had 8 treatments and 3 replicates, totaling 24 experimental units. The studied variables were: dry matter content (DM); crude protein (PB); acid detergent insoluble fiber (FDA); neutral detergent insoluble fiber (NDF); total digestible nutrients (NDT), and CNF-amido, at the reproductive stages. The best economic yield is obtained when the maize crop is ensiled at the reproductive stage R4 and R5. Among the hybrids, the P32R48 VYHR® was the one that obtained better yield, providing greater production of milk by area.

Keywords— qualitative parameters, harvest point, economic income, Zea mays

I. INTRODUCTION

The importance of dairy monoculture in the state of Santa Catarina is indisputable, both as a source of income for rural properties, as for the generations of jobs in the processing industries. Currently, the state is the fourth largest milk producer in the country, with 2.83 billion liters of milk, with emphasis on the western region of Catarinense, which represents 79% of this production (EPAGRI/CEPA, 2018). To maintain this growth, producers constantly seek, forms of supply the nutritional demands of their herds, with quality pastures, supply of concentrated feedingstuffs or preserved foods (silage or hay). In this sense, it gains prominent role, the making of corn silage plant. Due to food shortages during certain periods of the year, when the forage used as the basis for feeding livestock, cannot meet the nutritional demands. Maize has been the most used crop for making plant silage whole due to its high potential for dry matter production and its large adaptability to different cultivation regions (FACTORI et al., 2012). Still, there is

a large number of maize hybrids destined for silage production, from which significant differences with respect to the production of Green forester, production of grains, leaves and stalk directly interfering with the nutritional value of the silage (MORAES et al., 2013). In this sense, the choice of hybrid and reproductive stage of cutting becomes determinant factors for the success of the system, since the hybrid may represent up to 50% of the final yield (FACTORI et al., 2012), and the stage of cutting that the plant is in, is directly related to the available energy of this material, by increasing the participation of grains (MARAFON et al., 2015). In this context, it is important studies, which demonstrate the best strategy for harvesting these hybrids, which provide higher milk production ha-1 and economic income for the rural producer. In this way, the objective of this work was to evaluate different hybrids and identify the ideal moment of cutting of maize for silage production that provides greater economic return to the system..

II. MATERIALS AND METHODS

The experiment was conducted in the agricultural year of 2017/2018, in the municipality of Iraceminha-SC, located in the extreme West region of the state of Santa Catarina (26 ° 48'25.36's and longitude 53 ° 20 ' 4.50 ' ' W). The region's climate according to the system of Köppen classification, is humid subtropical with hot summer (CFA; ALVARES et al., 2014), with an average altitude of 401 m. Maximum and minimum air temperatures (°C) and rainfall (mm) observed during the experiment period are presented in the figure 01.

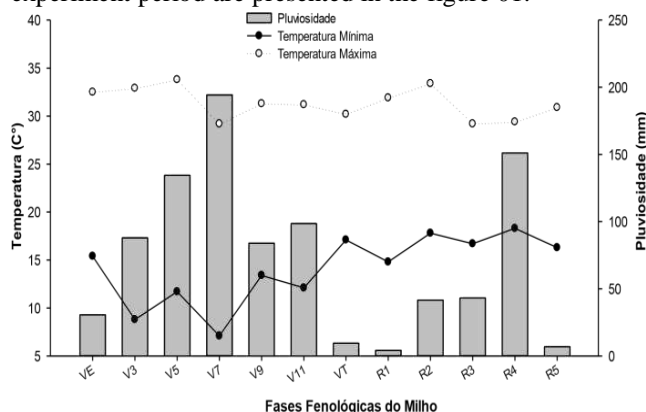


Fig. 1 - meteorological data observed during the experimental period (maize: Stadiums in the region of Iraceminha – SC. Source: INMET, São Miguel do Oeste-Santa Catarina-PR 2018.

The soil of the experimental area is classified as NITOSSOL BRUNO. Dystrophic with clayey texture and smooth wavy relief (EMBRAPA, 2013). According to soil analysis, the soil chemical attributes of the experimental area before the maize crop implantation are presented in table 1.

Table 1 – Chemical characterization of the soil in the depth of 0-20 cm, collected before the sowing of corn hybrids

pH	M	P	K	Ca	Mg	Al ³⁺	H+Al CTC	SB	Ca	Mg ⁻¹	CA	K ⁻¹	Mg	K ⁻¹
0														
H ₂ O	%	mg dm ⁻³				mol _c dm ⁻³		%						
5,8	3,0	9,48	138,1	6,36	2,5	0,0	9,22	13,7	70,33	2,54	18,02	7,09		

*Soil collected in August 2017; Soil Analysis Laboratory Terranálises-Fraiburgo(SC).

The experimental design used was the complete randomized blocks, in factorial scheme 2x4, allocating the hybrids (P30F53 VYHR®; P32R48 VYHR®) in the main plot and in the subplot the stadiums (R2, R3, R4, R5). The experiment had 8 treatments and 3 replications,

totaling 24 experimental units with an area of 17.5 m² (3, 5m wide x 5m in length), with a useful area 7.35 m² (5 lines length of 3m). The total area of the experiment was 420 m². Each subplot consisted of 7 lines of 5 meters, spaced 0.49 m apart.

Corn sowing was performed on 09 September 2017, in a no-tillage system, in succession to black oat (*Avena strigosa*), which was desiccant 30 days before sowing with a herbicide based on Glyphosate (Original Roundup® 2.5 L ha⁻¹). A tractorized sow was used, with a density of 74500 seeds ha⁻¹.

For the fertilization of the crop, the soil analysis was interpreted for an expectation of productivity of 24 tons of MS per hectare, using as basis the Manual of liming and fertilization of the Commission of Soil Chemistry and fertility RS/SC, 2016.

The base fertilization used was 520 kg ha⁻¹ of the fertilizer MAP (11-52-00), the pre-planting fertilization (21 days before sowing) was 800 kg per hectare of potassium chloride 00-00-60, and in the fertilization of coverage were used 320 kg per hectare of the fertilizer nitrogenated urea (45-00-00), at V4 Stage, and 480 kg per hectare of Sulfammo MeTA® (29-00-00), in the V6 stadium.

The hybrids used were the Pioneer brand, P30F53 VYHR® and P32R48 VYHR®, both with Leptra® technology (maize cartridge caterpillar, Spodoptera Frugiperda) and RR (Roundup Ready®), with industrial seed treatment (Dermacor® + Poncho® + Derosal Plus®). Weed control was performed 20 days after sowing of the crop with a herbicide based on Atrazine + Simazine (Primatop® 6, L ha⁻¹).

As soon as the culture reached the stages of R2, R3, R4 and R5, the cuttings of the whole plants were performed in the useful area of each plot and at the cutting height of 25 cm, in order to achieve maximum milk production per hectare, considering beyond the quality of the ensiled mass, also a larger amount of stored dry mass.

The cut in the aforementioned reproductive stages, aim to represent the different harvesting points observed in the region of study, where most farmers, because they are family farmers, depend on the outsourcing of the service of harvest. In this way, some crops occur when maize is in the R2 stage (anticipating the harvest), or in R5, due to the high demand of farmers for this type of service. On the other hand, the producers with better implement structure, which can perform the harvesting when they deem appropriate, perform the cut normally when the plants are in R4.

The samples were packaged in mini PVC silos with 75 mm in diameter and 50 cm in height. After 30 days of

ensilage, the samples were referred to the laboratory of Bromatological analyses for analysis, through which the contents of a) dry matter (MS) were obtained; b) crude protein (PB) (Prates, 2007); c) Acid detergent insoluble fiber (FDA); D) neutral detergent insoluble fiber (NDF); e) Starch (ANFAR, 2009; method n ° 11-NIR), and f) Total digestible nutrients (TDN) calculated through the near infrared spectrophotometer – NIRS.

Using these parameters, milk production per hectare was estimated, considering the need for nutrients for maintenance, locomotion and milk production, according to the methodology proposed by NRC (2001). For this, we considered the nutritional need of 3 cows of 450 kg PV during one year and milk production with 3.5% of fat. Based on the values obtained from total milk production and the average price per liter of milk paid to the producer in the month of October 2018 for the state of Santa Catarina of R \$1.3636 (CEPEA/ESALQ-USP, 2018), one can estimate the economic yields of each hybrid in each Reproductive stage of cutting. The method used does not take into account losses occurring in the process of silage, fermentation and desilage of the roughage.

Data were subjected to analysis of variance by the F test using the statistical software sratgraphics (12.5). When the data did not present interactions among the factors (hybrids and reproductive stages of cutting), were analyzed as simple effects. The averages that showed significance were compared by the Tukey test ($P < 0.05$).

III. RESULTS AND DISCUSSION

The interaction between the factors (hybrids and reproductive stages of cutting) was not significant ($P < 0.05$) in the variables studied, and the isolated effect of each factor was analyzed, as can be seen in table 2 and 3. For the hybrid maize factor, there was no significant effect for the variables MV, MS and PB. However, there was a difference ($P < 0.05$) between the response variables, starch, NDT, NDF and FDA (table 2).

Table 2 – Quantitative and qualitative parameters of silage in relation to the hybrid maize factor (Iraceminha, SC – 2017/2018 crop)

pH	M.O	P	K	Ca	Mg	Al ³⁺	H+Al/CTC	SB	Ca Mg ⁻¹ CA K ⁻¹	Mg K ⁻¹		
H ₂ O	%	mg dm ⁻³	-----mol ₂ dm ⁻³ -----			%	-----					
5,8	3,0	9,48	138,1	6,36	2,5	0,0	9,22	13,1	70,33	2,54	18,02	7,09

Averages followed by the same letter in the column

do not differ from each other ($P < 0.05$) by the Tukey test).

Observing the data presented in table 2, it is noted that the hybrids used in the experiment, because they are of double aptitude (grain and silage), have qualitative and quantitative characteristics within the expected standard for a good quality silage. As shown in Figure 1, one of the factors responsible for this result was the good climatic conditions, recorded during the development of the culture.

The production of 84.51 and 87.70 Mg of MV ha⁻¹ in the hybrids analyzed were much higher, the production above 55 Mg of MV ha⁻¹ considered by Neumann et al., (2015), as characteristic ideas of a good hybrids. This high production per hectare, in addition to allowing greater production of meat or milk per area, still dilutes the production costs.

There was no difference between the crude protein values between the hybrids and neither between the different reproductive stages (table 2 and 4). COSTA et al., (2006) considers that PB contents below 7% could be limiting animal production, because they imply less voluntary consumption, reduction in digestibility and negative nitrogen balance. However, it is observed that the silages produced in this work (table 2 and 4) would satisfactorily meet (PB $\geq 7,81$) to the minimum requirements of ruminants. On the other hand, in the case of milk production, the PB contents would be limiting the productivity, since the NDT values could provide conditions to obtain higher production values.

In the different reproductive stages of cutting, there was a significant statistical difference ($P < 0.05$) for the variables MV, DM, starch, NDT, FDN and FDA, with no difference between treatments only for the variable PB (table 3).

Table 3- Quantitative and qualitative parameters of silage in different reproductive stages of cutting (Iraceminha, SC-2017/2018 crop)

Estádios Reprodutivos	MV	MS		PB	Amido	NDT	FDN
		FDA					
	<i>Mg ha-1</i>	<i>-----g 100 g MS</i>					
		<i>-d-----</i>					
R2	88,29A	20,07C	7,99A	8,17C	67,34B	47,30A	29,29A
R3	86,26AB	23,17C	8,08A	17,32B	68,76B	45,23B	27,25A
R4	92,26A	27,17B	7,88A	30,14A	71,61A	41,51C	23,18B
R5	77,60B	32,91A	7,81A	32,13A	71,49A	41,66C	23,36B
CV (%)	5,1	5,38	3,59	10,59	1,07	2,09	4,15

Averages followed by the same letter in the column do not differ from each other ($P < 0.05$) by the Tukey test)

Considering the MV variable, it is observed that the R4 stage providing approximately 15 Mg ha⁻¹ of MV to more than the R5 stage. However, the highest DM content (32.9%) Observed at the R5 stage, it provided about 500 kg ha⁻¹ more than DM when compared to R4. This result was expected, since with the advancement of phenological stages, there is an increase in the DM content and a decrease in MV values. Marafon et al., (2015) verified in his work, an increase of 26.70% to 34.78%, in R3 for the R5 stage, respectively.

The DM content has a great influence on the final quality of the ensiled material, and it is indicated levels between 30 and 35% of MS (LAUER, 1996). The ensilage of materials with DM content above 35%, generates difficulty in compaction, increasing the oxygen levels between the forage mass, causing the development of aerobic microorganisms and nutrient losses (OLIVEIRA et al 2014). On the other hand, high moisture content, above 70% are correlated with higher nutrient losses by effluent, lower final dry matter production, bacterial proliferation, which slow down pH (SILVEIRA, 2009).

For the variable starch, it is observed that with the advancement of the reproductive stage the levels increase, with no difference between the stages R4 and the R5, obtaining values of 30.14 and 32.13% respectively. This result is linked to the advancement of the grain formation, which increases the starch content in the silage. This same response behavior is observed for the NDT parameter, that increase with the advances of the reproductive stages. According to Cabral et al., (2012) The higher the proportion of grains in the mass, the higher the values of total digestible nutrients found.

Therefore, besides the total mass production, it should also be considered the quality of the silage, which is influenced by the proportion of the plant components and the advancement of the reproductive stage of the plant. Thus, despite the increase in the fraction in more advanced stages of maturation, the increase in grain participation, provides higher energy levels and the quality of silage in greater proportion, than the losses caused by the fibrous portion (Oliveira, 2010), a situation observed in this work.

The FDN and FDA values (table 3) decrease with the advancement of the reproductive stages, this result is due to the greater participation of grain in silage, consequently higher energy value (starch) and higher nutrient content digestible (NDT). Ensiled crops, before the ideal point, besides presenting lower total mass production, have a higher NDF content due to the occurrence of effluent and the lower share of the grain fraction in the mass (VAN SOEST, 1994; VILELA et al.

2008). Similarly, Marafon et al. (2015), evaluating different maize harvesting stages, observed that maize plants in the R5 stage presented lower FDN and FDA content, when compared to the R3 stage due to the dilution of these fractions, by the transformation of simple sugars into starch in the grain component.

Also, VAN SOEST et al., (1991), points out that good silage must comply with some minimum quality criteria. Thus, values lower than 50% of neutral detergent fiber and 32% of acid detergent fiber (table 4), are important because they have a high correlation with the capacity of daily dry matter consumption and energy density of the resulting silage, respectively (VAN SOEST et al., (1991). For the production estimate (L cow⁻¹ day⁻¹; L ha⁻¹), a significant isolated effect was verified between the hybrids and between the reproductive stages of cutting. Thus, the production estimate was higher for the hybrid P32R48 VYHR®, with values of 15.43 L cow⁻¹ day⁻¹, 16900.4 L ha⁻¹, while the P30F53 VYHR®, obtained an average yield of 14, 47 L Vaca⁻¹ day⁻¹, 15845.7 L ha⁻¹ (table 4).

Table 4 - Milk production estimation per hectare based on qualitative parameters and quantitative silage for different maize hybrids (Iraceminha, SC – 2017/2018 crop).

Híbridos	Produção de Leite	
	----- L vaca ⁻¹ dia ⁻¹ -----	----- L ha ⁻¹ -----
P32R48 VYHR [†]	15,43 A	16900,4 A
P30F53 VYHR [†]	14,47 B	15845,7 B

Averages followed by the same letter in the column do not differ from each other (P < 0.05) by the Tukey test. Standard error of Mean ± (0.299 L cow⁻¹ day⁻¹), and ± (327.69 L ha⁻¹).

The highest production observed in hybrid P32R48 VYHR®, possibly due to the fact that it has a higher MS content, which raises the amount of PB available (table 2), approximately 90 kg of PB more per hectare, even if it does not differ from the other treatment. According to Pereira et al., (2007), the MS and PB contents of the plant are important factors in the ensilage process and in the determination of the nutritional value. This hypothesis may be considered because the protein in this case is the limiting factor of production, therefore greater availability of PB, higher production.

In addition to being highly demanding in energy, lactating animals also present high protein demand that can limit the productive potential of these animals. The protein content in the diet has a positive correlation with the consumption, being this effect partly from the increase in

rumen degradable protein and improvement in food digestibility (CARDOSO et al., 2017). Several studies have shown that the increase in crude protein consumption increases milk yield per animal. As data presented in the NRC (2001), of which milk production increased 0.75 Kg cow-1 day-1 when the PB content in the ration was increased from 15 to 16%, and 0.35 Kg cow-1 day-1 when the PB content was increased from 19% to 20% , being the maximum milk production was observed with contents of 23% PB ration.

The production estimate in relation to the reproductive stages of cutting (table 5) increased as the phenological stages of the plant occurred. Thus, the highest productivity was observed in R5 and R4, with values of 17.58 and 17.44 L Cow-1 day-1 and 19244.5 and 19099.1 L ha-1, respectively, with no difference between them.

The phenological stage interferes directly in the amount of dry matter of the ensiled material, this evaluation is important, since in stage MS are contained all the nutrients, having great effect on the quality of the final material (OLIVEIRA et al., 2014). Thus, the highest productions were verified in the most important reproductive stages advanced, where increments in the parameters occurred; MS, starch and NDT, and decrease in NDF and FDA values.

Table 5 - Estimation of milk production based on qualitative and quantitative parameters of silage in different reproductive stages (Iraceminha, SC-Safra 2017/2018).

Estágio Reprodutivos	Produção de Leite	
	----- L vaca ⁻¹ dia ⁻¹ -----	-----L ha ⁻¹ -----
R2	11,32 C	12385,4 C
R3	13,48 B	14763,2 B
R4	17,44 A	19099,1 A
R5	17,58 A	19244,5 A

(Averages followed by the same letter in the column do not differ from each other (P < 0.05) by the Tukey test. Standard error of Mean (0, 423 L Cow-1 day-1), and ± (463, 42L ha-1)

Table 6 and 7, refers to the estimated economic income achieved in each hybrid and at each reproductive stage, considering the amount paid to the producer by the liter of milk. For the hybrid factor, the highest economic return (R\$ ha-1) is obtained by the hybrid P32R48 VYHR®, being higher in 1438.18 R\$ ha-1, compared to the P30F53 VYHR® (table 7).

Table 6 - Estimate of economic income (R\$ ha-1) for corn hybrids, estimated based on quantitative and qualitative parameters of silage and the price paid per liter of milk (Iraceminha, SC-2017/2018 crop).

Híbridos	Rendimento Econômico
	-----R\$ ha ⁻¹ -----
P32R48 VYHR [†]	23045,4 A
P30F53 VYHR [†]	21607,2 B

Averages followed by the same letter in the column do not differ from each other (P < 0.05) by the Tukey test. Standard error of mean ± (446.833)

In relation to the economic performance of the different reproductive stages, the R5 and R4 are superior to the other treatments, with no difference between the same (Table 7).

Table 7 – Economic Income estimation (R\$ ha-1) for the reproductive stages, estimated based on the quantitative and qualitative parameters of the silage and the price paid per liter of milk (Iraceminha, SC – Harvest 2017/2018).

Estádios Reprodutivos	Rendimento Econômico
	-----R\$ ha ⁻¹ -----
R2	16888,7 C
R3	20131,0 B
R4	26043,6 A
R5	26241,8 A

Averages followed by the same letter in the column do not differ from each other (P < 0.05) by the Tukey test. Standard error of mean ± (631.918).

It can be seen that when the harvest of corn for whole plant silage was performed at the R2 stage, although it provides the producer with the removal of the early crop of the crop and allows to anticipate the sowing of the second crop, the producer fails to win, R\$9353.11 Ha-1 when compared to the cut performed in R5. It is also important to emphasize that the ensilage process can be done between the R4 stages and R5 without significantly compromising the economic performance of the system, since the difference between these two cutting moments (R4 and R5) is only R\$198.285 ha-1.

This result is important as it allows a longer interval of time for the producer to perform the harvesting and ensiling of the material, decreasing the disorder and financial losses to the system.

IV. CONCLUSION

The Hybrid P32R48 VYHR® presented the best economic return to the system, for providing higher milk production per hectare.

The best breeding stages for making silage are the R4 and R5.

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Biomechanical Evaluation of Different Implant Positions when Restoring the Maxilla: A Finite Element Analysis

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Abstract—The absence of four upper incisors is a complex and delicate treatment challenge. The fewer implants are placed into the arch is easier to restore esthetically. However biomechanical principles could be jeopardized. This study evaluated the biomechanical behavior on a fixed prosthesis supported by different number and position implants in the anterior maxilla. Four different models, 4 implants supporting four splinted crowns (4I); implants in central incisors as support and lateral incisor as cantilevered elements (CS); one implant in central and one lateral incisors as support, with a pontic and cantilevered crowns (CSLS) and implants in lateral incisors as support and central incisors as pontics (LS) were analyzed by finite element analysis (FEA). The implants received mini conical abutment and zirconia screwed prosthesis. A magnitude force of the 37.5N was applied on each palatal surface of the incisors with 45° angle to the long axis of the implants. The reduction of number of implants increased von Mises stress in all components. Lower values of von Mises stress were observed in the 4I model. In the models with two implants, the CS model showed lower von Mises stress except in framework that is in CSLS model. The study concluded that the number of implants influence in biomechanical behavior and when reduce implant number to enhance esthetically anterior rehabilitation the CS and CSLS models showed better biomechanical behavior.

Keywords—Dental implants, dental prosthesis, finite elements analysis.

I. INTRODUCTION

Oral rehabilitation with dental implants in the anterior maxilla is still a challenge due to the high esthetic requirement.¹ Currently, the treatment success with implant-supported prosthesis requires understanding of the basic biomechanical principles combined with the dentist surgical skills and the capability of satisfying the patient's functional and esthetics demands².

An essential prerequisite for a predicable implant-supported rehabilitation is the adequate bone availability³. The buccal-lingual ridge dimension should be enough to provide approximately a 2mm-thick buccal and lingual bone walls around the implant, as well as enough mesiodistally⁴. In many clinical situations the anterior maxillary ridge is highly resorbed, making it impractical restore with single crown implant-supported restorations⁵. Conventionally, the distance between implants (external or internal hexagon connection types) must be of at least 3mm, in order to ensure the preservation of crestal bone⁶.

However, the required distance between implants decreases when using morse taper connection, preserving the interimplant crestal bone more efficiently⁷. A common approach to rehabilitate atrophic anterior maxilla is through the use of two implants to support four crowns (either pontics or cantilevers), optimizing the esthetic outcomes in the anterior section^{8,9}. However, the reduction in the number of dental implants may increase the risk of mechanical failures such as prosthetic screw loosening and fracture of implant, abutment, framework or veneering ceramic^{6,9}.

The use of two implants to support a four elements partial prosthesis may enable better handling of the soft tissue in the pontic area, enhancing the cervical embrasures and reducing the black triangle appearance in the more esthetic demanding region of anterior maxilla¹⁰. However, two implants may jeopardize the biomechanical behavior of the system, as fewer implants supporting a prosthesis may

increase the concentration of stress in the perimplantar region¹¹.

The understanding of stress concentration and dissipation in different implant number and configuration options may provide more evidence to the decision-making process when restoring the anterior edentulous section. This analysis is crucial due to the inherent oblique loading in the anterior section and the possible use of suspended elements in the restoration (pontics and cantilevers) that may increase the risk of biomechanical failure¹².

Due to the absence of the substantive data that evaluated the mechanical behavior of the components on different implant configurations, the analysis of different positions and number of implant in the prosthetic rehabilitation is still needed to find out the most predictable treatment¹³. Therefore, the aim of this study was to evaluate the biomechanical behavior of the fixed partial prosthesis in different positions of implants in the anterior maxilla using the three-dimensional finite element method.

II. METHOD

2.1 Experimental Design

In order to reproduce a clinical situation of the absence of four maxillary incisors restored with four-unit fixed partial prosthesis (FPP) supported by implants, four models using a three-dimensional computer-aided design software (SolidWorks 2013 Corp., Concord, MA, USA) were created. Each model consisted of dental implants supporting four elements restoration with four different arrangements: 4 implants model supporting four crowns splinted (4I); implants in central incisors as support and lateral incisor as cantilevered elements (CS); one implant in central and one lateral incisors as support, with a pontic and cantilevered crowns (CSLS) and implants in lateral incisors as support and central incisors as pontics (LS) as seen in Fig. 1. Finite Element Analysis (FEA) was used to determine the stress values in the restorations for all models.

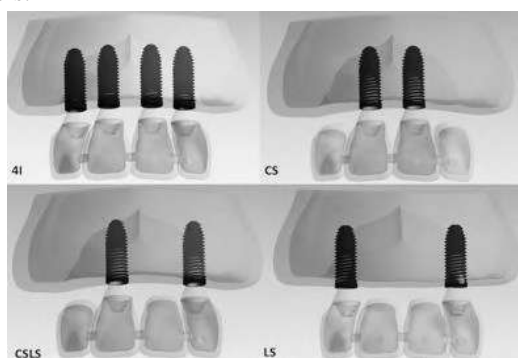


Fig. 1: 4I, CS, CSLS and LS models. Different positions of the implants and corresponding prosthesis.

2.2. Model Construction

A section of the anterior maxilla of a completely edentulous patient (volunteer) and natural maxillary central incisors were obtained in the laboratory of images of finite elements of the Faculty of Dentistry of Piracicaba (FOP -UNICAMP) library. The maxillary bone including cortical and trabecular layers and also the anatomy of upper incisors (prosthetic crowns) were obtained by cone beam CT images (CTCB) (i-CAT Cone Beam 3D Dental Imaging System, Imaging Sciences International). The images CTCB were transferred to In Vesalius 3.0 (Center for Information Technology Renato Archer) software for 3D (three dimensions) image reconstruction from a sequence of DICOM 2D (two dimensions) images (Digital Imaging and Communications in Medicine). Afterwards, all the images were exported to the CAD (Computer Aided Design) software SolidWorks® (SolidWorks Corporation 2013, Concord, MA, USA) and the 3D solid models were obtained. In order to simulate a challenging scenario in which the anterior maxilla is severely resorbed (atrophic anterior maxilla), an edentulous ridge was used as a reference for a partially atrophic edentulous maxilla.

The physical measures of the implants and prosthetic components regarding their diameter (D), height (H) and length (L) of the implants and 3D prosthetic components were designed in the CAD / SolidWorks® software and based on the characteristics of the materials applied. Likewise, the reconstructed had shown maxilla showed the following dimensions: 27mmx20mmx10mm (L / H / D). The bone in the anterior maxilla was classified as type 3 represented by a thick layer of cortical bone surrounding a core of dense trabecular bone, as described by Lekholm & Zarb¹⁴. The implants with a Morse taper interface (dimensions: 3.75x11mm Titamax CM/EX Neodent, Curitiba- Brazil) as well as the prosthetic components (mini type conical abutment - Mini Conical Abutment CM, Neodent, Curitiba, Brazil) consisted of a titanium alloy Ti6V4¹⁵ were used in the models.

A zirconia prosthetic framework was, then, manufactured based on the anatomic area of the maxillary bone and the shape of the prosthetic crowns of the upper incisors (dimensions of the connector: 4x4mm). Feldspatic ceramic was employed to veneer in the prosthetic crowns. The crowns, abutments, implants were considered to be isotropic, homogenous and linearly elastic^{16,18} and cortical and trabecular bone were considered to be anisotropic, homogenous and linearly elastic. The mechanical properties (modulus of elasticity or Young's modulus, shear modulus and Poisson's ratio) of these structures are shown in Table 1.

Table 1- Mechanical properties of materials

	Young's modulus (E) (MPa)	Shear modulus (G) (MPa)	Poisson ratio (ν)
Cortical bone ^{14,25}	E_{11} 12,600 E_{22} 12,600 E_{33} 19,400	G_{12} 4,850 G_{13} 5,700 G_{23} 5,700	ν_{12} 0.30 ν_{13} 0.39 ν_{23} 0.39
Trabecular bone ^{14,25}	E_{11} 1,150 E_{22} 2,100 E_{33} 1,150	G_{12} 6,800 G_{13} 4,340 G_{23} 6,800	ν_{12} 0.001 ν_{13} 0.32 ν_{23} 0.05
Titanium (Implant and Abutment) ^{14,25}	104,000	38,800	0.34
Zirconia	210,000	33,000	0.31
Ceramic Crowns ^{14,25}	70,000	40,000	0.30

2.3. Numerical Analysis

The models were exported to the software ANSYS Workbench 14.0 (Swanson Analysis Systems Inc. Houston / PA, USA) in order to obtain the mesh and its subsequent numerical analysis. From the mesh standpoint, the quadratic tetrahedral elements with 3 degrees of freedom per node, consisting of 0.5 mm each one, were then generated. In order to increase the accuracy of the models, a mesh refinement process was performed by the analysis of convergence (5%). The models presented a number of elements ranging from 290.203 to 177.992, and a number of nodes ranging from 501.571 to 310.143 in each model. The boundary conditions were established in the outer superior and posterior surfaces of the models in all directions.

The “bonded type” contact was used in this linear analysis. The bone/implant interface was assumed as in a perfect union, simulating a complete osseointegration. In addition, the set of abutments, framework and crowns were completely splinted. During the analysis, no sliding or separation was allowed between the interfaces.^{14,17} A 150N load was applied in the cingulum areas of the four incisor crowns, 37.5N each. A 45° angle to the long axis of the implants was used to simulate the inherent oblique loading in the anterior region.^{18,19}

The ANSYS® software was used to calculate the values of von Mises stress for implants, abutments, framework and ceramic of the prosthetic crowns.

III. RESULTS

The highest values for equivalent von Mises (σ_vM) stress in all models are presented in the figure 2.

The number of the implants revealed an important influence on biomechanical behavior proved by lower equivalent von Mises stress in all components evaluated into the group 4I as seen in figure 2.

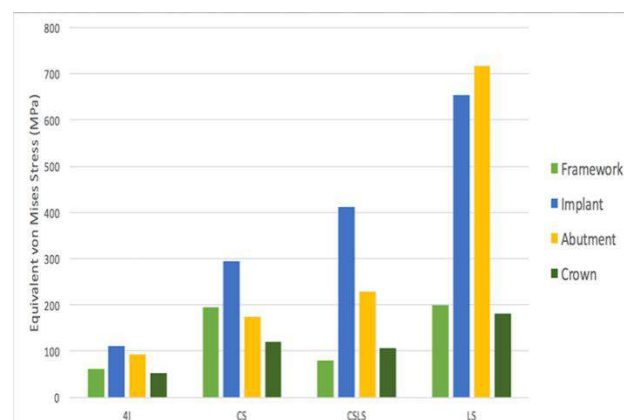


Fig. 2: The equivalent von Mises stress values (MPa) and the components of the models.

The analysis von Mises stress in the implants showed, in all models, that the prevalence of the stress on the buccal side was predominantly in the inner surface of the conical prosthetic connection as seen in Fig. 3. The stress was concentrated in the first threads on the implant and decreasing towards the implant apex, regardless the implants arrangement. The higher σ_vM stress concentration was found in LS model (654 MPa), following the CSLS model (412 MPa) and CS model (295 MPa). The model 4I showed lower stress concentration values with peak the 112 MPa.

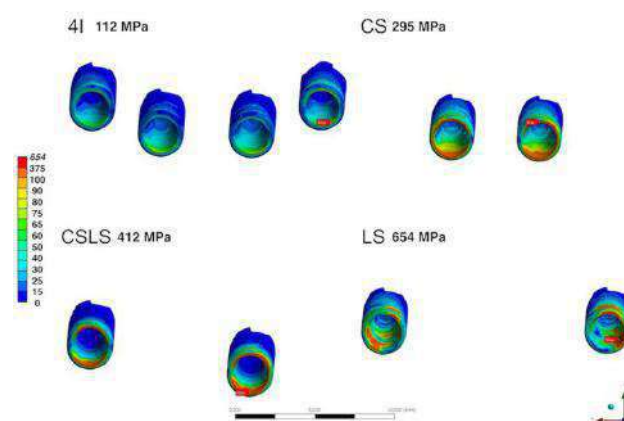


Fig. 3: The von Mises stress (MPa) in the dental implants.

In the abutments all models showed stress concentration on the buccal surface at the implant platform contact, except the LS model showed the stress in all abutment body with the highest value stress (716 MPa). The CSLS (228 MPa) and CS (174 MPa) models had a similar biomechanical behavior as seen in Fig. 4.

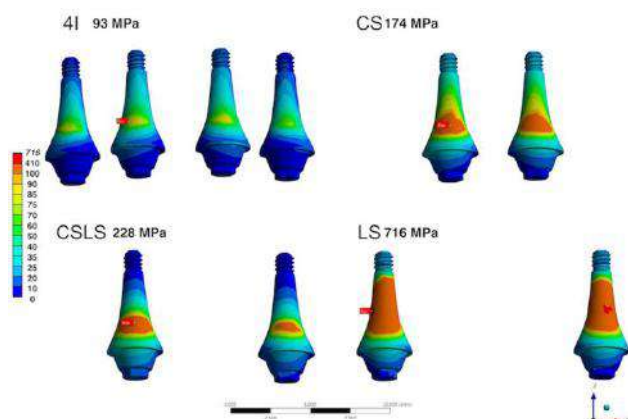


Fig. 4: The von Mises stress (MPa) in the abutments.

When analyzing the frameworks, the von Mises σ_M stress values were concentrated in the connector area in all models as seen in Fig. 5. The highest values were found in LS model (200 MPa) and the lowest values in the 4I model (61 MPa). The CS and CSLS models showed similar the von Mises values.

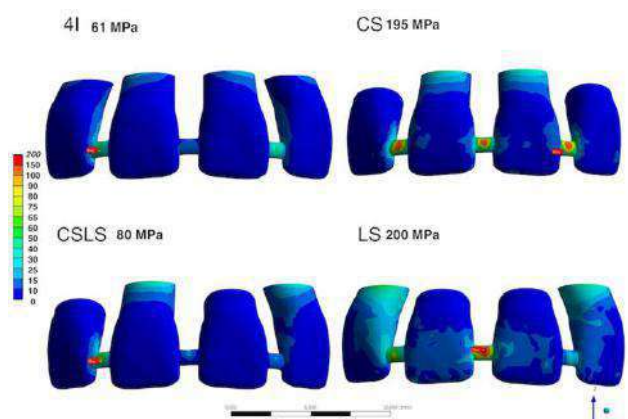


Fig. 5: The von Mises stress (MPa) in the frameworks.

The similar results of frameworks, the ceramic prostheses showed the equivalent von Mises stress values were concentrated in the connector area in all the models Fig. 6. The highest values were found in LS model (182 MPa) and the lowest in 4I model (53 MPa). The CS and CSLS models showed the von Mises values similar, 121 and 108 MPa respectively.

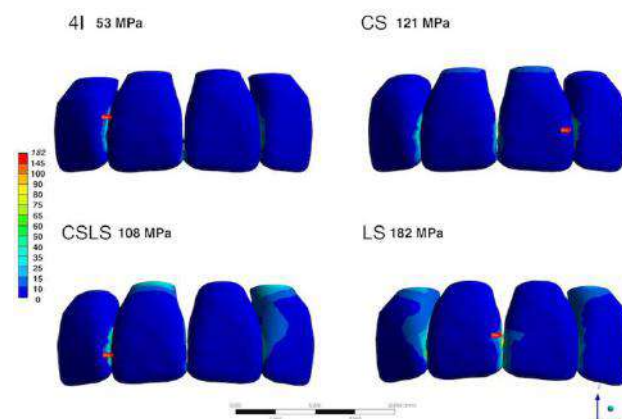


Fig. 6: The von Mises stress (MPa) in the ceramic crowns.

4. Discussion

The positioning of the implants in the anterior region raises several issues ranging from bone quality to the long-term maintenance of the implants, since it is located in a region with a high aesthetic and mainly functional requirement.²⁰ The successful treatment with Osseo integrated implants depends on the ability to satisfy patient's functional and esthetics demands.^{2,31} Considering this, it is important to study the position and the number of implants in a fixed partial denture, since this have an important role in the mechanical behavior of prosthetic rehabilitation. This study may provide biomechanical information to clinicians to aid the treatment planning regarding implant amount and distribution in the anterior maxilla. Also, an insight is provided on the biomechanical risk and stress concentration on the obliquely loaded restoration and implants.

The “bonded type” contact has been extensively used in finite element analysis in dental research despite the fact of not simulating the real clinical condition.²¹⁻²³ This simplification does not jeopardize the results of the study as it was conducted during the linear regimen of the structures during the numerical analysis. Thus, as a complete Osseo integration is simulated, the “bonded type” contact may be justified. The contact between implant, abutment and restoration was also considered bonded as the aim of this study was to evaluate the stress dissipation and not the gap formation between components.²⁴⁻²⁷ The loading condition used in the present study was based in the occlusal contact points existing within the normality of mandibular movements for the anterior teeth observed in several studies.^{9,12,15,28} As the force applied on the restoration is in agreement with the loads exerted in this region, it allows the materials to undergo elastic deformation.

The materials of the structures analyzed have elastic behavior at the applied load regimen, which further

undermines the use of linear simulation. The use of the von Mises fault criterion is more applicable when observed in ductile materials, as in the case of metals.²⁹ As in this study we observed the tensions in the implants and abutments, the use of the von Mises criterion was justified.³⁰

In the development of an FE model, the assumptions regarding material properties, loading conditions, model accuracy, and stress criteria are important for analysis. In the present study, trabecular and cortical bones were assumed to be anisotropic, a propriety, which has been, neglected in other FEA studies.^{6,7,9}

The loading conditions assumed a force of 150 N divided among four upper incisors applied at cingulum with 45-degree angle to long axis of tooth to simulate mastication.^{18,19} Generating the components from CBCT images and CAD images ensured dimensional accuracy of the models. The results of the present study were in agreement with Dejak and Mlotkowski (2008)¹⁷ the authors of the study reported that von Mises stress might be used to evaluate the behavior of ductile materials such as implants and prosthetics components.

Various implant treatment plans are used for replacement of absence of four upper incisors, varying upon many factors, such as bone quality, space viability and the width of residual ridge. For this condition, the commonly used protocols are either a fixed partial prosthesis supported by two implants to support a four-units prosthesis or a four implants to splinted or unsplinted prosthesis. To improve the esthetics is recommended the use of fewer number of implants,^{5,32} however the biomechanical risk may increase.^{4,33}

The present study showed that the number and the positioning of dental implants influenced at the mechanical behavior of prosthesis and implants at a four-units upper anterior rehabilitation. Esthetically, it is important to have a certain space between two implants, since it influence on the proximal bone crest level and therefore on the soft tissue volume.²¹

The present study showed that the number of implants influenced biomechanical behavior of four-units upper anterior rehabilitation. When two implants were used in the placement of central incisors as support of lateral incisors as cantilevered elements (CS model) and one implant in central and one lateral incisor as support, with a pontic and cantilevered crowns (CSLS model) the results showed better biomechanical performance than lateral incisors as support and central incisor as pontics.

As an alternative to reduce the overload risk is increasing the number of the implants into the prosthesis. Our results, in accordance with previous studies^{6,7} showed that the

number of the implants can influence and improve the stability of the implants and prosthetics components. However, others studies, in posterior area under higher load condition stated that the two implants could adequately support a fixed partial prosthesis.^{22,23}

In a systematic review³⁴, all types of fixed implant reconstructions such as implant-supporting single crowns, cantilever partial fixed prostheses or supported partial fixed prostheses (FDPs), non-cantilever, showed 96.8%, 98.5% and 92% of the survival rates. While the implants survival rates are very high, prostheses survival rate is just slightly less favorable with a 5-year survival of 96.3% and 86.5% after 10 years.³⁴

Esthetically, fewer implants placed in the arch is easier to restore.⁵ Limiting the implant number gives the ceramist more flexibility in designing the prosthesis. Besides that, when restoring multiple teeth with multiple implants, the presence of the bone crest is crucial for the position of the soft-tissue margin in the inter-implant area.³⁴ The bone crest serves as a foundation for the soft tissues between implants, and loss in height of the proximal bone crest may negatively affect the papillae presence.³⁵ The distance between two implants may have an influence on the maintenance of the proximal bone crest level.^{34,35} Barros et al., 2010⁵ in animal studies showed that morse taper implants could be placed in narrow interimplant distance, such as 2mm, which justify its use in the present study, differently from the previous studies that used implants with external connections.^{8,9,36}

Following this philosophy our study evaluates three alternatives in the implant rehabilitation for four upper incisors with fewer implants (two). In all the models evaluated, the biomechanical patterns on the implants presented similar concentration in buccal side and in the firsts threads. These results are in agreement with some studies^{14,32,37} that explain bone remodeling during the first year of the functional load.

For the prosthetics components, abutments, framework and veneer ceramic, the model LS showed higher stress, specially, on the connectors of the framework. Our data is in accordance with the findings of Bal et al., 2013²⁰ and Guichet et al., 2002³³, which show an increase of the stresses in the connector's region. Although framework fractures are not common for partial FDPs,^{27,38,39} the design used by them influenced on fracture strength of ceramic veneer.^{28,40} Our results showed that the presence of stress in the framework correspond to transferred stress to the ceramic veneer. It can be suggested that one of the reasons for the ceramic veneer fractures may be due to the high stresses concentrated in the connector regions.

All the models presented high concentrated stress in the connector surface as the higher von Mises stress was found in the LS model. The highest stress values on the LS model can be explained by reaction forces and bending moments in the framework. The bending moment is the force times the orthogonal distance between the force direction line and the counter-acting support,²⁹ which is higher in LS model. Therefore, in a long-term follow-up, this kind of FPD could be expected to increase load on the supporting structures.⁸

Despite the present study evaluated different amount of implant and different distribution of implants *in silico* and provided insights on the biomechanical behavior of these combinations, more *in vivo* studies should be carried out in order to observe the clinical effect of such combinations.

IV. CONCLUSION

It was concluded that a higher number of implants interfere positively in both concentration and distribution of stress in all the components of the prosthesis. However, when a reduced implant number is used to enhance aesthetics in anterior rehabilitation, the CS and CSLS models showed better biomechanical behavior.

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Plant Extracts and Pesticides for the management of the American Serpentine Leafminer (*Liriomyza trifolii*)

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Abstract— Pesticides have been the most common method for management in the control of *Liriomyza trifolii*. However, some plants produce substracts with pesticide potential and could be used for the management of this pest. Therefore, the aim of this study was to assess the pesticide potential of tobacco, pepper, castor beans, and garlic extracts in the management of *L. trifolli*, comparing them to commercial pesticides (Milbeknock® and Vertimec®). The extracts were tested at a concentration of 2.5 mL/100mL of water and pesticides in the concentrations recommended by the manufacturer. The extracts were applied to 10 tomato plants (50 days after sowing), previously submitted to an infestation of *L. trifolli* for 4 hours. The assessments were initiated one day after pulverization, counting the presence of miners in the leaves, number of alive and dead larvae and the viability of pupae. To assess the effects of the extracts and the pesticides on larval phase, tomato plants with the same characteristics of the previous experiment were submitted to an infestation of the pest for 4 hours. After 72 hours, the extracts and pesticides were pulverized at its respective concentrations. The larval, pupae, and total mortality data were subject to variance analysis, regression, and means were compared by Tukey test at 5% probability. It was found that the pesticide Vertimec® was efficient in the management of *L. trifolli* both when applied over eggs and larvae. However, among the tested extracts, the garlic extract was more efficient on eggs and larvae, becoming a promising and viable alternative to the management of *L. trifolli*.

Keywords— Phytosanitary management, *Solanum lycopersicon*, Pesticide plants, Pest insects, Integrated management.

I. INTRODUCTION

With a higher demand for healthy foods, research has been developed aiming to find alternative pest management. Besides, the continuous and indiscriminate use of pesticides has led to a number of serious problems related to human and animal health (Perez & Iannacone 2006; Wamser *et al.*, 2008).

Pesticides have been the most commonly used method for management by producers in controlling the American serpentine leafminer (*Liriomyza trifolli*) (Diptera: Agromyzidae) (Wamser *et al.*, 2008). On the other hand, plants have been studied for their capacity to produce substracts with pesticide potential, especially those in the Solanaceae, Euphorbiaceae, Liliaceae, Meliaceae families, which have pesticide potential. Among those plants, the tobacco (*Nicotiana tabacum* L.), the habanero pepper

(*Capsicum chinense* Jacq.), the castor bean (*Ricinus communis* L.) and the garlic (*Allium sativum* L.) have been highlighted for having composts with pesticide properties (Yang *et al.*, 2017).

Therefore, studies with biopesticides based on plant extracts had shown promising results in pest management. Moreover, the development of new pesticide molecules by using secondary metabolites in plants may also offer repellent action in oviposition of pests (Pavela, 2016). Even though there viability for biopesticides using plant extracts, studies must be conducted since those vegetal origin products present limitations such as photosensitivity, temperature, humidity, and problems in active ingredient concentrations in plants (Machado *et al.*, 2007).

Given the aforementioned, this study aimed to assess the pesticide and repellent potential to the American serpentine leafminer, *L. trifolii*, for peper, garlic, tobacco, and castor bean extracts when compared to commercial pesticides (Milbeknock® Onu 1993 FR® and Vertimec®).

II. MATERIAL AND METHODS

The experiment was conducted in the Nucleus for Scientific and Technological Development in Phytosanitary Management (NUDEMAFI) at the Agronomic Sciences Center at the Federal University of Espirito Santo, Brazil (CCA-UFES), Alegre-ES and followed these phases:

2.1 *L. trifolii* breeding.

Leaves containing fly punctures were deposited in polyethylene trays for collection of pupae and posteriorly transferred to petri dishes covered in plastic film. After the emergence of *L. trifolii* adults were released in antiaphid net cages (50 x 50 x 50 cm) in a room at 12 hours of light and 25 °C, raised in leaves of jack bean (*Canavalia ensiformis*), according to the recommendations by Sombra *et al.* (2011).

2.2 Obtaining Castor Oil.

Castor fruit in the IAC 80 variety were submitted to oil extraction through cold press and filtering of impurities with thin screen filter (patent pending). Then, the oil was kept in a dated hermetically closed clear container in an acclimatized room at 25±2 °C and photophase of 12h. For oil dilution, distilled water was used with adhesive surfactant (Tween® 80) at concentration 0.5% (v/v).

2.3 Obtaining tobacco, garlic, and pepper extracts.

Rolls of tobacco leaf (Vieira - Ubá - MG), bulbs of garlic (São Gotardo - MG) and habanero peppers were dried in stove at 50°C until constant weight was achieved, later grinded in cutting mills (Oliveira & Vendramim, 1999). The dried and ground parts of the plants were taken into immersion with deionized water with the concentration of 10g powder in 90 ml water (10%). These were kept in homogenization for 24 hours in a transverse agitator (200RPM). The solution was then strained in voil cloth and it was complete to 100ml in the proportion of one gram of dry plant to 10mL of distilled water, obtaining then the aqueous extract of the plant.

2.4 Efficacy of natural products x chemical products applied to the egg phase.

The following formulations were tested: pepper extract (2.5 mL/100mL water), garlic extract (2.5 mL/100mL water), tobacco extract (2.5 mL/100mL water) and castor oil (2.5 mL/100mL water), Milbeknock Onu 1993 FR® (40 mL/100 L water) and Vertimec® (100 mL/100 L water) and witness (distilled water). Concentrations

superior to 2.5% presented traces of phytotoxicity in the plants and were not used in the experiments.

To assess the action of the extracts in the management of the American serpentine leafminer, tomato plants at 50 days after sowing (with five true leaves) were submitted to the pest infestation, in breeding cages for four hours. After this time, the plants were removed and immediately pulverized com the respective concentrations of each extract. A total of 10 plants were used, each one being one repetition. The process used an automated pressure pulverizer (pressure of 15 lb/pol²), releasing 6 mL solution with automated pipette of 2 to 10 mL, simulating a field inoculation.

2.5 Efficacy of natural products x chemical products applied to the larval phase.

The same formulations from the previous experiment were tested, however, the pulverizations occurred 72 hours after the plants were removed from the cages. For each concentration, 10 plants were used. The application of extracts and pesticides were similar to those in the previous experiment.

The assessments were started one day after pulverization, accounting for the presence of miners in the leaves and number of alive and dead larvae. It was also calculated the viability of pupae from larvae to survive the application. The larval, pupae, and total mortality data were used for analysis of variance (comparison among products), regression (comparison among the concentrations of one product), and means compared by Tukey's test at 5% probability using PROC ANOVA in Assistat (Silva & Azevedo, 2006).

III. RESULTS AND DISCUSSION

3.1 Efficacy of natural products x chemical products applied to the egg phase.

The larval mortality for *L. trifolii* when applied at the egg phase varied according to the product, with significant differences between the treatments (F6, 34= 244.9602; P = 0.001). Treatments with chemical products produced higher larval mortality but there were statistical differences between pesticides Milbeknock® and Vertimec® with 90% and 100% mortality, respectively. Among the extracts, the best results were obtained with the garlic extract with 60% larval mortality, but that was not significantly different from the tobacco extract (Figure 1-A).

On the pupae mortality, Vertimec® and garlic extract had the best results. The pesticide Milbeknock® and the castor bean, tobacco, and pepper extracts had statistically similar results with mortality ranging from 30 to 58% (Figure 1-B). These results indicate that the garlic

extract is more efficient on *L. trifolii* pupae phase when applied during the egg phase, when compared to other extracts.

For total mortality analysis, all extracts and pesticides used in the tomato culture presented adequate results. However, Vertimec® and Milbeknock® presented superior results with 90 and 100% efficacy, respectively, and statistically different from extracts (F6, 29 = 45.2572; $P < 0.0001$). The garlic, pepper, tobacco, and castor bean extracts showed efficacy ranging from 68 to 78%. However, the castor bean extract was statistically inferior from the other extracts (48%) (Figure 1-C).

Efficacy of natural products x chemical products applied to the larval phase. The results from extracts and chemical products when applied during larval phase presented variation in efficacy, significant among the treatments (F6, 34 = 28.8045; $P = 0.001$). The chemical products Vertimec® and Milbeknock® results in higher larval mortality. The pesticide Vertimec® presented efficacy of 100%, while the pesticide Milbeknock® presented efficacy of 80%. (Figure 2-A).

On the percentage of unviable pupae, there were no assessments to the plants treated with the pesticide Vertimec® since it resulted in total mortality of larvae. The garlic extract resulted in 78% unviable pupae, with efficacy statistically superior to the chemical product Milbeknock®. The remaining extracts presented results statistically inferior (Figure 2-B).

For all treatments, there was variation in total mortality of *L. trifolii* (F6, 29 = 27.9049; $P = 0.0001$). The garlic extract and the chemical product Vertimec® presented the best results, with 89 and 100 % total mortality, respectively. The efficacy of the pepper and tobacco extracts was statistically inferior to the garlic with values close to 70%. The pesticide Milbeknock® and the castor bean extract presented the lower results with 58% and 63% efficacy (Figure 2-C).

In general, the pesticide Vertimec® was efficient in the management of *L. trifolii* both in application on eggs and larvae. The pesticide Vertimec® has as its active ingredient the abamectin, a macrocyclic lactone with translaminar action, allowing the action on the eggs as well as larvae, even when those are inside the leaf parenchyma (Monnerat *et al.*, 2000). However, when facing the many cases of resistance of pests to pesticides and also the many environmental and human generated problems by the use of pesticides, studies suggest the use of plant extracts and essential oils such as biopesticides have been intensified around the world.

Therefore, the garlic extract showed to be efficient in the management of *L. trifolii* both during egg and larval

phases. The garlic extract has as a main composite the allicin that promotes the typical garlic aroma and which acts as a defense mechanism for the plant against herbivores (Szymack *et al.*, 2009). This extract is reported as a potential pesticide, insecticide, nematicide, and fungicide (Corrêa & Salgado, 2011). The allicin has action by contact and reacts in the cuticles of pests as well as a fumigating effect, being able to be absorbed through insects' airway (Corrêa & Salgado, 2011).

IV. FIGURES AND TABLES

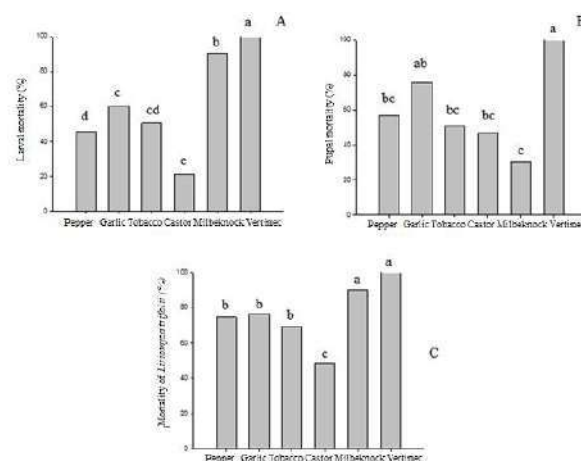


Fig. 1: Application of natural products from pepper, garlic, tobacco, and castor bean compared to chemical products at egg phase in *L. trifolii*. A) Larval mortality; B) Pupal mortality; C) Total mortality. Means (\pm SE) followed by the same letter in the column are not statistically significant through ANOVA at 5% probability with Tukey test.

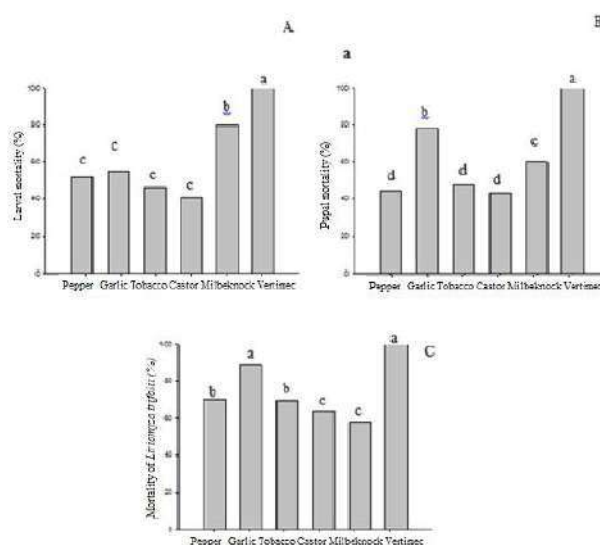


Figure 2. Application of natural products from pepper, garlic, tobacco, and castor bean compared to chemical products at larvae phase in *L. trifolii*. A) Larval mortality; B) Pupal mortality; C) Total mortality. Means (\pm SE) followed by the same letter in the column are not statistically significant through ANOVA at 5% probability with Tukey test.

V. CONCLUSION

The Vertimec® pesticide was efficient in the management of *L. trifolii* both for eggs and larvae. However, among the tested extracts, the garlic extract seemed more efficient on eggs and larvae, presenting promising and a viable alternative in the management of *L. trifolii*.

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Adverse Post-Vaccination Events to BCG in Cacoal City, Rondonia, Brazil - 2016-2018 Period

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Abstract— The Calmette-Guérin Bacillus (BCG) vaccine is used against severe forms of tuberculosis. Although BCG post vaccination adverse events (EAPV) are uncommon, when identified they should be reported. The objective was to characterize the EAPV to BCG in the Municipality of Cacoal / RO from 2016-2018. This is a documentary, cross-sectional and descriptive study of quantitative approach, conducted with secondary data obtained from the reporting / investigation forms of AEFI to BCG, in the period 2016-2018 of individuals residing in Cacoal / RO. The population consisted of 13 notification forms, and they were part of sample 11, since 02 met the exclusion criteria. Data were collected through a collection instrument prepared by the researchers and the project was executed after authorization by the Municipal Secretary of Health and CEP under CAAE No. 2556919.0.0000.5298. During the study period, 4,677 individuals were vaccinated with BCG, data collected through the SI-PNI. Of the 11 AEFIs reported, 7 were male and 4 female. The AEFIs identified with the respective proportion of cases in the study population were: cold subcutaneous abscess (2.67: 2.500), non-suppurative regional lymphadenopathy (1.6: 2.500), warm subcutaneous abscess (1.07: 2.500) and lymphadenopathy. regional suppuration (0.5: 2,500). Among the 11 cases studied, 04 did not follow the AEFI management protocol. It was concluded that VAPA to BCG predominated in males, in children younger than 1 year old and that cold subcutaneous abscess, non-suppurative regional lymphadenopathy and warm subcutaneous abscess are above the standard recommended by NIBP.

Keywords— Calmette-Guérin Bacillus Vaccine. Adverse event. Notification of grievance.

Eventos Adversos Pós-Vacinação à BCG No Município De Cacoal, Rondônia, Brasil -Período De 2016-2018

Resumo— A vacina Bacilo de Calmette-Guérin (BCG) é utilizada contra formas graves da tuberculose. Embora os eventos adversos pós vacinação (EAPV) à BCG não sejam frequentes, quando identificados devem ser notificados. Objetivou-se caracterizar os EAPV à BCG no Município de Cacoal/RO no período de 2016-2018. Trata-se de um estudo documental, transversal e descritivo de abordagem quantitativa, realizado com dados

secundários obtidos através das fichas de notificação/investigação de EAPV à BCG, no período 2016-2018 de indivíduos que residem em Cacoal/RO. A população foi composta por 13 fichas de notificação, e fizeram parte da amostra 11, pois 02 se enquadraram nos critérios de exclusão. Os dados foram coletados através de um instrumento de coleta elaborado pelos pesquisadores e o projeto foi executado após autorização pelo Secretário Municipal de Saúde e CEP sob CAAE nº 2556919.0.0000.5298. No período do estudo foram vacinados com BCG 4.677 indivíduos, dados levantados por meio do SI-PNI. Dos 11 EAPV notificados, 07 eram do sexo masculino e 04 do sexo feminino. Os EAPV identificados com a respectiva proporção de casos na população do estudo foram: abscesso subcutâneo frio (2,67:2.500), linfadenopatia regional não supurada (1,6:2.500), abscesso subcutâneo quente (1,07:2.500) e linfadenopatia regional supurada (0,5:2.500). Dentre os 11 casos estudados, 04 não seguiram o protocolo de manejo dos EAPV. Conclui-se que os EAPV à BCG predominaram no sexo masculino, em crianças menores de 01 ano e que os EAPV do tipo abscesso subcutâneo frio, linfadenopatia regional não supurada e abscesso subcutâneo quente estão acima do padrão preconizado pelo PNI.

Palavras-chave— Vacina Bacilo de Calmette-Guérin. Evento adverso. Notificação de agravo.

Eventos Adversos Después De La Vacunación A BCG En Cacoal City, Rondonia, Brasil - Período 2016-2018

Resumen— La vacuna Calmette-Guérin Bacillus (BCG) se usa contra formas graves de tuberculosis. Aunque los eventos adversos posteriores a la vacunación con BCG (EAPV) son poco frecuentes, cuando se identifican, deben informarse. El objetivo fue caracterizar el EAPV a BCG en el Municipio de Cacoal / RO desde 2016-2018. Este es un estudio documental, transversal y descriptivo de enfoque cuantitativo, realizado con datos secundarios obtenidos de los formularios de informe / investigación de AEFI a BCG, en el período 2016-2018 de individuos que residen en Cacoal / RO. La población constaba de 13 formularios de notificación, y formaban parte de la muestra 11, ya que 02 cumplía los criterios de exclusión. Los datos fueron recolectados a través de un instrumento de recolección preparado por los investigadores y el proyecto fue ejecutado después de la autorización del Secretario Municipal de Salud y CEP bajo el CAAE No. 2556919.0.0000.5298. Durante el período de estudio, 4.677 personas fueron vacunadas con BCG, datos recopilados a través del SI-PNI. De los 11 AEFI reportados, 7 eran hombres y 4 mujeres. Los AEFI identificados con la proporción respectiva de casos en la población de estudio fueron: absceso subcutáneo frío (2.67: 2.500), linfadenopatía regional no supurativa (1.6: 2.500), absceso subcutáneo cálido (1.07: 2.500) y linfadenopatía supuración regional (0.5: 2,500). Entre los 11 casos estudiados, 04 no siguieron el protocolo de gestión AEFI. Se concluyó que VAPA a BCG predominaba en varones, en niños menores de 1 año y que el absceso subcutáneo frío, la linfadenopatía regional no supurativa y el absceso subcutáneo cálido están por encima del estándar recomendado por NIBP.

Palabras clave— Vacuna Calmette-Guérin Bacillus. Evento adverso. Notificación de quejas.

I. INTRODUCTION

Tuberculosis (TB) is a classic disease related to poverty, being one of several neglected diseases. The predominance of TB affects the most vulnerable, being poor and marginalized, who for years make up the majority of those affected by the disease (MACIEL, 2016).

Worldwide, the TB mortality rate declined by 40% between 1990 and 2010, with a 70.7% drop in the Americas. Brazil currently ranks 16th among the 22 countries with the most tuberculosis cases worldwide (BRASIL, 2014a).

In the state of Rondônia, the incidence rate of TB

in the year of 1990 was 68.6 / 100 thousand inhabitants, a significant decrease is observed when compared to the year of 2015, which the incidence rate was 29.1 / 100 thousand inhabitants (BRASIL, 2017). It is also observed in the Café Region, in which the municipality of Cacoal belongs, that during 2015, 16 new cases of TB were registered, with a 81.3% cure rate. This percentage, when compared to the other regions of the state, occupies the 3rd position, just behind the Region of Zona da Mata and the Central Region, with regard to the rate of cure of the disease (SINAN; AGEVISA, 2016).

One of the most effective ways of preventing severe forms of TB is the Bacillus Calmette-Guérin (BCG) vaccine, which in Brazil is recommended at birth and in leprosy contacts. Adverse reactions resulting from BCG are not frequent in the literature, but the risks of local events vary between 0.01 to 6.0 per 1,000 live births. Adverse events characterized as disseminated infections occur between 6 (six) to 12 (twelve) months after vaccination and are more rare events (BARRETO; PEREIRA; FERREIRA, 2006).

The usual time for BCG to evolve is 6 to 12 weeks, and may rarely extend until the 24th week. During the normal course of the vaccine lesion, axillary and supra or infraclavicular ganglionic infarction may occur, single or multiple, without suppuration. The lymph node appears three to six weeks after vaccination, it is homolateral to the application site, firm, mobile, clinically very noticeable, cold, painless, measuring up to 3 cm in diameter and not accompanied by general symptoms. It can evolve for a variable time, usually around four weeks and remains stationary for one to three months (BRASIL, 2014a).

Although adverse events to BCG are not frequent, every vaccinated individual may develop an adverse event after vaccination (AEFI), which are undesirable clinical situations, which can occur in people who have received some type of immunobiological. Regarding immunobiologicals, the vast majority can develop AEFV, which are considered mild, such as fever and local reaction, they can also develop as moderate and severe, leading to the individual's hospitalization and disability, and even death (SILVA et al., 2016).

Among the expected events, we can have relatively trivial events, such as: fever, pain and local edema; or more serious events, such as: febrile seizures, among others. Unexpected events are those arising from problems related to product quality, such as contamination of lots; causing local abscesses, or undue endotoxin content in certain vaccines, leading to feverish reactions and sepsis-like symptoms (BRASIL, 2014a).

Three basic points are used for the investigation of an adverse event, namely: factors related to the vaccine, factors related to vaccines and factors related to administration (BRASIL, 2014a).

Serious adverse events after vaccination are part of the national list of Compulsory Notification diseases / diseases, that is, it is mandatory to be notified, and any health professional who identifies the adverse event is responsible for this notification (BRASIL, 2016).

Given the above, this research is relevant, as the data collected in this study regarding the characterization of adverse events to BCG, as well as the proportion of these

events, will serve as a basis to identify whether these adverse events are within the parameters expected by the Ministry of Health (MS), as well as serving as a subsidy for the development of actions to improve the quality of care provided, together with the National Immunization Program (PNI), with regard to the BCG vaccine.

This work aims to characterize the adverse events after BCG vaccination in the municipality of Cacoal / RO in the period 2016-2018, according to gender and age, to identify the proportion of these events for correlation with the normal parameters of the PNI, to classify the types adverse events according to the signs and symptoms presented and verify the evolution and conclusion of the reported adverse events.

II. MATERIALS AND METHODS

This is a documentary, cross-sectional and descriptive study with a quantitative approach, carried out with secondary data obtained through the notification / investigation forms of adverse events after vaccination of patients who presented some type of adverse event after BCG vaccination, in the period from January 2016 to December 2018, of residents in the municipality of Cacoal / RO.

The study population consisted of 13 patients who had an adverse event to the BCG vaccine in the period proposed by the study and were notified by means of the notification / investigation form of adverse events after vaccination, with the sample consisting of 11 patient notifications, as 02 were excluded from the study, as they met the exclusion criteria, as they were not vaccinated in Cacoal and do not reside in the municipality.

As inclusion criteria, they were determined by means of notification / investigation forms of adverse events after vaccination and medical records of patients residing in the municipality of Cacoal / RO and who presented some type of adverse event after vaccination to BCG, in the period from January 2016 to December 2018. As exclusion criteria, medical records with illegible handwriting, adverse event notification forms to BCG with illegible handwriting and adverse event notification forms to other vaccines, which were not BCG, were determined.

The data collection questionnaire was developed by the researchers, containing 07 closed questions and 06 open questions, with information about the gender and age of the study population and variables related to the notified AEFI, namely: proportion of reported adverse events that will be correlated with the expected events standardized by the Ministry of Health through the PNI, classification of the AEFIs reported according to the signs and symptoms presented, classification of the evolution of the case and

conclusion of the notified case.

The data collected through the adverse event notification form were collected according to the availability of the time of the technician in charge, who works in the municipality's Health Department and in the Specialized Outpatient Clinic, on 07/05/2019 and 07/31 / 2019, in the morning period. At this moment, the number of vaccinees with the BCG vaccine in the municipality of Cacoal / RO was made available by the digitizer of the National Immunization Program Information System (SI-PNI), and the number of individuals vaccinated in 2016 was 1,435 , in 2017 the total was 1,675 and in 2018, 1,567 individuals, totaling 4,677 vaccinated individuals between January 2016 and December 2018.

Access to patients' medical records was made impossible due to the lack of computerization in basic health units, which made it impossible to locate them.

After data collection, they were arranged in tables, using Microsoft Office® programs (Word 2013 and Excel 2013). Descriptive statistics were used, using mean, relative frequency, absolute frequency and proportion calculation.

To carry out the research in accordance with Resolution 466/12 of the National Health Council, it was necessary to approve the Ethics and Research Committee (CEP) of the Faculty of Biomedical Sciences of Cacoal-RO FACIMED, under protocol No. 3,347,996 and CAAE No. 12556919.0.0000.5298, and authorization from the Municipal Health Secretariat of Cacoal (SEMUSA).

III. RESULTS AND DISCUSSIONS

The present study was carried out by analyzing 11 (100%) of notification / investigation forms of adverse events after BCG vaccination performed in the municipality of Cacoal. Since the number of cases notified in 2016 was 05 (45.5%) cases, 05 (45.5%) in 2017 and 01 (9%) in 2018.

According to the study, among the 11 reported cases (100%), 04 (36.4%) were female, and 07 (63.6%) were male. The average age of vaccinated individuals who experienced an adverse event in this period was 01 month and 16 days, the minimum age was 03 days and the maximum age 04 months and 27 days.

A study carried out in Recife / PE in 2017, showed the incidence of adverse events after vaccination in children,

among which 373 AEFIs were identified, with 83.90% adverse events temporarily related to the vaccine (EATV) and 16.10% to errors immunization (IS). The most frequent occurred in male children and under one year old (BRAGA, 2017).

Although the BCG vaccine is also indicated for contacts of patients with leprosy, in which it can be administered to individuals older than 1 year according to the MS protocol (BRASIL, 2016), there were no cases of adverse events to BCG in the age group of adult individuals. This may be related to the fact that the adult individual is more resistant to going to the vaccination room to refer to an adverse event or to other factors, because according to Brasil (2014c), the adverse events may be related to the individual's immune system. Another factor may be related to the ease of administration of BCG in an adult individual, when compared to administration to a newborn, who has thinner and more sensitive skin for administration of the immunobiological agent intradermally.

The collected data resulted in 04 types of adverse events to the BCG vaccine, being cold subcutaneous abscesses, hot subcutaneous abscesses, non-suppurated regional lymphadenopathy and suppurated regional lymphadenopathy. Of the 11 (100%) cases of AEFI to BCG reported during the study period 05 (45.5%) were of the type cold subcutaneous abscesses, 03 (27.3%) unsuppurated regional lymphadenopathy, 02 (18.2%) hot subcutaneous abscesses and suppurated regional lymphadenopathy, 01 (9%). The main symptoms presented in the notification forms were nodule, abscess and pain related to the four types of adverse events. Other symptoms were observed, such as fever, erythema, flushing and regional adenopathy, among others. Among the 04 types of adverse events, 03 presented the use of Isoniazid as conducts, as shown in table 01.

Table 01 also presents data on the final classifications of AEFIs to BCG, in which they presented four types of manifestations, namely, local, systemic skin / mucosa clinics, systemic / respiratory clinics and systemic / neurological clinics. Among the manifestations presented, the most prevalent was the local manifestation, followed by the systemic clinical manifestation / skin and mucosa.

Table.1: Distribution of results regarding the types of adverse events, signs and symptoms, conduct and classification of AEFIs of patients vaccinated with BCG notified in the period from 2016 to 2018. Cacoal / RO, 2019.

ADVERSE EVENT TYPE	n (%)	SIGNALS AND SYMPTOMS	CONDUCT	CLASSIFICATION EAPV
		Nodule and pain.	Isoniazid use, notification and follow-up.	Local demonstrations.
		Cold abscess, pain, erythema,	Isoniazid use for 10 days,	Local demonstrations.

		flushing and lump.	notification and follow up	
Cold subcutaneous abscesses	05 (45,5%)	Cold abscess.	60-day use of isoniazid, notification and follow-up	Local demonstrations.
		Cold abscess.	Oral antipyretic, notification and follow-up.	Local demonstrations.
		Cold abscess and lump.	Isoniazid use, notification and follow-up.	Local demonstrations.
		Nodule		Local demonstrations;
		Reaction adenopathy		Systemic clinical manifestations / skin and mucosa;
		Sneezing;	Isoniazid use for 15 days, notification and follow-up.	Systemic clinical manifestations / skin and mucosa
		Agitatio		Systemic / neurological clinical manifestations
Hot Subcutaneous Abscesses	02 (18,2%)	Fever		Other manifestations
		Hot abscess, heat, pain, edema, erythema or flushing.	Isoniazid use, notification and follow-up.	Local demonstrations
		Regional lymphadenopathy		Systemic clinical manifestations / skin and mucosa
		Sneezing and dry cough	Notification and Tracking	Systemic / respiratory clinical
Unsuppressed regional lymphadenopathy	03 (27,3%)	Agitation		manifestations; Systemic / neurological clinical manifestations
		Axillary regional lymphadenopathy, less than 3 cm	Notification and Tracking.	Systemic clinical manifestations / skin and mucosa
		Right axillary lymph node measuring 3 cm.	Isoniazid use, notification and follow-up.	Systemic clinical manifestations / skin and mucosa.
			60-day use of isoniazid, notification and follow-up.	Systemic clinical manifestations / skin and mucosa.
Suppurative regional lymphadenopathy	01 (9%)	Lymphadenopathy	Notification and Tracking.	Systemic clinical manifestations / skin and mucosa.
Source: Sales; Mendonça; Faria, Romanholo, Romanholo (2020).				
Caption: EAPV - Adverse Event After Vaccination.				

It is noted that health professionals are aware of the attendance, notification and follow-up of BCG-related adverse events, as all reported events presented in table 1

are part of the compulsory notification adverse events according to the conduct to be adopted in the Manual. of adverse events to immunobiologicals (BRAZIL, 2014b).

Regarding the behaviors adopted by health professionals regarding what is advocated by the MS through the PNI, it is noted that health professionals need to have greater knowledge of the protocols established by the program, given that some behaviors adopted in relation to AEFIs do not according to Brazil, according to Brazil (2014b), the cases of AEPS of non-suppurative regional lymphadenopathy and hot subcutaneous abscess is not indicated for use of isoniazid, but it is noted as a conduct, the prescription and use of medication, and in one of the cases of cold subcutaneous abscess that indicated the use of isoniazid according to the protocol, it was not prescribed.

According to the 2014 AEFI epidemiological surveillance manual, BCG is naturally resistant to pyrazinamide. The Moreau Rio de Janeiro strain is isoniazid sensitive, so administration of isoniazid is used as the gold standard for treatment (BRASIL, 2014a).

Regarding the classification of AEFIs to BCG, local clinical manifestations, and systemic clinical manifestations / skin and mucous membranes were the most predominant. Local manifestations are the most common in cases of AAPV to BCG and are considered at or near the site of administration and may occur after application of any vaccine. These reactions are consequences of the introduction of the needle and the vaccine content into muscle tissue, hyperesthesia, reactive vasodilation, pruritus and urticarial papules and ganglionic infarction. This may cause an abscess at the site of administration, cellulitis, near hardening or at the site of administration, near edema or at the site of administration, lump and pain (BRASIL, 2014a).

Systemic manifestations can be defined as an acute hypersensitivity reaction, with involvement of multiple systems being considered of greater severity (BRASIL, 2014a).

Table 2 shows the proportion of reported AEFIs in the municipality of Cacoal during the study period compared to the proportion of AEFIs recommended by the MS through the NIP, and the cold subcutaneous abscess type AEFIs presented 2.67 cases for every 2,500 vaccinated, followed by unsuspected regional lymphadenopathy, the number of cases was 1.6 for every 2,500 vaccinated. Hot subcutaneous abscess adverse events presented 1.07 cases for every 2,500 vaccinated patients, while the proportion of suppurative regional lymphadenopathy adverse events was 0.5 cases for every 2,500 vaccinated.

The MS through the PNI, recommends that for every 2,500 vaccinated, 01 individual will present adverse event to BCG (BRAZIL, 2014a). Among the results obtained, three types of adverse events were above the recommended standard, only the suppurative regional lymphadenopathy adverse event was below the EAPV

expected by the PNI.

Table.2: Comparative analysis of the presented ratio of AEFI to BCG, with the standard recommended by the PNI. Cacoal / RO, 2019.

ADVERSE EVENT TYPE	EAPV PROPORTION NOTIFIED	PREFER RED NIBP
Cold subcutaneous abscesses	2,67:2.500	1:2.500
Hot Subcutaneous Abscesses	1,07:2.500	1:2.500
Regional lymphadenopathy not suppurative	1,6:2.500	1:2.500
Suppurative regional lymphadenopathy	0,5:2.500	1:2.500

Source: Sales; Mendonça; Faria, Romanholo, Romanholo (2020).

Caption: EAPV - Post-Vaccination Adverse Event, PNI - National Immunization Program.

According to Brazil (2014a), BCG vaccine has been used for decades and is the main form of prevention of severe forms of TB, but may cause local, regional or systemic adverse events, and local and regional adverse events such as abscess, lymphadenopathy. regional suppuration greater than 3 cm, regional suppurative lymphadenopathy may be directly linked to incorrect vaccine administration technique.

Note the importance of nurses working directly in the vaccine room, because they are responsible for their nursing staff, being important their training and constant updating, as well as promoting continuing education for their team.

IV. FINAL CONSIDERATIONS

Taking into account the above data, it was observed that males were the most affected by adverse events to BCG and the prevailing age was in children under 01 (one) year. It was found that VAPE of cold subcutaneous abscess, hot subcutaneous abscess and non-suppurative regional lymphadenopathy are above the standard recommended by the NIBP, and only the adverse event of suppurative regional lymphadenopathy is within the recommended.

It is suggested a proposal for the study presented, where professionals who attend the AEFI are constantly trained and updated to attend and follow up these cases, and that professionals who work directly with immunization are regularly trained regarding errors of immunization,

application, proper handling and storage conditions of immunobiologicals. It is also suggested new scientific studies that seek to analyze the quality of care provided to the population, with regard to immunization.

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Assessment of mental suffering in a population affected by the Madeira River flood in the Brazilian Amazon

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Abstract— *Objective: to evaluate the frequency of common mental disorders (CMD) in the population affected by the Madeira River flood, in Rondônia, Brazilian Amazon. Method: This is a descriptive and cross-sectional study carried out in two stages, the first just after the flood and another 4 years later. In its first stage, 392 people were investigated, and in the second stage, 58 people of both sexes and ages ranging from 10 years (child) to 86 years (elderly). For data collection, the Self-Report-Questionnaire (SRQ – 20) was used. Results: the population exposed and affected by the flood had 64.1% of CMD, in the following order of determination: other symptoms of SRQ-20 (77.6%), decreased energy (76.3%), somatic symptom (67.8%), depressed mood (66.2%) and depressive thoughts (32.5%). After 4 years, in a reassessment, the population affected by the flood still presented 28.2% of CMD, in the following order of determination: other symptoms of SRQ-20 (45.9%), somatic symptom (33.6%), depressed mood (29.9%), decreased energy (17.8%) and depressive thoughts (13.8%), considered as important indicators of evidence of mental suffering. Conclusions: From the data collected in this study, it can be indicated that the group of people affected by the flood, regardless of gender or age group, has mental suffering that lasts for at least 4 years of the victim's life.*

Keywords— *Common Mental Disorders – CMD; SRQ-20 instrument; Flood of the Madeira River; Rondônia; Brazil.*

I. INTRODUCTION

The floods affect more than 102 million people a year, according to the study "Disaster-resilient Societies - Facts and figures" of the United Nations Conference on Sustainable Development (UNCSD) ¹ and most of the

exposed populations (95%) and deaths (95%) are found in the countries with the lowest per capita income (equal to or less than US \$ 3,705 per year) according to the "International Strategy for Disaster Reduction (ISDR) - Global Assessment Report on Disaster Risk Reduction -

Risk and poverty in a changing climate Invest today for a safer tomorrow”². According to Freitas, Ximenes³ the impacts of floods are more severe for certain population groups and more vulnerable geographic spaces, whether in the poorest countries or even in the richest countries. Studies by Blashki, McMichael, Karoly⁴ and Haine et al⁵ report that the causes and consequences of floods, as well as responses and actions for prevention and mitigation, have become topics of great interest after countless alerts from the scientific community about the potential for changes large-scale environmental issues such as climate change.

Several studies point out social and psychological impacts as a consequence of the floods, mainly on the physical health of the individual and society in the face of a flood situation such as material losses, mortality and morbidity. According to Freng et al⁶, few studies focus on the impacts on the mental and psychological health of flood victims. For these authors, the most frequent symptoms are related to psychological stress such as sleep disorders, insomnia, repetitive nightmares about the event, flashbacks, amnesia, difficulty concentrating, irritability and anger, panic attack and fear of talking about the event. Also according to these authors, the affected population may have high prevalence rates of psychological disorders such as “posttraumatic stress disorder - PTDS”.

For Tapsell et al⁷, psychological disorders are common in victims of disasters exposed to psychologically stressful and traumatic events and more intensely impact certain social groups such as women, residents of rural areas, illiterates, children, the elderly, the disabled and less favored classes. They were found by Tapsell et al⁷; Euripidou, Murray⁸, and Fundter et al⁹ after floods, cases of depression, increased levels of anxiety in those affected, loss of appetite, shortness of breath, fatigue and dizziness. Kovats¹⁰ adds that women may be more burdened due to the fact that they take responsibility for the health care of their family, adding to this specific group another stressor. Tapsell et al⁷ states that breaking the daily routine of family and social life also generates psychological impacts on those affected and that flood victims have a feeling of helplessness and helplessness in relation to the flood and that all these stresses and traumas can last for months or years after the floods. For Keim¹¹, those affected by the floods still present abuse of chemical substances - drugs and alcohol, family violence and behavioral disorders in children.

In Brazil, recently some environmental disasters and their consequent psychological damage have been widely reported by the Brazilian press. The rupture of the dam of the mining company Vale, in Brumadinho, as occurred in

2015 with the rupture of the Fundão dam, in Mariana, caused damage to the mental health of the victims - who lost family members - and even those who left their homes and personal objects destroyed by the mud. In 2017, the team from the Vulnerabilities and Health Research Center (NaVeS) at the Federal University of Minas Gerais (UFMG) conducted a survey among the victims of Mariana. The project “Research on the Mental Health of Families Affected by the Disruption of the Fundão Dam in Mariana (Prismma)” heard 271 victims, between 13 and 90 years of age. The study revealed that 28.9% of respondents suffered from depression, a rate five times higher than that described by the World Health Organization (WHO) for Brazil in 2015. The suicidal behavior among those affected by the Fundão dam breach also generated an alert: 16.4% of respondents reported the risk. The survey also identified the predominance of Post Traumatic Stress Disorder (PTSD), seen in 12% of the affected population. Leite, Sttefens¹² identified the Post-Traumatic Stress Disorder (PTSD) pathology in the population affected by the flood in the municipality of Maravilha in Santa Catarina. According to DSM-513, the essential feature of Posttraumatic Stress Disorder is the development of characteristic symptoms after exposure to one or more traumatic events. People's mental health can be profoundly affected when a disaster occurs, such as a flood that directly and / or indirectly affects a more exposed and vulnerable population group.

In Porto Velho, capital of the state of Rondônia, Brazilian Amazon, at the end of 2014, the gradual rise in the level of the Madeira River produced important consequences for the region's socio-spatial dynamics, whether in urban or rural areas. In Rondônia, more than 6 thousand families were directly affected in 10 municipalities, which is equivalent to approximately 30 thousand people. It is estimated that 97,000 people were affected in some way by the 2014 disaster across the state, according to the State and Municipal Civil Defense. A total loss of R \$ 4.2 billion was estimated as a result of the natural disaster, which led the state government to draw up a reconstruction plan¹⁴. França and Mendonça¹⁴ analyzed the risks and the occurrence of diseases associated with flooding during the period of the Madeira River flood. The direct contact of the population with contaminated water and the lack of basic sanitation in the region have had an impact on the mental and psychological health of flood victims.

Paraguassú-Chaves¹⁵ when researching the consequences of the 2014 Madeira River flood caused on the health of the affected population, from the International Classification of Diseases - CID found a high incidence of cases of infectious and parasitic diseases such as diarrhea and gastroenteritis, fever typhoid, malaria, dengue,

leptospirosis, shigellose, eschechichia coli, giardiasis. Malnutrition was the disease that best represented endocrine, nutritional and metabolic diseases (Chapter IV CID). Eye diseases and appendages (Chapter VII ICD) identified an outbreak of conjunctivitis. High blood pressure in the group of diseases of the circulatory system (Cap. IX ICD). Allergic rhinitis, acute respiratory infections, severe sinusitis, asthma, lung infections, laryngitis among others in the group of diseases of the respiratory system (Cap. X ICD). Dermatitis and skin rashes in the group of diseases of the skin and subcutaneous tissue (chap. XII ICD). Muscle strains in the group of diseases of the musculoskeletal system and connective tissue (chap. XIII ICD). Kidney infections in the group of diseases of the genitourinary system (Chapter XIV CID). In the group of diseases, injuries, poisoning and some other consequences of external causes (Cap. XIX CID), asphyxia, intoxication and poisoning, hypothermia, injuries, traumas, cuts, lacerations and injuries were diagnosed in the municipal health units. In the group of diseases external causes of morbidity and mortality (Chap. XX CID), domestic violence increased considerably, in addition to electric shocks, drownings and falls among the population affected by the flood.

What most attracted attention in the research by Paraguassú-Chaves¹⁵ was the state of mental health of the population exposed to the flood, which the researcher called invisible diseases. In the disorders and diseases of the group of mental and behavioral disorders (Chap. V CID) Paraguassú-Chaves, he identified high rates of cases of post-traumatic stress states, adaptation disorder, non-organic sleep disorder, insomnia, nightmares and memories repeated on the event, amnesia, difficulty concentrating, irritability and anger, phobia, anxiety and panic, depression, loss of appetite, fatigue, dizziness, increased consumption of alcohol and medication, behavioral and emotional disorders in children and the elderly. There was a manifestation of ulcer development. What is still observed is an inefficiency of the public health service to prioritize the indispensable assistance to treat these neglected pathologies.

In view of the scenario presented by Paraguassú-Chaves¹⁵, a survey was carried out in the first stage with a group of 392 victims of the Madeira River flood, which occurred in 2014 and in the second stage, 4 years after the event, with a sample group of 58 affected people due to the flood and which have already been submitted to assessment in the first stage of the research, based on the following problems: a) What is the level of mental suffering of the victims of the Madeira River flood immediately after the environmental and social disaster ?. b) What is the level of mental suffering of these victims 4 years after the flood?

With a view to the problems presented, the present study was carried out to analyze the level of the level of mental suffering using the SRQ-20, which is the 20-item version of SRQ-30 for tracking non-psychotic mental disorders.

II. METHOD

It is a descriptive study, with a quantitative approach, of a type characterized as epidemiological, whose model is transversal, which consists of a cut in the historical flow of the event, in which the exhibition is observed simultaneously, carried out with a group of people victimized by the Madeira River flood, in Rondônia, Brazilian Amazon.

As an instrument of data collection, an adapted version of the Self-Reporting Questionnaire (SRQ-20) was used, originally developed by Harding et al¹⁶ - "Mental disorders in primary health care: a study of their frequency and diagnosis in four developing countries", Already validated in several countries, according to World Health Organization¹⁷ - "A user's guide to the Self Reporting Questionnaire" and Husain, Creed, Tomenson¹⁸ - "Depression and social stress in Pakistan" and in Brazil by Lima et al¹⁹ - "Stressful life events and minor psychiatric disorders: an estimate of the population attributable fraction in a Brazilian community-based study", Mari²⁰ - "Psychiatric morbidity in three primary medical care clinics in the city of São Paulo: issues on the mental health of the urban poor", Gonçalves, Stein, Kapczinski²¹ - "Performance evaluation of the Self-Reporting Questionnaire as a psychiatric screening instrument: a comparative study with the Structured Clinical Interview for DSM-IV-TR". Data collections were performed with an average filling time of 30 minutes, under the guidance of a senior researcher. Mental distress was assessed using 20 variables, with the response scale consisting of yes or no.

The questionnaire consists of 20 yes / no questions, four of which are about physical symptoms and 16 about psycho-emotional disorders. Initially, the cut-off score of the SRQ-20 for this study was set at 7/8. The scores obtained are related to the probability of the presence of non-psychotic disorder, ranging from 0 (no probability) to 20 (extreme probability). SRQ-20 is recommended by WHO for community studies and primary health care, especially in developing countries. This instrument has been used in several countries of different cultures to screen for non-psychotic disorders.

The categorization was carried out by 5 factors, being addressed in the factor analysis 1 - decreased energy consisting of 6 variables: (feels tired all the time; gets tired easily; finds difficulties in making decisions; finds difficulties in carrying out with satisfaction with their daily

activities, difficulties in thinking clearly, difficulties in service - their work is painful, causes them suffering.

Next, there are the variables of the factor analysis 2 - somatic symptoms, composed of 4 variables, being: (you have a headache frequently, you have an unpleasant feeling in your stomach, you have poor digestion, you have a lack of appetite).

Regarding the variables of factor analysis 3 - depressed mood, 3 variables appear, being: (feels nervous, tense or worried, has been feeling sad lately, has been crying more than usual).

And in the factor analysis 4 about depressive thoughts - it consists of 4 variables, being: (he has lost interest in things, he is unable to play a useful role in his life, he feels like a useless person, without help, he has an idea of end life).

Finally, factor 5 organized from other symptoms of the SRQ-20, with 3 variables: (sleeps poorly, gets scared easily, has hand tremors).

Mental suffering was assessed by the sum of the variables presented in the SRQ-20, considering as cut-off point 7 or more affirmative answers to the 20 questions presented. For the representation of the data, the absolute frequency (AF) and the relative frequency (RF) of each listed variable were calculated.

The research in its first phase was carried out in the provisional shelter (type military campanile located in the Parque de Exposição Agropecuária de Porto Velho, where part of the population victimized by the flood was housed. In the second phase of the research, the subjects (individuals) were interviewed in their new home addresses. The inclusion criteria were people who expressed a voluntary interest in participating in the research and who signed the free and informed consent form if an adult or the parents signed the term when it came to children. according to the ethical aspects provided for in Resolution 196/96 of the National Health Council of Brazil, it was forwarded and duly approved by the Research Ethics Committee of the College Faema. In the second phase, the work had its limitations regarding the sample universe due difficulties in locating the same individuals who participated in the research in the first step, several attempts were made to locate and identify individuals after the suffering of the 2014 flood tragedy. The relocation and relocation census was used to locate the new addresses of the target population of the research.

III. RESULTS AND DISCUSSION

3.1. Results of the SQR-20 applied in 2015 after the flooding of the Madeira River, Rondônia, Brazilian Amazon

The data on mental suffering are presented according to the classification of Iacoponi & Mari²², in a sequenced manner, with adaptation for this research. Factor 1, decreased energy; Factor 2, somatic symptoms; Factor 3, depressed mood; Factor 4, depressive thoughts and Factor 5, other symptoms of SRQ-20.

392 volunteers participated in this research, all of whom were victims of the 2014 Madeira River flood and were in temporary shelter, with 230 (58.7%) female and 162 (41.3%) male, with ages varying from 10 to 86 years (average of 53 years). In the second stage of the research, 4 years after (2019) the first stage, 58 volunteers of both genders / genders participated, 26 (44.8%) of whom were female and aged between 20 and 70 years.

Tables 1, 2, 3, 4 and 5 show the absolute and relative frequencies of the responses to the SQR-20 instrument referring to a survey conducted in 2015 right after the environmental disaster (Madeira River flood).

Table 1 presents the data in relation to factor 1. Decreased energy, with greater frequency in the variables "Finds difficulties to carry out your daily activities with satisfaction" with 89.5%, then with 86.7% "Have difficulties to think clearly" ; "Finds difficulties in making decisions" with 84.7%. The variables "You have difficulties in the service (your work is painful, it causes you suffering) with 67.1%," "You feel tired all the time and "You get tired easily" with 64.8% also present with very high frequencies . The average Energy Decrease Fact was 76.3%.

Table 1. Frequency related to Factor 1 - Decrease in Vital Energy.

QUESTIONS	Yes	%	No	%
Do you feel tired all the time?	254	64.8	138	35.2
Do you get tired easily?	254	64.8	138	35.2
Do you find it difficult to make decisions?	332	84.7	60	15.3
Do you find it difficult to carry out your daily activities with satisfaction?	351	89.5	41	10.5
Do you have trouble thinking clearly?	340	86.7	52	13.3
Do you have difficulties in service (is your	263	67.1	129	32.9

work painful, does it cause you suffering?)				
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In factor 2 (table 2), the frequency of somatic symptom had its highest index in the variable “Has headaches frequently” with 74.0%, followed by the variables “Has poor digestion” with 68.6%, “Has unpleasant feelings in the stomach” with 66.0% and “There is a lack of appetite with 62.4%. The average of the Somatic Symptom Factor was 67.8%.

Table 2. Frequency related to Factor 2 - Somatic Symptom

QUESTIONS	YES	%	NO	%
Do you have headaches often?	290	74.0	102	26.0
Do you have unpleasant feelings in your stomach?	258	66.0	134	34.0
Do you have poor digestion?	269	68.6	123	31.4
Do you have a lack of appetite?	245	62.5	147	37.5

In factor 3 (table 3), depressed mood, the most frequent was the variable “Have you been feeling sad lately”, with 82.9%, followed by the variable “Do you feel nervous or tense, worried” with 75.5%. The lowest frequency was found in the variable “You have been crying more than usual”, with 40.3%. The average Depressive Mood Factor was 66.2%.

Table 3. Frequency related to Factor 3 - Depressive Mood

QUESTIONS	YES	%	NO	%
Do you feel nervous or tense or worried?	296	75.5	96	24.5
Have you been feeling sad lately?	325	82.9	67	17.1
Have you been crying more than usual?	158	40.3	234	59.7

In factor 4 (table 4), with regard to depressive thinking, the variable “Has lost interest in things” predominates with 70.7%. “He is unable to play a useful role in his life” with 33.2% was the second highest frequency found. The variables “You feel like a useless person, without help” with 16.8% and “You have an idea of ending your life” with 9.4% were the lowest frequencies found, however, with important indicators for a deeper assessment of the problem. The average of the Depressive Thoughts Factor was 32.5%.

Table 4. Frequency related to Factor 4 - Depressive Thoughts

QUESTIONS	YES	%	NO	%
Have you lost interest in things?	277	70.7	115	29.3
Are you unable to play a useful role in your life?	130	33.2	262	66.8
Do you feel like a useless person, without help?	66	16.8	326	83.2
Do you have any idea of ending your life?	37	9.4	355	90.6

In the variable Other Symptoms of the SQR-20, the frequencies found should be considered as important and very sensitive. “Sleeps badly” with 82.9% and “Scared easily” with 80.2%, with figures above 80.0%. Another important variable is “You have tremors in your hands” with 69.1%. The SRQ-20 Other Symptom Factor average was 77.63%.

Table 5. Frequency related to Factor 5 - Other Symptoms of SRQ-20

QUESTIONS	YES	%	NO	%
Do you sleep badly?	325	82.9	67	17.1
Are you scared easily?	317	80.9	75	19.1
Do you have tremors in your hands?	271	69.1	121	30.9

3.2. Results of the SQR-20 applied in 2019, 4 years after the 2014 Madeira River flood

After 4 years of the first phase of the research, 58 volunteers participated in the second phase (14.8% of the total number of subjects in the initial phase of the research), all of whom were victims of the 2014 Madeira River flood, 26 (44.8%) of whom female and 32, with ages varying from 20 to 70 years old (average of 55 years old). Table 6 presents a summary of all factors evaluated in this second stage of the study.

In factor 1 - decreased energy, the highest relative frequencies were found in the variables “You have difficulties in the service (your work is painful, it causes you suffering) with 25.9% and “You find it difficult to carry out your daily activities with satisfaction” with 24.1%. The variables “You feel tired all the time” and “You get tired easily” obtained the same values with 15.5%. The lowest results were found in “You have difficulty thinking clearly” with 13.8% and “You find it difficult to make decisions” with 12.1%. The average Energy Decrease Factor was 17.8%.

In factor 2 - somatic symptom, the highest frequency was found in the variable “You have headaches frequently” with 41.4%; followed by the variables “Has an unpleasant feeling in the stomach” with 36.2%, “Has poor digestion” with 32.8%. The lowest frequency found was in “You have no appetite” with 24.1%. The average of the Somatic Symptom Factor was 33.6%.

In factor 3 - depressed mood, the highest relative frequency was with the variable “Have you been feeling sad lately”, with 34.5%, followed by the variable “Do you feel nervous, tense or worried” with 31.0%. The lowest frequency was found in the variable “You have been crying more than usual”, with 24.1%. The average of the Depressive Humor Factor was 29.9%. With regard to

Depressive Thinking, the variable “Has lost interest in things” predominates with 25.9%. “You are unable to play a useful role in your life” and “You feel like a useless person, without help” with 10.4% and, “You have an idea of ending your life” with 8.6% were the lowest frequencies found, however, with important indicators for a deeper assessment of the problem. The average of the Depressive Thoughts Factor was 13.8%. “Sleeps badly” with 56.9%, “Scared easily” with 53.4% and “Has hand tremors” with 27.6%, are the relative frequencies of other symptoms of the SQR-20 that must be considered important and very sensitive. The SRQ-20 Other Symptom Factor average was 45.9%.

Table 6. Absolute and relative frequency of all Factors assessed in the second stage of the study (4 years after the first assessment)

Factor 1 - Decrease in Vital Energy	YES	%	NO	%
Do you feel tired all the time?	9	15.5	49	84.5
Do you get tired easily?	9	15.5	49	84.5
Do you find it difficult to make decisions?	7	12.1	51	87.9
Do you find it difficult to carry out your daily activities with satisfaction?	14	24.1	44	75.9
Do you have trouble thinking clearly?	8	13.8	50	86.2
Do you have difficulties in the service (is your work painful, does it cause you suffering?)	15	25.9	43	74.1
Factor 2 - Somatic Symptom				
Do you have headaches often?	24	41.4	34	58.6
Do you have unpleasant feelings in your stomach?	21	36.2	37	63.8
Do you have poor digestion?	19	32.8	39	67.2
Do you have a lack of appetite?	14	24.1	44	75.9
Factor 3 - Depressive Mood				
Do you feel nervous or tense or worried?	18	31.0	40	69.0
Have you been feeling sad lately?	20	34.5	38	65.5
Have you been crying more than usual?	14	24.1	44	75.9
Factor 4 - Depressive Thoughts				
Have you lost interest in things?	15	25.9	43	74.1
Are you unable to play a useful role in your life?	6	10.4	52	89.6
Do you feel like a useless person, without help?	6	10.4	52	89.6
Do you have any idea of ending your life?	5	8.6	53	91.4
Factor 5 - Other Symptoms of SRQ-20				
Do you sleep badly?	33	56.9	25	43.1
Are you scared easily?	31	53.4	27	46.6
Do you have tremors in your hands?	16	27.6	42	72.4

The SRQ-20 was applied to 450 affected by the flood, victims who were in the temporary shelter with an average

relative frequency of 48.25 in males and 51.75% in females. There was a relative equivalence in the

distribution of sex in the average of the two stages of the research (Table 7). In the period in which those affected were in the temporary shelter, the application of SRQ-20 was more frequent in women, because women were more concentrated in domestic services, caring for the few material and sentimental goods left over and caring for children (children and grandchildren).

Table 7. Distribution of the population affected by the flood by sex in the two stages of the survey.

GENDER	Male	%	Female	%
First stage	162	41.3	230	58.7
Second stage	32	55.2	26	44.8
Average by gender	97	48.25	128	51.75

There was a predominance of the population in the adult age range from 41 to 60 years with 58.9% (Table 8). The second highest concentration of respondents occurred in the age group 21 to 40 years old. It can be verified that the target population for the application of the SRQ-20 was concentrated in the adult population. The children were submitted to the questionnaire voluntarily, with their own manifestation to participate in the research and with the consent of their parents or guardians. The children shaken by the event and every change in routine and situation they were in asked to speak, express themselves in whatever way they were going through.

Table 8. Distribution of the population affected by the flood by age group in the research stages.

Age Range	10 to 20	21 to 40	41 to 60	+ 60
First stage	27	71	259	35
Relative frequency	6.9	18.1	66.1	8.9
Second stage	0	22	30	6
Relative frequency	0.0	37.9	51.7	10.4
Average years	3.45	28.0	58.9	9.65

The population that directly suffered from the effects of the Madeira River flood, in Rondônia, Brazilian Amazon, which were assessed by applying the Self-Reporting-Questionnaire, SRQ-20 shortly after the environmental disaster, presented 64.1% with minor mental disorders (currently called mental disorders) common - CMD), in the following order of determination: other symptoms (77.6), decreased energy (76.3), somatic symptom (67.8),

depressed mood (66.2%) and depressive thoughts (32.5%). In the second phase of the research, 4 years after the tragedy, the population submitted to the evaluation presented 28.2% with minor psychological disorders, in the following order of determination: other symptoms (45.9), somatic symptom (33.6), depressed mood (29.9%), decrease of energy (17.8) and depressive thoughts (13.8%).

Table 9 - Comparison of the TMC after the flood and after 4 years.

TCM	Relative Frequency (%)	TCM	Relative Frequency (%)	Difference (%)
After the flood	64.1	Four years after the flood	28.2	35.9
Factor 1	76.3	Factor 1	17.8	58.5
Factor 2	67.8	Factor 2	33.6	31.2
Factor 3	66.2	Factor 3	29.9	36.3
Factor 4	32.5	Factor 4	13.8	18.7
Factor 5	77.6	Factor 5	45.9	31.7

A mental health survey that interviewed 271 people affected by the Samarco Fundão dam burst in Mariana, in the central region of Minas Gerais, Brazil, found that 12% of those affected by the disaster suffer from post-traumatic stress. Among children and adolescents, the rate is higher, reaching 83%.

The experience of the disaster and the memories impact on the routine of these people, who presented depression, anxiety, insomnia, increased cardiovascular problems and suicidal thoughts, after more than two years of the tragedy, considered the greatest in the country.

"Anxiety disorder is a perception of constant restlessness. In post-traumatic stress, these people keep dreaming, from time to time they have flashbacks of what happened and this causes great stress"²³. According to the survey, depression affects almost 30% of victims. Among children and adolescents, the incidence is 39%. The study states that anxiety among victims is greater than the standards identified in Brazil by the World Health Organization (WHO). A high prevalence of psychiatric mental disorders related to stress and depression was observed, five times

higher than the Brazilian population assessed by the World Health Organization.

Depression, excessive alcohol consumption, post-traumatic stress and even suicide are some of the consequences that can affect people in situations of major humanitarian crisis, as was the case of the rupture of dam 1 of the Córrego do Feijão complex, in Brumadinho. For Leite²⁴, in these situations the focus should also be directed to mental health care. "We say little and there is no culture of spreading the psychosocial sequelae that remain in the people around us. The psychological impact of the affected people can extend up to 15 years after the traumatic events. "Mental health problems generate incapacity for work, worsening quality of life, impoverishment and impairment in personal and family relationships, in addition to early mortality". In our study, mental disorders such as depression, generalized anxiety disorder, post-traumatic stress disorder, suicide risk and substance use disorders were evaluated. Self-reported depression was 15% before the tragedy. However, the diagnosis now corresponds to twice that, that is, about 30% of the victims have a depressive condition. This number is five times higher than the average for Brazil, according to data from the World Health Organization (WHO) 2015. Already generalized anxiety disorder was diagnosed in 32% of respondents, a prevalence three times higher than the Brazilian average.

Another worrying data refers to the risk of suicide in this population: it was found in 16.4% of respondents. To obtain this index, those affected had to answer "yes" to at least one of the questions that evaluated this topic - for example, having already thought, planned or attempted suicide at some point in their lives. "The number is quite high." According to the study, 4.4% of those affected interviewed had planned suicide in the 30 days prior to the survey.

In the first stage of this research in the factor of decreased vital energy, all frequencies are extremely high and worrying about the 76.3% average. This group of people affected by the flood "Finds difficulties to carry out their daily activities with satisfaction", "Has difficulties to think clearly", "Has difficulties to make decisions", "Has difficulties in the service (his work is painful, it causes him suffering)", "Feeling tired all the time and "You get tired easily". After 4 years of trauma, the average found for factor 1 has an average of 17.8%, still considered high. The most important and persistent relative frequencies were found in "You have difficulties in the service (your work is painful, it causes you suffering) and "You find it difficult to carry out your daily activities with satisfaction". However, all variables are considered important in this analysis.

In the first stage of the research, factor 2, the relative frequency of the somatic symptom, had its highest index the variable "You have headaches frequently", "You have poor digestion", "You have unpleasant feelings in your stomach" and "You have a lack of appetite". The average of the Somatic Symptom Factor was 67.8%. After 4 years, those affected by the flood continue with high frequency in the somatic sector, having been found at higher frequencies in decreasing order "You have headaches frequently", "You have an unpleasant feeling in your stomach", "You have poor digestion" and "You lack appetite". The average of the Somatic Symptom Factor was 33.6%. The victimized population continues to suffer from disorders related to somatic symptoms.

With an average of 66.2%, the depressive mood factor also had a great negative impact on this population affected by the flood, with the highest frequency "Have you been feeling sad lately", followed by the variable "Do you feel nervous, tense or worried". With an average of 29.9% in the depressive mood factor, 4 years after the event, the highest relative frequency was with the variable "Have you been feeling sad lately", followed by the variable "Do you feel nervous, tense or worried". The lowest frequency was found in the variable "You have been crying more than usual".

With an average of 32.5% with regard to depressive thoughts "He has lost interest in things" predominated, followed by "He is unable to play a useful role in his life". Striking frequencies were found that demonstrate the level of suffering of these people, such as "You feel like a useless person, without help" with 16.8% and "You have an idea to end your life" with 9.4%. In the time of 4 years after the event, the population affected by the flood show depressive thoughts in the order of 13.8%, having predominated the issue of having lost interest in things, they are unable to play a useful role in their life. He has the idea of ending his own life and remains at 8.6% of the population.

The other symptoms raised by the SRQ-20 with an average of 77.6% are extremely sensitive, in decreasing order in the variables "Sleeps badly" with 82.9% and "Scares easily" with 80.2% and "Has hand tremors" with 69.1%. Despite the difference in values between the two stages of the research, 4 years after the flood of the Madeira River, the exposed population continues with the other symptoms of the SRQ-20 high, such as sleeping poorly with 56.9% and being easily frightened by 53.4%.

The young and adult women evaluated by the SRQ-20 presented their responses more concentrated in Factor 1, in the variables "Feels tired all the time (in a feeling of helplessness)", "You get tired easily" (because you are lost, aimless, without direction), "Finds difficulties in making

decisions” (the omission, neglect and inefficiency of the public power leaves us with no hope of what to do), “Finds difficulties in carrying out their daily activities with satisfaction” (the sudden change of life, without a home, without the place won with so much effort, makes us very sad), “Finds difficulties to think clearly” (we don't know what to do. Uncertainty left everyone without believing in anything else), “You have difficulties in the service” (the drastic change in life directly affected the performance at work. It cannot be what it was before. Very difficult).

The somatic symptoms “Headaches daily”, “The unpleasant feelings in the stomach, poor digestion and lack of appetite” were concentrated in women. Regarding the depressive mood factor, in women there was a predominance of crying more than usual and feeling sadder lately. Women showed disinterest in things (depressive thoughts). They sleep poorly, are easily frightened and have hand tremors were the highest frequencies in other symptoms of the SRQ-20.

In young men and adults submitted to the SRQ-20, their responses were more concentrated in the two stages of the research in the variables “They sleep poorly”, “They are easily alarmed” and “You have tremors in your hands” (other symptoms of the SRQ-20). They presented unpleasant feelings in the stomach, poor digestion and lack of appetite (somatic symptom), have difficulties in making decisions, have difficulties in thinking clearly and find difficulties to carry out their daily activities with satisfaction and still have difficulties in service (decreased energy). In the depressive mood factor, young men and adults showed a concentration in “Do you feel nervous (a) tense (a) or worried” and have been feeling sad lately. The variable “You have lost interest in things” predominated in the depressive thoughts factor. A fact that moves and scares is the demonstration in “Having the idea of ending life”. The depressive mood factor was the most important finding in children. “Feeling nervous or tense or worried,” “Have you been feeling sad lately” and “Have you been crying more than usual”. Other important findings are found in the depressive thoughts factor “You have lost interest in things”, in the factor other symptoms of the SRQ-20 “You sleep badly” and “You get scared easily”, in the energy decrease factor “You find it difficult to do your daily activities with satisfaction” and “you have difficulties to think clearly”. It is not to be frightened by the results found. George²⁵ points out and discusses the impacts on the mental health of those affected by a situation similar to the research carried out in Rondônia, Brazil.

Bich et al²⁶; Seto et al²⁷; Warraich, Zaidi, Patel²⁸; Vineis²⁹ are some authors who indicate that populations exposed to

floods have emotional sequelae and worsening of the state of post-traumatic stress. Studies by Kovats¹⁰; Tapsel et al⁷ found adaptation disorders with percentages between 10% to 25% in individuals exposed to the flood, affecting women, rural dwellers, illiterates, children, the elderly, the disabled and the poorest more intensely, in agreement with what is observed in the present study. The findings by Feng et al⁶; Vineis²⁹ on disorders and syndromes resulting from emotional factors, mainly as sleep disorders, insomnia, nightmares and repeated memories about the event, amnesia, difficulty concentrating, irritability, anger and anxiety are references that can and should be considered when interpreting the results of our research. In other important studies that deal with mental suffering in those affected by floods are those by Warraich, Zaidi, Patel²⁸; Paranjthy et al³⁰; Vineis²⁹, phobias, panic and depression were observed. Fundter et al⁹; Kovats¹⁰ have already pointed out that loss of appetite, fatigue and dizziness are common symptoms after a flood. The attempt to take one's own life and suicide is addressed by Vineis²⁹ in “Climate change and the diversity of its health effects”. Tapsell et al⁷ affirm that emotional disorders are manifested in the population exposed during floods, after and during a short period. There is confirmation of mental suffering in the exposed population when there is a break in the family and social routine, according to Greenough et al³¹; Kovats¹⁰. Studies point to other consequences on mental and emotional health in exposed populations, such as family violence and abuse of alcohol and medication consumption among adults (Tapsell et al⁷; Keim¹¹). Vineis²⁹ in his study points to behavioral disorders in children and young girls exposed to mental and sexual harassment in temporary shelters. For Tapsel et al⁷, the mental and emotional consequences of this exposed population can last for a long period, and can remain until the end of the person's life.

According to Guirado, Pereira³² the SRQ-20 screening instrument, designed to detect symptoms, is useful for measuring the level of suspicion (presence / absence) of mental disorder and achieves relevant action aimed at primary levels of care, which can identify symptoms associated with CMD. The results obtained in the present study corroborate this statement.

IV. CONCLUSIONS

The study covered people aged 10 (child) to 86 years (elderly), in the first stage and only young adults (20 years) to 70 years in the second stage. 392 and 58 affected, respectively, participated in the two stages of the research. There was an equivalence regarding the representation of

sex, with an average of 51.7% for women and 48.7% for men. Regarding the age variable, the manifestations evidenced by the SRQ-20 occurred at all ages, with a more prominent proportion in the age group between 20 and 60 years. The group of people affected by the Madeira River flood presented 64.1% of Common Mental Disorders - CMD, in the following order of determination: other symptoms (77.6%), decreased energy (76.3%), somatic symptom (67.8%), depressed mood (66.2%) and depressive thoughts (32.5%), all considered as indicators of evidence of mental suffering. After 4 years this same group of people presented 35.9% TCM in the following order of determination: other symptoms (45.9%), somatic symptom (33.6%), depressed mood (29.9%), decreased energy (17.8%) and depressed thoughts (13.8%), all considered as indicators of evidence of mental suffering. Therefore, the mental suffering observed in this population is of long duration. Additionally, the SRQ-20, easy to handle and validated in Brazil, proved to be an instrument with acceptable performance to assess CMD in this studied population. Despite covering a variety of emotional disorders, the SRQ-20 is an instrument capable of identifying indispensable variables for tracking the mental health of vulnerable population groups, receptive and exposed to the situation of risk.

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Econometric study of the integration of young Moroccan immigrants in France

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Abstract— *Insertion is the essential aspect of the immigrant question, neglected for too long. The reform of the nationality code can only be a means at the service of a policy and not a policy in itself. Inclusion also presupposes the success of school, housing and vocational training policies.*

Economic, social and cultural integration, the sharing of common values and the transmission of knowledge are at the heart of the challenges of both school and immigration. Being more than a million foreign children to attend, it is today on the school that we count to strengthen the integration of young immigrants.

Keywords— *Econometric, Insertion, Integration, Logit Model, Moroccan immigrant.*

I. INTRODUCTION

The word insertion most often refers to the fate of immigrants and their children, the place they occupy in society and the place where their cultures of origin must be taken, the legal provisions concerning their rights and obligations and, more generally, public policies concerning them.

To be inserted is to have a place in society, a place that relies on work and housing and which leads to the recognition of others.

The French tradition of integration has been to open widely to foreigners access to nationality in order to quickly make French. It does not seem that historically France has been able to live sustainably with too many foreign nationals on its soil.

France has already been confronted with a massive presence of foreigners, but the question today has a new aspect: the populations concerned, mainly Maghreb, are different in their culture and their religion.

We can not hope to achieve the integration of these populations without acting to facilitate coexistence with the French population. Exclusion factors are numerous: school, housing, training,...

Faced with the three problems of housing, school and professional integration, we are inevitably torn between two needs: the desire to trivialize solutions to problems that are also those of French origin, from the most disadvantaged, and the need to specifically treat those who hold the immigrant status.

II. METHODOLOGICAL APPROACH

1. Objectives of the study

The purpose of this study is to detect the determinants of social integration and verify the accuracy of several

hypotheses concerning the insertion of young Moroccan immigrants in France who are still studying and in parallel with those who abandoned them, and from there knowing their relationship with their families, their friends, their comrades, their teachers and in a global context all the entourage of their place of social life in the French society.

Hence the interest of making a survey of these children in order to verify if the family environment, the school environment, the student's environment, the profile as well as the behavior have an influence on the social integration of the Moroccan immigrant child in France.

From this problematic, follows a questionnaire for which we asked ourselves several questions: What are the factors that determine the social integration of the children of Moroccan immigrants in France? What are the explanatory variables of the social integration of young Moroccan immigrants in French society?

2. Elaboration of the questionnaire

After consulting a certain number of statistical documents (questionnaires, grids, interviews, focus-group, etc.), we were able to select several themes that relate to our research. This enabled us to write the contents of the questionnaire project and to collect a set of qualitative and quantitative variables that are sufficiently relevant. The latter was tested on some children of Moroccan immigrants who came to spend their holidays in Morocco. This pilot survey was used to restructure and take stock of the choice of the final variables of the questionnaire. This one is composed of several types of variables such as:

- Individual variables;
- Environment variables;
- Behavior variables;
- School variables;
- Performance variables.

This decomposition as a whole is not fixed, it does not reflect all the complexity of reality and is not unique. Moreover, any other logical decomposition could be considered. The goal is to simplify the presentation to better understand the reality.

3. Choice of respondents

This survey concerned children of Moroccan immigrants whose age varies from 13 to 22 years. It was conducted with:

- Families with children in school or who have dropped out;
- Students pursuing their studies;
- Students who have left school.

It should be noted that some families did not respond favorably to our expectations, as some institutions did not even want to read the content of the questionnaire.

4. Location of the survey

The department of Yvelines as well as Trocadero and the suburbs of Paris were selected for reasons of convenience and means.

Indeed, the Moroccan school population is more represented in these regions of high immigration, because of the existence of a very large number of companies that employ abundant foreign labor in addition to the headquarters of our embassy in France.

We wish to point out the support of the members of our family living in Yvelines which has been of great help to us since no subsidy was granted to us for transport or stay during our multiple trips to France.

5. Survey field

We have had problems with some high school principals for direct contact with students in class and for a consultation of their school textbooks. This reluctance is due to bad circumstances:

- Beginning of schooling.
- Period of bombings.

These obstacles did not prevent us from continuing and persevering to determine the scope of our investigation. We visited the following places:

- High schools;
- Colleges;
- Youth associations;
- Socio-cultural centers;
- Households of Moroccan immigrant families (home visits).

On this occasion, let us point out the reluctance of some administrators responsible for manifest racism that did not allow us to access classes in high schools and colleges for direct contact with students and consultation of school textbooks. This resulted in the narrowing of the

scope of our investigation. With regard to the selected high schools:

- Lycée Saint Exupéry in Mantes la Jolie;
- Lycée Jean Rostand in Mantes la Jolie;
- Vaucanson Professional High School in Les Mureaux.

Indeed, these are characterized by the presence of a large number of Moroccans, as well as the existence of the Renault and Peugeot houses employing abundant Moroccan labor.

6. Sample size

600 copies of the questionnaire were distributed. Our desire was to get as many people as possible to have a comprehensive and representative sample and to be able to collate the results of the survey.

Unfortunately, only 56% were returned, of which 24 questionnaires were rejected and only 52% were retained thus narrowing the size of our sample without diminishing the richness of its information.

We give below the number of questionnaires delivered and returned in each city.

City	Number of questionnaires	
	Distributed	Returned
Poissy	148	114
Les Mureaux	60	10
Mantes la Jolie	200	105
Achères	46	37
Chanteloup	10	9
S.G. en Laye	10	3
Trocadéro	70	44
Limay	20	0
Others	36	13
Total	600	335

7. Receipt of questionnaires

Of the 600 copies distributed, only 335 questionnaires were retrieved. As noted earlier, some students and directors of establishments have had uncivilized behavior sometimes even throwing us the questionnaire.

We are very pleased to report the positive support of our embassy in Paris and our consulate in Pontoise for their intervention with the Prefect of Yvelines in Versailles for an extension of the residence visa and the incentive to answer the questionnaires.

During the collection and taking advantage of the grouping of children at the exit of schools, or in front of the doors of their homes and in the socio-cultural centers, some questionnaires were completed thus making it possible to enrich the research.

8. Data gathering

With regard to data collection, the survey took place during the period from 24/08/1995 to 11/11/1995. On the whole, all the objectives set were achieved despite the many difficulties encountered.

9. Data processing

The data processing took place in two steps:

9.1 Computer processing

It has been realized in several phases:

- Coding of variables;
- Coherence test between variables;
- Making entry masks;
- Data entry;
- Clearance of files (coherence tests and code validity program);
- Tabulation program.

Data exploitation was performed on the statistical processing software EXCEL, SPSS, STATA and LIMDEP.

9.2 Results and statistical tests

The results of the exploitation allowed us to reach the following series:

- The marginalized;
- Two-dimensional cross-tabulations;
- The ratios;
- Statistical tests: Fisher, Student et Khi²;
- Correlation tests;
- Logit models.

All these results have been analyzed and interpreted. In terms of content analysis for qualitative questions, we elaborate summary sheets to identify key ideas for each theme.

III. PRESENTATION OF THE RETAINED ANALYSIS

In this section, we present the rankings operated on the variables and data processing methods implemented in the following sections.

1. The ranking of variables

The data extracted from the questionnaires have been grouped into five homogeneous sets which are as follows:

- Individual variables,
- Family variables,
- Environment variables,
- Behavior variables,
- School variables.

This decomposition as a whole is not fixed, it does not reflect all the complexity of reality and is not unique. Moreover any other logical decomposition could be considered. The goal is to simplify the presentation to better understand the reality.

2. The methods used in statistical processing

The approach consists of using the data collected on young immigrants to identify the most significant econometric models (from the statistical, economic, social and other points of view). The search for the most relevant models requires the elimination of colinear variables. Thus, among two collinear variables, the one that is the least correlated with the variable to explain, namely the social integration of the children of Moroccan immigrants in France, is discarded.

On the other hand, analyzes are occasionally supplemented and explained by the crossing of the rival variables within double-entry tables.

Finally, note that the interpretation of the results found is done by reference:

- To the results of the various statistical treatments performed on the data of our sample,
- To the theoretical contributions cited in the bibliography that preceded the development of this work,
- To the results of empirical work realized by some researchers and organizations specialized in the subject.

III. DETERMINANTS OF THE SOCIAL INSERTION OF MOROCCAN IMMIGRANTS IN FRANCE

The main aim of any education system is to improve its own efficiency and to improve the social integration of young people that society is responsible for training.

One of the essential conditions for social integration is socio-professional integration, but if we consider that school success is probably the generally necessary condition of social success, it is certainly not the sufficient condition; in other words, somewhat paradoxical situations, or even perverse effects, can lead to academic success becoming a factor of social and socio-professional inequalities aggravation.

Insertion is the essential aspect of the immigrant question, neglected for too long. Insertion requires successful school, housing and vocational training policies.

1. Definition of the insertion variable and presentation of the explanatory variables

Using theoretical analysis and survey data we were able to define the insertion variable. Indeed, a student is inserted if:

- he succeeds scholastically, that is, his average is greater than or equal to 10;
- the number of rooms in his accommodation is greater than or equal to three;
- he has a professional ambition.

Among the different cohorts we selected the bac, because the students belonging to the other cohorts (CM₂,

6th, second) are not sure of their future ambitions. Indeed, a pupil in CM₂, for instance, biases the information concerning the professional ambition because all the students of this age prefer the profession of doctor or teacher by against a bac pupil is more certain of his choice.

It is therefore to explain the social integration of Moroccan immigrants in France. Due to the dichotomous character of the dependent variable, the estimated equation for the student *i* becomes:

$$\text{Insert} = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \mu_i$$

Wherein

$$\text{Insert} = \begin{cases} = 1 \text{ if: RS} = 1, \text{ the number of rooms} \\ \text{housing} \geq 3 \text{ and the student has a} \\ \text{professional ambition} \\ = 0 \text{ otherwise} \end{cases}$$

And

X_{1i} is the set of personal variables,

X_{2i} is the set of family variables,

X_{3i} is the set of environment variables,

X_{4i} is the set of behavior variables,

X_{5i} is the set of school variables.

μ_i is the element of the random error vector whose probability distribution follows a logistic form.

2. Analysis of the results

The results are overall satisfactory. The coefficients of the variables are in the majority of cases significant at the usual levels of confidence and their sign does not contravene reality.

The numerical values of the coefficients have no direct interpretation, however, their sign and the fact that they are significant or not are interpretable. The sign makes it possible to know if the probability of being inserted is an increasing or decreasing function of the corresponding explanatory variable.

The non-significance of some coefficients makes it possible to identify variables that do not perfectly explain insertion or non-insertion.

2.1. Impact of individual variables

Personal characteristics can play a determining role in explaining insertion.

At first, gender, age and school entry age are characteristics negatively related to insertion. But only the variable age is a bit significant. Indeed, these results reflect that girls fit more easily than boys and the higher the age of the student and the school entry age are, the more difficult the pupil finds it to integrate.

In a second step, the age of arrival in France squared is significantly negative. As the following graph shows, from the age of 18, students will find it difficult to integrate socially into French society.

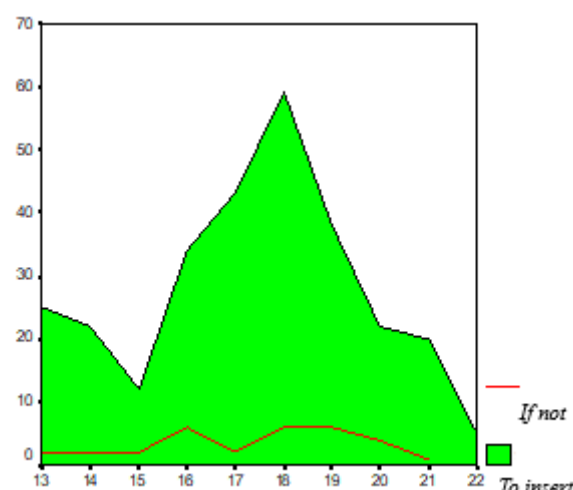


Fig. 1: Graph representing the insertion discrimination threshold

2.2. Impact of family variables

The family environment appears as a powerful determinant of the integration of Moroccan immigrant students in France. Thus, the variables measuring the family environment have positive coefficients but only the rank is very significant. According to these results, the more siblings number (weakly significant) and the rank of the pupil in the family increase the less he encounters insertion problems.

2.3. Impact of environment variables

The coefficients of the environment variables are sometimes positive and sometimes negative, and show a good coherence. Variables measuring family income such as housing type and socio-professional category (less convincing) are a decreasing function of insertion. Students who live other than the pavilions and the HLMs find it much more difficult to fit in.

The language spoken at home acts negatively. In fact, speaking Arabic or Berber at home does not make it easier for young people to be inserted. On the other hand, the number of siblings has an impact consistent since the pupil can only fit in with a limited number of brothers and sisters without a level of education, in other words the number of siblings with no education can have a deleterious effect on the insertion.

The variable supposed to measure the impact of the family situation on the social integration of young immigrants is relevant. Note that the presence of stay-at-home parents is important, and that the more comfortable the children are between their families, the easier they fit in.

As for the family problems, they can only aggravate the social situation of the pupils because of the negative sign of the coefficient relative to this variable.

In accordance with the various studies mentioned above, our study simultaneously takes into account the indicators that identify the change of place of residence in order to evaluate its significant impact on the insertion. Estimates show that one or more changes in place of residence from city to city or within the same city disrupts the student's integration.

2.4. Impact of behavior variables

Certain behaviors can have favorable or unfavorable effects on the social integration of immigrants in French society. Our econometric results show that the consumption of cigarettes, alcohol and drugs hinders the insertion. Similarly, part-time work is significantly negative because the less time students spend on searching for part-time work, the more the likelihood of being inserted increase.

On the other hand, the favorable effect of future career ambitions among young immigrants favors their integration.

Regional variables measuring where the student's family lives have coefficients that are not easy to interpret. It is the young people who live in Mantes la Jolie who have the strongest probability to fit in, followed by those who live in Poissy and finally those who live in Achères, Chanteloup, and Saint-Germain in Laye relatively to Trocadéro, Nanterre, Defense and Creil.

2.5. Impact of school variables

Overall, more favorable school variables favor insertion. It should be noted, however, that the problems between the student and his teachers are considered perfectly exogenous since this variable explains statistically the insertion of young immigrants, on the other hand the student's satisfaction of his orientation has a negative but a bit significant effect. This means that the more the student is less satisfied with his orientation, the more he can not fit in.

3. Distributions of predicted and observed values of school success

The table below shows the distributions of the predicted and observed values of the decision to fit for the entire sample. The model correctly identifies 18 of the 31 young immigrants who do not fit in and 275 of the 280 young immigrants who have become part of French society.

Table. 1: Distribution of the predicted and observed values of the decision to fit

	Total	0	1
Total	311	27	284
0	31	18	13
1	280	9	275

Thus, our results are more successful in clarifying the impact of the decision to insert than in predicting the behavior of young immigrants.

V. LESSONS LEARNED FROM TREATMENTS AND CONCLUSIONS TAKEN FROM THE ECONOMETRIC MODEL

From our sample, it appears that school and work integration is covered differently by boys and girls. Considered as forming a system and observed over time, the ambitions, educational and professional success of young immigrants confirm previous findings.

Note that we are in this case at the end of a study cycle and that our results may also reflect, in addition to differences in family residence, the tendency of young immigrants to insert themselves after obtaining their Baccalaureate.

The language spoken at home and the socio-professional family background exert an important influence on integration into French society. In addition, education is often the main instrument of social mobility in the eyes of family members.

These results constitute new arguments in favor of theses on the fidelity of the French school to its mission of insertion of the populations of foreign origin and the mobilization of the young people (and probably of their families) around the professional insertion thanks to extensive schooling (Schnapper, 1991).

The supervision of the student within his family, measured by the number of brothers and sisters living under the same roof, implies a greater relaxation of the insertion constraint. That being said, it must be admitted that the level of meaning is not always perfectly convincing, and that baccalaureate students are more sensitive to these variables.

It should be noted that a stable and problem-free family situation cannot favor the social integration of young people.

The students' work is a sign of a greater propensity to not fit in. Early contact with the labor market encourages school dropout. These effects may well offset, in the long run, through the profitability of education, the short-term benefits of being able to hold a job and, above all, productivity or higher wages.

Finally, children born in France, whose parents are educated, whose profession is more prestigious and the situation is more stable, and who have fewer children, continue their studies for a long time. This undeniably allows a good integration into the French society: the school, the cultural practices acquired in childhood, guide the pupils to the professions knowing the greatest expansion.

VI. CONCLUSION

Academic success appears as a generally necessary condition for social success, but it is certainly not a sufficient condition. In other words, there are other insertion conditions that relate to employment and housing.

It is established that the family plays a vital role in the child's schooling and is a powerful determinant of social success. For the children of immigrants, the interactions are even more essential: the school, in order to fulfill its educational mission and play its full role as a vector for the insertion of children, must imperatively rely on the will of insertion of parents.

The social characteristics of the parents before emigration, the existence of a favorable attitude to the integration, exert a significant weight in the explanation of the educational success of their children, as well as the construction of migratory projects where the school occupies a prominent place.

In such a context, the pupil's adaptation problems are solved or in the process of being solved and this is the most general case. On the other hand, when the family lives on its own and experiences a feeling of marginalization, there is a risk of tensions between the child and the family or between the child and the school, and by then his schooling is risked too.

How, therefore, motivate parents to schooling their children and make them understand the importance of family involvement in school success and future social integration in French society.

Going so far as to say that this question is of considerable importance for the educational success and social integration of the children of Moroccan immigrants in France, there is only one step and that certainly future research will make it possible to cross.

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Patient Safety: Adverse events notified in the Southern Region of Brazil, 2014-2019

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Abstract— *Introduction: One in ten inpatients suffers damage from healthcare, most of which is preventable. Objective: To describe the occurrence and characteristics of adverse events or incidents recorded in the National Health Surveillance System (Notivisa) for the three southern states of Brazil, between March 2014 and January 2019. Methods: Use of data from Notivisa's Adverse Events Reports for the three states of the Brazilian South Region (n=55.536 records). Variables studied: type of incident and year of occurrence; processes involved and problems occurred in incidents involving failures during assistance; types of services and hospital units; patient profile; shift in which the incident occurred; degree of damage and deaths per incident. Results: Of the total records, 56.7% occurred in male people, 57.7% in the age group above 56 years of age, 54.3% in the day shift and 50.7% resulted in mild damage. The three main reasons for incidents and adverse effects were: Failures during healthcare (24.5%), pressure ulcers (21.6%) and patient falls (15.0%). In "failures during health care", the procedures, treatment and / or intervention predominate (64.5%); in problems, incomplete or inadequate assistance (36.3%). The number of notifications four times higher in Paraná and twice in Santa Catarina suggests possible underreporting in Rio Grande do Sul. Conclusion: Failures predominated during health care in Paraná and Santa Catarina, and the patient's fall in Rio Grande do Sul.*

Keywords— *Health Information System, Health Management, Patient Safety, Risk Management.*

I. INTRODUCTION

Patient Safety is defined as "the reduction, to an acceptable minimum, of the risk of unnecessary harm associated with health care" [1]. Although the main objectives of health institutions are aimed at recovery and health promotion of patients, the occurrence of errors that imply damage to them is not uncommon [2]. According to data from the Latin American Study of Adverse Events, one in ten hospitalized patients suffers damage from health care, most of which may have been prevented [2].

Health errors can be characterized as acts of negligence or recklessness that, when they result in damage to the patient's health, are defined as an adverse event (AE) [1,3]. It is important to differentiate from the definition of incident, which would be an event or circumstance that could have resulted, or resulted, in unnecessary damage to health [1]. There are estimates that the occurrence of incidents related to health care affects 4% to 16% of hospitalized patients in developed countries, which has stimulated health systems around the world to seek improvements in patient safety [4,5,6].

A study covering 27 countries on six continents identified an average of 10% of patients affected by at least one adverse event during the hospitalization period,

51.2% of which were preventable [7]. In the United States, it is estimated that the error related to health care is the third cause of death, reaching up to 400.00 deaths per year, behind only cardiovascular diseases and cancer [8].

In Brazil, there is no overview of the real magnitude of the occurrence of AEs related to health care, however, data show that, every three minutes, more than two patients die in a Brazilian hospital, whether public or private, due to errors and other AEs related to the professional assistance provided to the patient [9]. A study carried out in three teaching hospitals in Rio de Janeiro found that 7.6% of patients were affected by some type of AE, 67% considered to be preventable [10].

In this context, notifications provide information that allows the identification of patterns and trends on patient safety, in order to prioritize continuous learning and the solution of identified problems, as well as to encourage the adoption of measures that can manage risk [11]. Thus, the objective of this study is to describe the occurrence and characteristics of events and incidents recorded in the National Health Surveillance System (Notivisa), in the three southern states of Brazil, between March 2014 and January 2019.

II. METHODS

The study was developed directly on the National Health Surveillance System (Notivisa), based on data from the Adverse Events Report of the three states in the South Region of the country (Rio Grande do Sul, Santa Catarina and Paraná), from March 2014 to January 2019, published and made available at:

<http://www.anvisa.gov.br/hotsite/notivisa/relatorios/index>.

Notivisa is a computerized system created by the National Health Surveillance Agency (ANVISA) to receive notifications of incidents, adverse events and technical complaints related to the use of products and services under health surveillance, allowing the monitoring, dissemination and monitoring of this data [12].

The following variables were used for this study: number of incidents by type; processes involved and problems occurring in failures during assistance; number of hospitals that reported each year; number of incidents per year; types of services versus number of incidents; hospital units versus number of incidents; number of incidents by sex and age group of the patient; occurrence shift; number of incidents per degree of damage; number of deaths per incident.

After collection, the data were entered into an electronic spreadsheet, using descriptive statistics for their management.

It should be noted that the use of a secondary data source from Notivisa is one of the limitations of the study, since it is a voluntary notification system, with the possibility of underreporting. Estimates are that a maximum of 15% of events are reported [13].

III. RESULTS AND DISCUSSION

In Brazil, from March 2014 to January 2019, 281,613 incidents and adverse effects were reported, with

55,536 (19.7%) in the South Region (Table 1). Of these, 29,802 (56.7%) occurred in males and 30,038 (57.7%) in the age group above 56 years of age, with no statistical difference between the states. Data similar to a study carried out in the states of São Paulo and Minas Gerais [14], but diverging from a study carried out in the context of primary care, where there was a predominance of females and between 20 and 59 years of age [15].

Of the total number of reported incidents and adverse effects, 30,150 (54.3%) occurred during the day shift (7 am to 7 pm), unlike the study that demonstrated a predominance of occurrences in the night shift [16].

Regarding the degree of damage, the highest number of incidents and adverse effects resulted in mild damage (50.7%), followed by no damage (33.3%), moderate damage (13.2%) and severe damage (2.5%) and deaths (0.3%). Similar data to another study in the area [7].

Table 1 shows the number of incidents and adverse effects according to the type in the three states of the Southern Region. It is observed that the three main reasons were: Failures during health care (24.5%), pressure ulcers (21.6%) and patient fall (15.0%), totaling 61.1% of the total. By state, Paraná and Santa Catarina differed regarding the ordering of these reasons when compared to Rio Grande do Sul, when the rubric of patients falls from third to first place.

Several studies have pointed out reasons related to the drug chain as the most frequent [16-20]. A Canadian study, on the other hand, found falls and pressure ulcers among the most frequent incidents and adverse effects [21].

Table 1 - Number of incidents / adverse effects reported by type in the three states of the South Region (Paraná - PR, Santa Catarina - SC and Rio Grande do Sul - RS), March 2014 to January 2019

Type of incident / adverse effects	States (n)		
	Paraná	Santa Catarina	Rio Grande do Sul
Failures during health care	8.769	3.405	1.452
Pressure ulcer	7.136	2.848	1.998
Patient's fall	3.392	1.852	3.089
Patient identification failed	2.781	1.264	179
Documentation failure	833	142	107
Failures in diet administration	617	321	118
Failures in administrative activities	481	105	85
Patient accidents	363	66	46
Failures in clinical or pathology laboratories	161	81	26
Burns	72	64	24
Failures during the surgical procedure	55	113	56
Failures in the administration of O ₂ or medicinal gases	19	10	2
Others	7.671	4.839	894
Total	32.350	15.110	8.076
n			
%	58,3	27,2	14,5

Source: Notivisa.

As for the processes involved and problems occurring in the “failures during health care”, the procedure, treatment and / or intervention (64.5%) and general assistance (28.3%) in the processes predominate; incomplete and / or inadequate assistance (36.3%) and not performed when indicated (26.4%) in the problems (Table2).

Table 2 - Processes and problems involved in failures during health care in the three states of the South Region (Paraná - PR, Santa Catarina - SC and Rio Grande do Sul - RS) from March 2014 to January 2019

	PR	SC	RS	Total	
Processes involved				n	%
Procedure / treatment / intervention	4.751	2.797	1.114	8.662	64,5
General assistance	3.090	471	241	3.802	28,3
Physical containment	413	12	4	429	3,2
Diagnosis / Complementary means of diagnosis	342	95	53	490	3,7
Screening / check up	26	5	6	37	0,3
				13.420	100,0
Problems Occurred					
Incomplete / inadequate	481	105	85	671	37,3
Not done when indicated	363	66	46	475	26,4
Wrong procedure / treatment / intervention	161	81	26	268	14,9
Out of stock	72	64	24	160	8,9
Wrong patient	55	113	56	224	12,5
				1.798	100,0

Source: Notivisa.

Studies carried out in several countries in the Middle East and Ireland have shown that therapeutic and diagnostic errors / events were the most commonly found [22, 23], corroborating what was found in this study.

Failures during care are generally considered to be avoidable errors, among which work processes and organization stand out, followed by technical capacity and

personal issues, such as distraction and anxiety during the prescription, dose or preparation [24].

There was a progressive increase in the number of hospitals that reported incidents and adverse effects, as well as the number of notifications made in the period and states under study. In 2014, only 78 hospitals made notifications, reaching 1,121 institutions in 2018 (increase of 1,337%). Notifications went from 866 in 2014 to 10,141 in 2018 (increase of 1,071%). This increase may be due to the establishment of a culture of safety among health professionals [16].

Hospitals concentrated notifications by type of service, with 53,594 (95.5%) records, followed by outpatient clinics, with 525 (0.9%) cases. A study in primary health care services found 125 (1.1%) incidents in 11,233 visits made [15].

As for hospital units, there was a predominance of hospitalization sectors (n = 28,654), in adult, pediatric or neonatal intensive care units (n = 14,905), in urgency and emergency units (n = 4,246) and surgical center (n = 1,615), accounting for 92.4% of valid records. Similar data to other studies [6,16].

IV. CONCLUSION

The three states that make up the South Region of the country were responsible for 19.7% of the total notifications made in the country in the period under study. Failures predominated during health care in Paraná and Santa Catarina, and patient falls in Rio Grande do Sul.

In the other variables, there are similarities between the three states. There was a progressive increase in the number of hospitals that carried out notifications over the years studied, with incidents and adverse effects focusing on the hospital area and, in these, in the sectors of hospitalization, intensive care units and urgency and emergency, in the shift daytime. Incidents and adverse effects affected both sexes equally, mainly in the age group above 56 years of age, resulting in a greater number of minor injuries.

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The Nurse's walk with the Community Health Agent: active search for the respiratory symptomatic of tuberculosis

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Abstract— The purpose of this study is to promote a dialectical construction on the active search of the respiratory symptomatic, with the community health agent as its protagonist, using problematization as a tool for transforming health education through effective participation of the nurse as assister of the process. This was a descriptive study with a qualitative approach, focusing on the Problematization of the Arch of Maguerez, with the participation of 12 community health agent of the municipality of Belém. The results were analyzed in two axes, the first one related to the social determinants of health, and the second one on the active search of the respiratory symptomatic by the agent, both observed during the home visits. With the results, the thematic was debated in three categories: problematizing to understand the active search of the respiratory symptomatic; dialogue between user/ community health agent /Nurse (researcher); health education and health education as a transformation tool in the active search of the respiratory symptomatic from community health agent perspective. Thus, it can demonstrate to the agent that its work tool is in its comprehensiveness; and that through problematization the actions of promotion and prevention with high powers of resolution can emerge, especially in the active search of respiratory symptomatic.

Keywords— Tuberculosis, Community Health Agent, Nurses and Health Education.

I. INTRODUCTION

Tuberculosis (TB) is still a serious public health problem in developing countries, although it is potentially predictable and curable. It is a disease that is associated with conditions of poverty and social inequity, affecting in most cases young adults of working age. It is estimated that a person with untreated active TB can transmit the disease to up to fifteen people each year, perpetuating the chain of TB transmission in the community (P. G. O. Di. Pinheiro, 2011; WHO, 2011).

Thus, Primary Care (PA) is the main entrance door for the user to the Unified Health System, having as logic of action the Family Health Strategies (FHS), which focuses on prevention and health promotion. Thus, the issue of tuberculosis is a problem that can be solved in PA, since this level of attention, when structured, can positively interfere in the determinants of the disease, through early diagnosis, by intensifying the active search for Respiratory Symptoms (RS), which is defined as individuals with a cough for three weeks or more (Ministério da Saúde da Brasil, 2019).

In this primary care perspective, the main actor responsible for the active search for RS is the community health agent (CHA), since it has a fundamental and agglutinating role, by being the link and spokesperson of the community's needs and demands in relation to the possibilities of health service offerings. Because they live in their locality, they are familiar with their values, customs and languages, and can thus produce a blend between the use of biomedical technology/knowledge and local beliefs. Therefore, as translators, they build bridges between health services and the community, promptly identifying the community's problems, facilitating the work of disease prevention and health promotion (Nunes, Trad, Almeida, Homem, & Melo, 2002; Rogerio et al., 2015).

Thus, in order to be successful in health promotion and prevention actions, where the search for RS is included, since this is an action based on early detection, which has as its main objective to establish a health education that can impact on the collective. Thus, the CHA needs to adopt the role of health educator, since health education is a multifaceted field, for which different conceptions converge, both in the area of education and health, which mirror different world understandings, demarcated by different philosophical political positions about man and society (Lima, Santos, Gonçalves, Teixeira, & Medeiros, 2012).

Health education is a process of constant learning, because the more you teach, the more you learn. Since learning is constant and dynamic and also means a

sum of stimuli capable of altering or modifying thoughts and attitudes, it means engaging in strengthening the daily struggle to minimize harm to society through lack of knowledge. There is, therefore, a challenge in encouraging people to learn in their reality, because "passing on information to someone" does not mean that they will be acquiring this knowledge or changing their behavior for health, so they should be willing to learn daily (Bohn, Marzari, & Scherer, 2011; Peixoto HMC, Lopes VC, Ferreira TN, Rocha RG, Silva PLN, 2016).

Therefore, health education is not an easy task, mainly because the assistance model is still in the verticalized logic, in which only the knowledge of the professional prevails over the knowledge of the user, family and community. In "Pedagogy of the Oppressed," Freire highlights the need to overcome the unequal relationship between educator and educator, and proposes dialogue and mutual respect as indispensable tools for the establishment of dialogic relationships (Freire, 2013).

Thus, it is necessary to overcome the traditional model of information transfer, especially when dealing with a subject such as TB, which is still seen restricted to the biologist mount, treating only the disease.

Aiming at changing this paradigm, the Ministry of Health created a National Policy for Permanent Education, which emerged as a potential strategy for the realization of expanded reflection on the health-disease process and its role in the context of care, which may, on the one hand, arouse curiosity and the need to advance knowledge, and, on the other hand, stimulate the development of professional autonomy and critical and reflective capacity of analysis by health professionals, especially by the CHA that develop actions with the community (Ministério da Saúde Brasil, 2009).

To strengthen these actions developed in the community it is necessary the participation of the nurse, who has responsibility to supervise, coordinate and carry out activities of Permanent Health Education (PHE) of the CHA. Thus, continuing education is a strategic action for collective learning from practices and work, providing opportunities for dialogue and cooperation between professionals, services, management, care, training and social control, enhancing the confrontation and resolution of problems with quality (Barbosa, 2008; Lima et al., 2012).

However, the forms of training offered to CHA have aroused interest because this professional is required to face conflicts that appear daily due to his or her lack of skills related to the identification of health needs and social dynamics of the community. Therefore,

reviewing forms of training for CHA means reviewing pedagogical conceptions that understand practice as a mere application of knowledge, in a view dissociated between theory and practice, between thinking and doing, reproducing the fragmentation of the work process (Barbosa, 2008).

Therefore, for a change in this context is necessary the walk of the nurse with the CHA, so that he can visualize the difficulties experienced by this professional, so that he is developing actions according to problematization, using the dialectic process, through the exchange of knowledge between user, community, CHA and Nurse. Providing changes in behavior and social participation, an aspect of extreme relevance for the transformation of the health-disease process.

Faced with this panorama, this study aims to promote a dialectic construction on the active search for RS, with the CHA as the protagonist, so that it can glimpse the problematization as a transforming tool for health education, providing a more effective social participation in the control of TB.

II. METHOD

The study is a cutout of a post-graduation dissertation research of the Master's in Health, Environment and Society in the Amazon of the Federal University of Pará. Entitled "The Knowledge of the Community Health Agents of the Municipality of Belém about the active search for respiratory symptoms". The investigation followed the qualitative trajectory, adopting a descriptive approach study with a focus on the problematization. Based on the principle of Arco de Maguerez, inspired by Paulo Freire (Berbel & Sánchez Gamboa, 2011).

There were 12 CHA from the Municipality of Belém, through a random sample, and the choice was 3 CHA from each FHS distributed in 4 administrative districts of the Municipality. It is important to note that the Municipality of Belém is composed of 8 administrative districts, however the study reached through the technique of saturation in 4 districts. Thus, although the focus is on the CHA, it did not have as a disincentive to user and community participation, since we understand that the

work process of this professional, as well as of other FHS professionals, is inseparable from social participation.

The study took place in the second semester of 2016 and was conducted with the CHA who signed the informed consent form, the study was previously authorized by the Ethics Committee of the Institute of Science and Health of the Federal University of Pará under the protocol of opinion 1,844,738 and authorized by the Municipal Health Secretariat. This study respected the ethical principles according to resolution 466/12 of the National Health Council (Ministério da Saúde Brasil, 2012).

The data collection was performed in two moments, the first through the CHA monitoring during home visits, totaling 57 visits. Participatory observation was used with a focus on problematization, being recorded through a field diary, in addition to health education on the active search for TB RS, according to the reality found.

In the second moment, a semi-structured interview was carried out in a closed place with the presence of only the researcher and the participant, in order to maintain anonymity, the alphanumeric code was used, composed of the letter E of the interview and the sequential number. A previous script on the theme was adopted, recording the interview in audio and later carried out in literal transcriptions of the collected data. The technique of content analysis proposed by Bardin was used for the interpretation of the data (Bardin, 2016).

III. RESULTS AND DISCUSSION

The results were obtained along two axes. The first was related to the situational diagnosis, which converged on the social determinants, related to housing condition, number of inhabitants, family income, basic sanitation and personal habits (smoking, alcoholism and drugs), since these factors interfere with TB control, since this disease is directly linked to social inequities, thus needing to be assessed to verify which groups are vulnerable to the disease, with the aim of mapping these groups, so that there is planning to intensify the active RS search according to the risk group. Such information related to the social determinants of health were grouped according to the micro areas of scope of each FHS visited, where the study was developed, follows the chart below.

Socioeconomic and cultural aspects of the families visited, Belém, 2016.

FHS	Housing condition	Per capita Income	Basic sanitation	Other problems
O1	Most of the houses visited were made of wood, clustered together, with little ventilation in an average of three rooms. The average number of residents per house visited was 8, however it is worth mentioning that there were 23 residents.	Of 1-2 salaries, but some cases of families that survive only from social programs.	Precarious basic sanitation. No sewage system, no paving. But with a water supply and waste collection network.	It stands out high rate of smoker, ethylist and drug user. There was an intense drug traffic in the area, according to CHA.
O2	The houses were diversified, masonry, wood and mixed houses (half wood and half masonry). The average number of rooms was three with an average number of 6 per house, but without good ventilation and lighting, due to the cluster of houses.	From 1-2 salaries	Minimum basic sanitation, although the streets were paved, but there was no sewage system. Waste collection present and also water supply.	The intense drug trafficking was identified with the greatest problem, since in a single micro area there were 5 locations, according to CHA. As well as the number of drug users in the area, in addition to alcohol users and smokers.
O3	The houses were diverse, masonry house predominance. In what consists the quantity of rooms in average was 4 rooms with an average number of residents of 5 per house, with a good ventilation and lighting.	1 minimum salary.	All streets were paved, with sewage network, selective garbage collection and water supply.	Regarding habits, we identified alcohol consumption and smoking, according to the CHA there is drug traffic in the area, but it is not so intense.
O4	The houses were mostly made of wood, and on average 2 rooms, living around 5 people. Regarding ventilation and lighting they were not adequate.	Of 1-2 salaries	The aspect of the sanitation network was precarious, without the drainage of rainwater, and most of the streets and houses were flooded, inadequate garbage collection, since it had a lot of garbage points thrown in the streets.	The greatest problem was identified as intense drug trafficking and alcohol abuse, even due to the number of bars identified during home visits. In addition to high danger points, this made the visits impossible, since the CHA reported that there would be no way to enter these areas.

Source: Based on data obtained from the study, Belém, 2016.

In the second axis, we took into consideration the approach of the CHA in relation to the active search for RS, which was unsatisfactory because it occurs in a punctual, restrictive way to the only member of the family, without accompaniment of health education. Therefore, it can be assessed that it is not part of the work

routine of the CHA of the study. Thus, the following categories emerged from these results: Problematicizing to understand the active search for RS; User/Community/CHA/Nurse Dialog (researcher): health education and health education as a tool to transform the active search for RS from the perspective of the CHA.

Problematizing to understand the active RS search.

The problematization finds in Paulo Freire's formulations a sense of critical insertion in reality in order to remove from it the elements that will give meaning to learning as well as to take into account the personal implications and the interactions between the different subjects who learn and teach (Batista, Batista, Goldenberg, Seiffert, & Sonzogno, 2005).

In this sense, the first step according to the stages of the Arch of Maguerez is the observation of reality, which consists of the active participation of the subjects for an attentive look at reality, thus making a first reading in which the theme to be worked on is inserted or happening in real life. It is the moment in which the subjects involved can look closely at reality, choosing aspects that need to be developed, worked on, reviewed or improved (Prado, Velho, Espíndola, Sobrinho, & Backes, 2012).

Thus, at this stage, the observer (researcher) carried out an explanation according to socioeconomic and cultural factors that have a direct or indirect relationship with tuberculosis, as well as the approach of the community health agent to the active pursuit of RS. Factors that have an impact on tuberculosis control.

Thus, the social determinants observed corroborate with studies that affirm that the disease is closely linked to social ills. We highlight the inadequate housing, with a cluster of houses, due to the culture of family aggregation in the same land, which hinders the circulation of air, in addition to the fact that these houses generally had 3 rooms of wood, in which up to 23 people lived, the greater the number of people sharing the same space to sleep, the greater the risk of transmission of tuberculosis, with respect to the carrier bacillus (Baldan, 2017).

Thus, these conditions beckon to a TB problem, that the disease still impacts more negatively people in situations of social inequality of income and education, being more exposed to infection, because they live in areas without ventilation and with large agglomerations differently from those living in regions with good conditions. This population also experiences situations of delay in diagnosis, due to an inefficacy of the active search for RS (Hargreaves et al., 2011).

Regarding personal habits, tobacco use, alcohol use and drug use are considered risk factors for tuberculosis, because approximately 10% of all TB cases in the world can be attributed to alcohol consumption, whereas in relation to smoking, a study revealed that it not only increases the risk of pulmonary tuberculosis but also delays the diagnosis of the disease because coughing is

commonly attributed to smoking (Alcântara et al., 2012; Hargreaves et al., 2011). But in relation to drug use, in most of the micro areas visited there were drug trafficking sites, and drug users. Thus, the difficulty of the CHA in dealing with this group was perceived, making it an aggravating factor, since they remain the margin of prevention and health promotion measures.

Among the different models that explain TB, the theory of social determinants seems to make more sense, since there is not only one single factor that determines it, but multiple factors, from living conditions to opportunities for access to health services (Hargreaves et al., 2011). Therefore, it is understood that the active search for RS is essential, especially for the CHA, because it is the professional who lives directly with the community, thus knowing the existing particularities.

However, despite all the risk factors for TB, it was clear that the CHA of the study do not work from the perspective of vulnerability groups, as well as the active search for RS is not included in the routine of these professionals or when it is included in a timely manner, since in the observation during the 57 home visits only one CHA conducted an approach based on the active search for RS, but it was a restrictive search, since the approach was individual and did not cover the family as a whole, without any type of health education focused on the subject. Such observation can be evidenced with the following statement:

(...) The specific time to make the active search is when the Secretary of Health determines, usually is once a year lasting 1 to 2 days (...) The active search of the RS is not part of my Daily Life routine, only when the user reports cough (E8).

This lack of active search in the process of CHA work may have a relationship with the model and periodicity of training, because he observed that this professional follows the biomedical model focused on the identification of diseases, it is understood the importance of early identification of RS. However, it is necessary to broaden the debate on the subject, so that it can transcend the scope of symptomatology and treatment of the disease, to the field of prevention and health promotion, through health education in order to strengthen the network of knowledge about the disease, allowing social participation. This type of training based on the mechanistic model, which was observed, is confirmed with the following statements:

I have already received tuberculosis training, but very little, two years ago last training, I found it very weak, because the right thing is that every Friday had some kind of training, since this day was destined for that, however it is not happening (...)

(E9). (...) they talked about tuberculosis, what are the symptoms and the medications too and that they take (E2).

Thus, the rupture of this assistance model still in force is necessary for one that can meet the needs of the population, and one of the models that has proven to be a way to break this paradigm is the PHE, because it allowed the development of critical and reflective thinking of the problems that emerge from the population and its work process, and as TB is still a disease of social nature, it is necessary to carry out planning that can dialogue with the various factors that surround this disease.

Dialogue between user, community, community health agent, nurse (researcher): health education

Following the stages of the Arch of Maguerez, the second stage is the identification of key points, on this stage we raise the following important points, social determinants, difficulty of the approach of the CHA in the search RS, knowledge of the population on the subject and PHE. The theorization, third stage, consists in the in-depth investigation of the key points defined (Prado et al., 2012). At this stage, we carried out in-depth readings of articles and dissertations that had discussions based on the active search for RS, the importance of CHA as a protagonist of this process and PHE as a tool for transforming actions in the control of TB.

The fourth stage is focused on the elaboration of actions capable of transforming the observed context, this stage was thought based on the first home visit carried out in the study, and in the course of the others, adaptations were made to contemplate the needs of each family. The fifth stage is the application to reality, thus health education was applied in each home visit, always taking into account the context of social determinants and the population's knowledge on the subject.

The mechanism used to implement health education was exclusively dialogue. The technique of dialogue is present in the PHE, since it must be based on significant learning, incorporating the dialogue to learn and do to the daily routine and collectively problematizing and producing solutions to problems in a continuous way,

in order to face the great challenge of producing transformations in health institutions in order to bring them closer to concepts of integral attention, humanized and with equity (Ceccim, 2005).

Therefore, the first step in building this dialogue was through a presentation mediated by CHA, since to establish a dialogue it is necessary to have a bond of trust. Thus, the approach to the subject did not occur directly, but during the home visit, when the user was more receptive. Then we asked if there was anyone in the family with a cough? This seemingly simple question, but it is essential for identifying RS, since the concept of RS is every individual with a cough within three weeks or more. However, a cough lasting at least one week as a presumptive symptom of TB should be valued in basic health unit users located in areas of high prevalence of this disease, as already described in the literature (Bastos et al., 2007).

Therefore, although there are a number of advertisements that highlight the symptoms of TB, the information they pass on through the audiovisual media is not able to clarify the symptoms of TB because most residents could not identify the symptoms of the disease and some claimed the fever as the main symptom. This lack of knowledge reflects the need for the FHS team to work with the PHE in order to better clarify the population. Given this lack of knowledge, it was established that the main symptom of TB is a cough of three weeks or more, and if someone has this symptom, they should look for the CHA or FHS to find out.

In relation to transmission, some myths still prevail, such as the sharing of objects, especially cutlery, some cited the kiss as a form of propagation, few would refer to the simple fact of breathing, coughing and sneezing as a mode of transmission. Thus, knowledge/disknowledge about the disease tends to be a hindrance in the daily life of the majority of the population, as they often carry a baggage of knowledge filled with taboos and erroneous information about the disease (Sá et al., 2007). In this way, we work with the demystification of the popular concepts that prevail in relation to TB transmission.

However, as far as the social determinants are concerned, health education was guided by actions that improved air circulation and environmental lighting, explaining that these factors increase the risk of transmission of the bacillus. However, in order to improve these determinants, it is not only health actions that are needed, but also intersectoral actions capable of changing the reality experienced by the low-income population. Thus, it was emphasized that TB is a curable disease, that

the treatment is offered free of charge by the Unified Health System and that we need to count on social participation for the early identification of RS, in order to form a network for dissemination of information.

Therefore, it is not enough just to inform, it is necessary to listen to the understanding of the population about the subject, so the feedback was positive from the population, because at the end of each visit the user was able to describe the symptomatology of the disease, as well as the way of transmission. Some users also stated that they would discuss the topic during Sunday lunch, when the whole family is gathered and also talk with the neighborhood, thus strengthening the sharing of knowledge, disseminating the network of supporters for TB control.

During the health education approach we identified two RS, who were involved with alcohol and drug abuse, which corroborates with studies that point out these habits as risk factors (Alcântara et al., 2012). Thus, needing to receive special attention from the CHA, intensifying the search for this group. However, this intensification of vulnerable groups is not part of the planning of the practice developed by the CHA of the study. Specifically, in the case involving drug use, therefore, the lack of preparation of the CHA in dealing with this audience was observed, since the approach is limited because of the associated stigma and fear of entering the trafficking zone.

Thus, it was necessary to encourage the CHA to enter this region, guiding it to use flexibility in its approach to the drug user. At first there was some resistance from the user in establishing a dialogue, but confidence was achieved when we made it clear that we were not there to make value judgments about his current condition. Thus, in view of this bond, he reported precious information to identify him as RS, since he had a clinical picture compatible with coughing for more than three weeks, besides being ex-convict for 2 months.

Based on this information, it was explained that the prison population is vulnerable to acquiring TB and we advised on the importance of its attendance at the FHS. In order to perform the sputum examination, besides passing the case to the FHS nurse, we guided the need for a continuous follow-up of the CHA in this case (B. N. da Silva, Temoteo, Vêras, & Silva, 2019).

In this way, in face of this form of approach, in which problematization was used, having the focus on dialogue, we tried to demonstrate to the CHA the importance of adopting the active search for RS in the home visit. It is known that the nurse is the main responsible for training the CHA, however the way to

teach this professional is still based on the traditional model, in which are only passed the technical information. Some consequences of this pedagogy are the passivity and lack of criticism, the distance between theory and practice and the lack of "problematization" of reality, which have repercussions on both individual and social levels (Queiroz, Silva, & Oliveira, 2014).

Thus, we adopt the logic of doing it together, allowing a greater resolution of the problems identified, in addition to promoting the empowerment of the CHA on the theme so that it can glimpse its role in the process related to the active search for RS.

Health education as a tool to transform the active search for Respiratory Symptoms in the perspective of the Community Health Agent

The PHE starts from the assumption of learning-work, contributing to the qualification and knowledge of professionals to the changes in assistance and educational practices in the process of work in health (J. A. M. da Silva & Peduzzi, 2011). This way of educating in practice has a more forceful effect than the technique of passing on information, making it clear in the following sentence of the deponent:

Like this, how did we see in the area that person said he was passing by the cutlery, the glass and the kiss, and that it's nothing like that, but how did you (researcher) say it's by the air, when person coughs and sneezes, right? (E4).

Thus, we realize that the traditional model of education does not impact positively on the actions provided by the CHA, because it becomes mechanical, without the preparation to make a reflection of the situation of the community in which it operates. This traditional model of training of health professionals, especially the CHA, does not privilege education from problems of daily life of services, being centered on interventions performed in isolation, based on the biomedical model of care (Pagani & de Andrade, 2012).

In this way, the health education developed in this study, provided a different view of the CHA, and there is an understanding of the importance of the RS problematizing approach to better know its clientele, since it allows to enter into different issues. We highlight the testimonial:

In that house, I did not know that that boy had already had tuberculosis (...)

And that he had gone to Marajó to perform the treatment (E5).

The above statement demonstrates that there is still immigration of TB cases to other locations, because this disease has a negative connotation, presenting social stigmas, causing isolation of the user. However, the CHA needs to be a supporter of this user in order to strengthen the link between the user and the FHS, so that he can be accompanied in his home. However, there are flaws in the learning process of this professional and the health team, providing the ignorance of some factors relevant to addressing TB.

In this sense, the health education model should be based on meaningful learning by professionals, through the experiences of the FHS and according to the needs of services and population (Coriolano, Lima, Queiroga, Ruiz-Moreno, & Lima, 2012).

Since the educational practice must be articulated to the work environment, so that the interventions can be resolute, according to the socio-economic conditions of each user, family and community. And this situation can be emphasized according to the speech of the deponent:

It's going into the area and trying to identify, like we did now. Because if it wasn't for you (researcher) I wouldn't have known he was RS, because I didn't know he was out of prison and that he had a cough.

Therefore, health education based on the PHE concept has to configure a behavior change in the working process so that participants can reflect on the problem and which mechanisms can be used to solve it. Emphasis is also placed on the E5 statement, in which it was perceived that from the dialogue developed during the home visit, that the CHA had no knowledge about the risk factors that the user presented for TB. Thus, these factors together with the symptoms were possible to classify him as SR. The importance of the search was emphasized, since in the field of three visits, we identified an RS.

In this way, the PHE must be based on meaningful learning, incorporating dialogue, learning-by-doing, according to daily routine, and collectively problematizing and reproducing, in a continuous way, the solutions to the problems, aiming to face the great challenge of producing transformations in health institutions (Ceccim, 2005).

This context of the importance of learning-by-doing was what motivated us to develop the action together with the CHA, so that it could adopt the active search of RS, so that it could visualize the problem from its reality, since it is necessary to wake it up for possible changes in the actions provided. When it is allowed to do together it can configure a critical, reflective and philosophical thinking of reality, providing possible changes in the actions before the community. This reconfiguration of the practice of work is highlighted with the testimonial:

Sure, I will. Because you (researcher) went and approached, you checked the cases, then I saw how you make an approach to active search for the RS, and now for sure I will be more attentive (...) now I will arrive, I will ask if there is any case of cough in the family, if the cough is more than three weeks old, if you have weight loss, fever. Now it will be part of my home visit, because in this short period that you went to the area with me, you soon identified an RS, now I don't know in the other houses, you can have it, right? So, now I'm going to these other houses to check.

The nurse plays an essential role in the FHS and contributes to its consolidation as a public health policy. When considering the importance of PHE for the reorganization and quality of health practices, it is necessary to question the educational action developed by the nurse, in which he is assigned the role of contributing, participating and carrying out PHE activities with the whole health team (Barros, Queiroz, & Melo, 2010; Paulino, Bezerra, Branquinho, & Paranaguá, 2012).

However, there is a distance to the achievement of health education actions when it comes mainly to TB control. Thus, to break this paradigm it is necessary that the nurse can demonstrate in practice the RS approach to the CHA, since the techniques used in traditional lectures, i.e., only the transfer of information, in which there is no interaction between peers, and does not enable the learning of doing together. Thus, it is necessary to reconstruct the meaning of educational techniques, for a participative and effective model, in which peers assume the protagonism of the entire educational process, but for this transformation significant learning is essential. We emphasize with the following testimony:

It was very important, I liked it very much. From now on I will adopt this approach that I learned from you in the home view, because I thought it was feasible. Sometimes we go to the patient's house, then he reports a cough, but we don't get very deep into this symptom, how long? How did you say it? When we talk about the cough, it's just a little flu, it's a virus, but we don't try to investigate further. If it's more than weeks old, for us to better guide the families (E6).

IV. CONCLUSION

The study made possible a dialectic discussion about the active search for RS with the concern of making an approach focused on problems, following the thought of Paulo Freire, where the author served as inspiration for the Arch of Magueréz, which has a well-defined process through the stages, thus served as a model for the practice of doing together, involving all actors of the process, so that each can contribute to building the understanding of the importance of the active search for RS.

It is believed that this study was able to break the paradigm of health education in traditional ways, since the action was developed through the needs of the user/family/community, demonstrating in a comprehensive way for the CHA, that its work tool is in its area of coverage, and that through the problematization is that emerges the actions of promotion and prevention with high resoluteness, especially when it comes to the active search for the RS. However, it should be noted that the search cannot be left to these professionals alone, requiring planning of the multiprofessional team.

The relevance of PHE based on health promotion is highlighted, and it needs to be part of the routine of primary care, since this policy enables change in the work process, reflecting positively on the actions developed in the community. This study made it possible for the CHA to reflect on its conduct in the face of the active search for RS, glimpsing the importance of its role in TB control. Thus, it concluded the importance of walking as a nurse with CHA tied to the user/family/community, fostering social participation as multipliers of knowledge for an effective active search for RS and TB control.

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Quality Characteristics of Vineyard Soil in the Conventional and Biodynamic Cultivation System of Chardonnay Vinifers

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Abstract— Viticulture, particularly in the production of viniferous varieties, is one of the most present crops in the State of Rio Grande do Sul. Soil indicators can be highlighted attributes linked to organic carbon, which have often been used, to assess soil quality. The objectives here were: a) to evaluate and compare soil quality characteristics of vineyards in the conventional and biodynamic cultivation system of chardonnay vinifers, together with areas of native forest, in the localities where the vineyards exist; b) to estimate the susceptibility to environmental impacts and possible soil degradation processes caused in soil management from cultivation systems and practices. The study was descriptive, exploratory and comparative of quantitative analysis. The sample was 26 vineyards and 19 corresponding native forests about 8 to 10 sub-samples, at a depth of 0 to 20 cm. The results showed an intermediate condition of VBI in relation to VCO and VAT, confirming the tendency of loss of initial soil characteristics from cultivation, but maintaining several attributes in a condition closer to that observed under natural vegetation.

Keywords— viticulture; organic matter; Natural forest; management; soil.

I. INTRODUCTION

Agricultural activity is increasingly referenced in paradigms that seek sustainability, within a multidimensional vision of this concept. In this sense, the environmental aspect becomes important as it is one of the fundamental requirements for achieving sustainable development models (UNITED NATIONS ORGANIZATION, 1987; MILLENNIUM, 2005). The soil, as one of the fundamental natural resources for agricultural production and for the maintenance of life on the planet in general, takes a priority position on the environmental issue.

Soil quality can be defined as "the ability of a soil to function within the limits of the ecosystem to sustain biological productivity, environmental quality and maintain animal and plant health" (DORAN and PARKIN, 1994). This cannot be measured directly, but can be evaluated by

measuring changes in some of its attributes, which are considered indicators (VEZZANI and MIELNICZUK, 2009; GIACOMO et al., 2015).

Among the soil indicators, attributes linked to organic carbon, which have often been used, can be highlighted to assess soil quality. In addition, attributes such as phosphorus and nitrogen contents, soil acidity and cation exchange capacity, in addition to trace element contents, have been shown to be sensitive to prolonged soil management practices and cultural practices related to different crops, affecting soil and water quality (NASCIMENTO et al., 2014; LOPES et al, 2007).

Viticulture, particularly in the production of viniferous varieties, is one of the most present crops in the State of Rio Grande do Sul, with annual production of around 65,540,421 thousand tons, with reference to the year 2018 (IBRAVIN, 2019). The culture is expanding rapidly,

and thus there is also a great variety in production, in terms of localities, regions and environmental conditions, as well as production systems (IBRAVIN, 2019).

Wine production requires techniques, practices and cultivation systems that enable agricultural management, with maintenance and improvement of the quality of natural resources used. The concern of the International Organization of Vine and Wine (OIV), and entities of the *Vitis vinifera* chain, has been to raise awareness of actions in rural areas to reduce the use of agrochemicals and human interventions to alter the balance of the ecosystem. Actions may show sparse effects on ecosystem size (EDWARDS et al., 2015; TANENTZAP et al., 2015), but they reflect the responsibility of the wine grower (SELG, 1924). However, due to concerns about the intensive use of agrochemicals in vine cultivation, there is a rethinking of soil management practices, in search of alternatives for cultivation with less chemical treatments and care for the environment and the farmers themselves. At the same time, the vision of integrating agricultural activity with its environment, both in a more local and macro level (the harmony and interaction with the "Cosmos"), and the valorization of knowledge and experiences acquired by the farmer himself gains space. In this sense, Biodynamic Agriculture emerges (ABAB, 2015; ASSISI and JESUS, 2002).

The biodynamic system of cultivation shows itself in philosophical opposition to the use of agrochemical pesticides and herbicides, both routinely used in the conventional cultivation system (TILMAN et al., 1997). It is characterized by a systemic view of property and crops, as an organism. Management includes the production of preparations and treatments in the care of the soil, plants and animals in the agricultural unit itself, providing sustainability and balance of biodiversity in the cultivation system (REGANOLD et al. 1993, MÄDER et al. 2002). Furthermore, it emphasizes the construction of the soil and the high diversity of cultures, animals and wildlife habitat through practices in alignment with the astronomical calendar, making use of the exchange relationship between the planet earth and the cosmos (KOEPPF et al. 1990).

Based on these assumptions, the objectives of the study were: a) to evaluate and compare soil quality characteristics of vineyards in the conventional and biodynamic cultivation system of chardonnay vinifers, together with areas of native forest, in the localities where the vineyards exist; b) to estimate the susceptibility to environmental impacts and possible soil degradation processes caused in soil management from cultivation systems and practices.

II. MATERIAL AND METHODS

The work was developed in the region of Encosta do Nordeste, in the state of Rio Grande do Sul. It is located in the Central-Northeast region, according to NUTEP (Figure 1). The climate is humid subtropical, with rainfall between 1500 and 1700 mm, distributed regularly during the year, but with records of water deficit between December and March. The relief is wavy to strong wavy, with geology formed by basalts from the Serra Geral Formation, with presence, in areas of higher elevation, of influence of acidic extrusive rocks, such as rhyolites or rhodocites. The vegetation is composed mainly of semideciduous seasonal forest, with contacts with *Araucaria* forest. The main taxonomic soil units are Argissolos, Cambissolos, Neossolos and Luvisolos (CPRM, 2006; STRECK et al., 2018).

The criteria for choosing areas and properties was that they work with the Chardonnay variety, this being the object of the research. Obeying this requirement, nineteen vineyards from the conventional cultivation system and seven from biodynamic cultivation (the latter inserted in seven properties) were found, totaling 26 vineyards, being a method of sample choice used for convenience (LEVINE et al., 2008).

In the conventional production system, the correction and fertilization of the soil have participation of synthetic fertilizers, such as NPK formulations, and the use of pesticides, for protection against infestation by pests and diseases. Some practices of a more conservationist and resource-saving nature are also used, such as organic fertilization (composting based on animal waste) and the use of grout for plant health. Examples are sulpho-calcium slurry and ash, also used in ecologically based production (LEÃO et al., 2014; NACHTIGAL and SCHNEIDER, 2007). The use of practices such as green fertilization and soil cover was variable among the properties studied. Biodynamic-based production, in turn, takes advantage of the presence of nutrient elements in compartments such as the atmosphere and the biosphere, and increases this availability through the use of biodynamic preparations for plant nutrition and health, as well as for the improvement of soil conditions. These preparations use plant extracts such as nettle (*Urtica* sp.), chamomile (*Matricaria* sp.) and oak leaves (*Quercus* sp.), sometimes wrapped in animal bones such as the skull or horns. Practices such as the use of crop consortia and green cover species are also used in several properties with vines in biodynamic system (HERRENKIND, 2006; CHALKER-SCOTT, 2013).

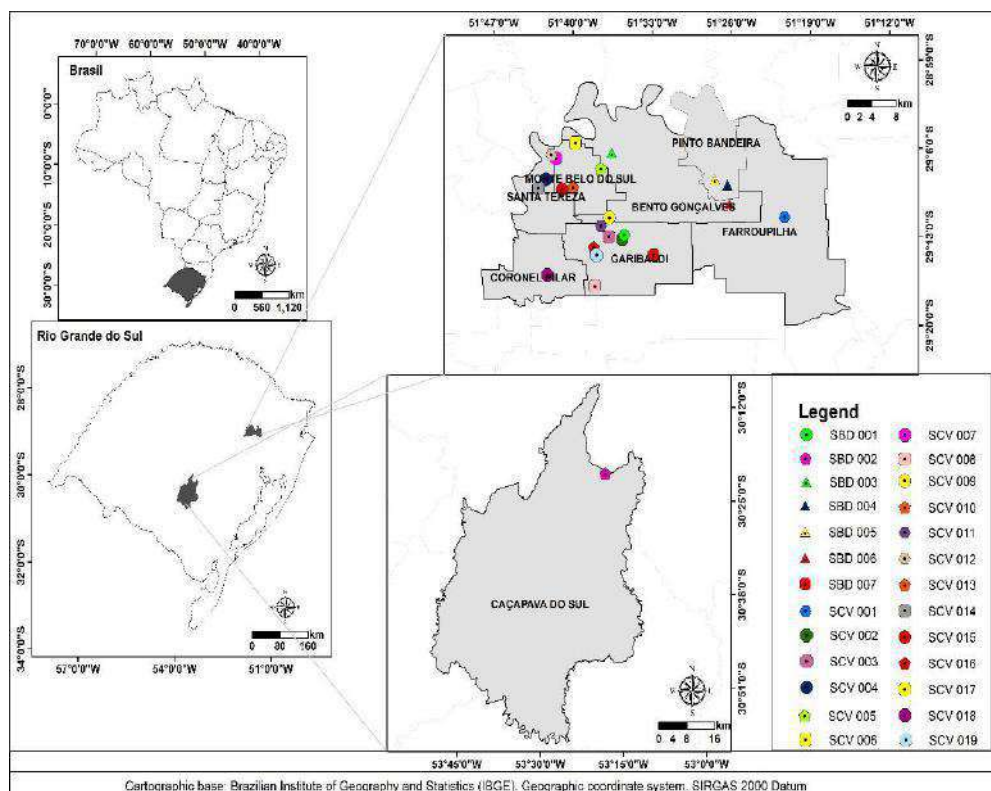


Fig.1: Map of the State of Rio Grande do Sul, and the region of Encosta do Nordeste and Caçapava do Sul.

Source: Prepared based on IBGE, 2019

The soil collections were held between July and August 2018. In the study areas, about 8 to 10 sub-samples were collected at a depth of 0 to 20 cm. for composite sample formation. In the same regions, 19 areas of native forest were selected, where the same soil sampling procedure was performed. The collection areas, both under woodland and vineyards, extend over 0, 5 and 4 ha, usually in wavy to strong relief.

Laboratory analyses consisted of determining the clay content by the densimeter method; pH in water; organic matter content by acid combustion; phosphorus and potassium by extraction in weak acid solution (Mehlich's method), with colorimetric determination for the first and by flame spectrophotometer for the second; Ca, Al and Mg contents determined by extraction with potassium chloride and determination by atomic absorption spectroscopy; estimated potential acidity by obtaining pH in solution with SMP; and micronutrient contents (Cu, Mn, Zn). The methods of analysis followed the recommendations of EMBRAPA (2011). Based on the results obtained, the parameters of cation exchange capacity and saturation by bases were calculated.

The statistical analyses were performed using the Software Statistical Package for Social Sciences (SPSS), comparing mainly the three land use groups (vineyards in

conventional and biodynamic systems, and native forest), using the Analysis of Variance (ANOVA) at 10% significance, and using the Tukey test in case of rejection of the hypothesis of difference between treatments. Some attributes, which did not obey the assumption of homogeneity of variances, underwent data transformations, or the application of non-parametric analyses (KRUSKAL WALLIS and MANN WHITNEY). Multivariate analysis was also applied, through discriminant analysis, to reclassify the samples in relation to the original groups, based on values obtained by each sample in relation to discriminant functions obtained (VARELLA, 2004).

III. RESULTS AND DISCUSSION

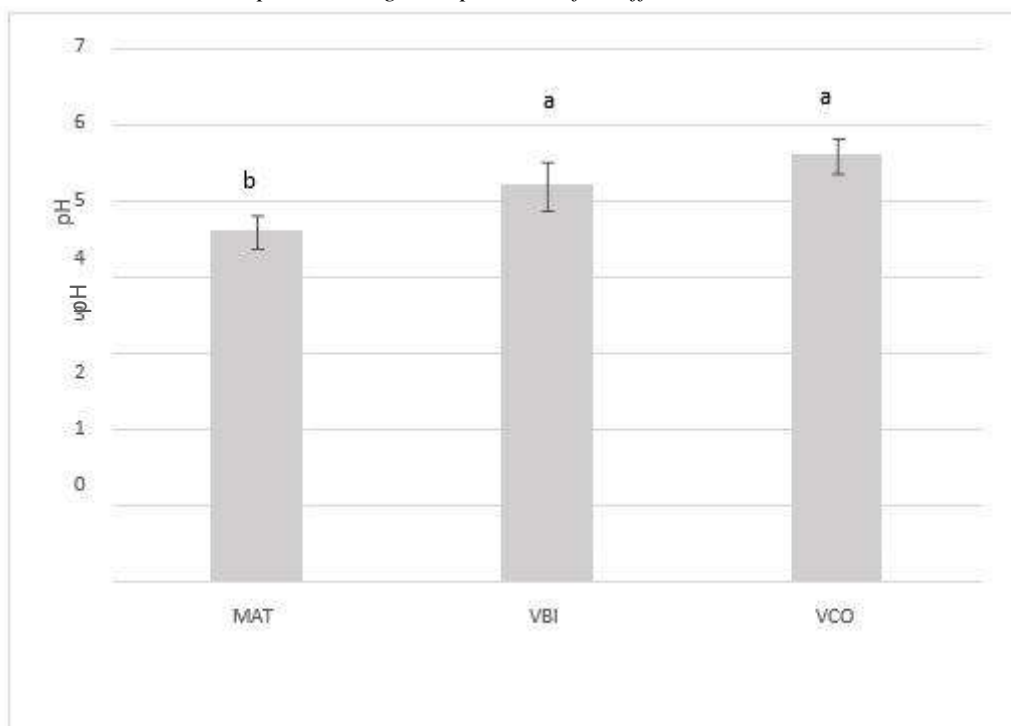
Clay contents were variable, but concentrated between 25 and 40%, characterizing soils with a clayey and loamy texture (SANTOS et al., 2015). Based on this value distribution, and considering that this attribute is not subject to significant changes by anthropic use and management, the clay content was not used as an attribute statistically analyzed. For the purpose of analyzing element contents, soils were mostly classified in class 3, according to ROLAS (2016).

The pH values proved to be higher in vineyard soils than in the forest. In this case, the difference in management

can be observed, with the adoption of liming and systematic fertilization, both chemical and organic. In addition to liming, the addition of elements such as potassium and

magnesium, by means of fertilizers (mainly organic), also implies an increase in the pH in both production systems (ABAB, 2015) (Chart 1).

Graph 1: Average soil pH values for different land uses.



The soil organic matter (MOS) contents had great heterogeneity of variances between treatments, which required the application of non-parametric methods. Thus, the Kruskal - Wallis test was applied, and from the detection of differences between treatments, the Mann Whitney test was applied for "two by two" analyses between land uses. The differences between the production systems can be seen, where the VBI, conducted based on systems such as consortium and green fertilization, provided significantly higher levels of MOS than the VCO, equating to VHV (Chart 2). The VCO presented some areas under management with these practices, but in a less systematic and intensive way, with intervals of some years for the repetition of the installation of these covering plants. Ruiz-Colmenero et al., (2011) found a significant increase in MOS levels in areas cultivated with green manure in seasonal consortium with grapevines. The practices used in agroecological-based systems tend to increase organic carbon stocks in the soil, stimulating diversity and microbial activity (MAZZANCINI et al., 2010). The VHV and VBI uses did not present significant differences between them, unlike VHV and VCO, thus indicating an approximation between the VHV and VBI uses.

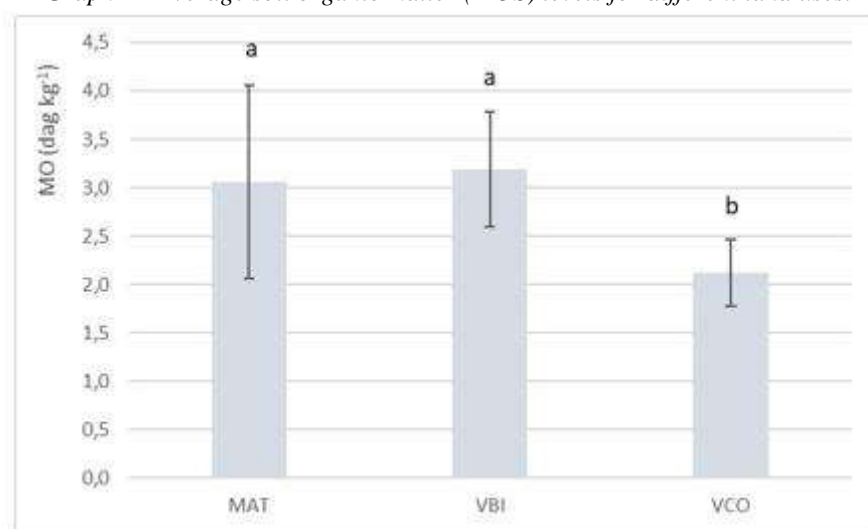
The cation exchange capacity (CTC) and base saturation (V) values did not have significant differences between land uses (not shown). A trend towards lower base saturation values is observed for VHV, which is also a reflection of the greater use of soil correction through liming and fertilization, which can be used in both systems (NACHTIGAL and SCHNEIDER, 2007; ABAB, 2015). CTC did not follow the increase of MO in VHM, however a correlation between MO and CTC of $r = 0.31$ ($p < 0.05$) was perceived. For the study areas, it can be seen that the variations within each treatment contributed to the absence of significance, expressed by standard deviations considered high especially for base saturation, which is directly dependent on fertilization and liming practices. In addition, it can be considered that the natural characteristics of the soils in the region, originating from basalt, lead to high values of V, even in uncultivated areas, such as MAT (STRECK et al., 2008). Nascimento et al. (2014), working in the same region of the Lower Slope of Northeast RS, found no significant differences for areas cultivated with vineyards under organic production and forest, among other types of land use.

The P levels had to be analyzed by non-parametric method (Kruskal Wallis). The difference detected was

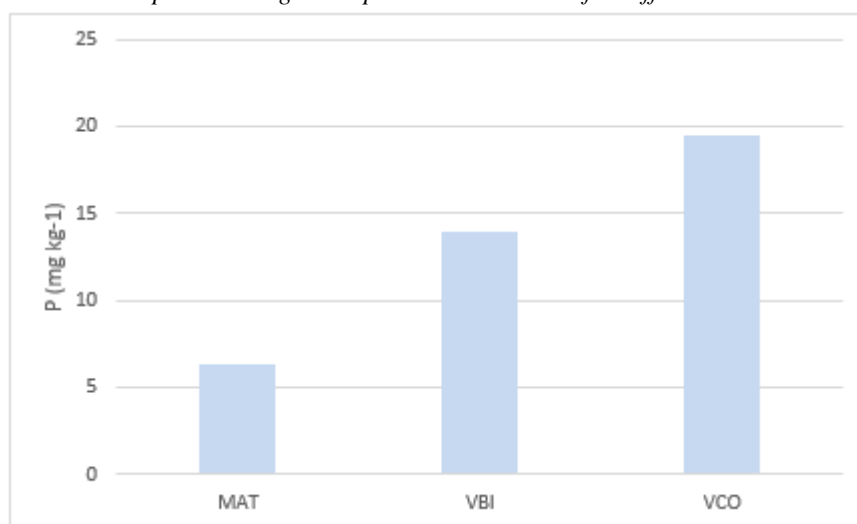
between VHV and VCO, with significantly higher values for these (Chart 3). Conventional crops usually associate synthetic and organic sources of fertilizer, the former being more soluble, such as simple superphosphate, leading to high levels of P in the soil (SCHMITT et al., 2013). Matos et al. (2006) indicate that organic fertilizers result in increases inorganic forms of the element. This is repeated in the present work, since no direct relationship was detected between phosphorus contents and organic matter, probably

due to the rather labile character of the latter, with rapid decomposition and release of the element to the soil. The great variation in the values presented among the areas cultivated under biodynamic system is represented by the standard deviation values, indicating that there are great differences in the forms of management, specifically regarding forms and quantities of compounds used in fertilization.

Graph 2 - Average soil organic matter (MOS) levels for different land uses.



Graph 3: Average Phosphorus levels in soil for different land uses.



Despite the significantly higher values in the vineyards, the phosphorus contents reached a maximum of about 50 ppm, not reaching critical values for the mobilization of this element in the soil, and consequently the contamination of nearby springs (GEBRIM et al., 2010).

The levels of micronutrients, specifically Zn and Cu, are quite high in VCO vineyard areas, with significant differences from VHV and VBI, which in turn showed no differences between them (table 1). Areas under fruit farming in general have relatively high Cu contents, either by phytosanitary treatments, based on grouts, or by the

fertilization normally used with animal manure compounds (LEÃO et al., 2004; LOURENZI et al., 2016).

In the work in question, Cu and Zn levels were very high (ROLAS, 2016), and may even characterize a potential for soil contamination. The correlation between it is $r = 0.80$ ($p < 0.05$), indicating probable origin from the same factors. Brunetto et al. (2018) found that increases in Cu and Zn yields are normal in conventional vineyard areas, increasing with the time of use under this crop. The authors also highlight the presence of Cu in forms more available to plants, due to the greater affinity of Zn with more energetic connections with the mineral fraction of the soil. This may

have been accentuated in this work, since the soils have medium to clay texture. In relation to the Mn, higher values are perceived for the areas of native forest.

It should be considered that these areas, for the most part, are formed by soils originated from basalt rocks, with high levels of the element. The intensive application of other elements, by means of phytosanitary treatments and fertilizers, may have reduced the presence of Mn by displacing them in the soil exchange sites. Nascimento et al. (2014), working in areas of floriculture and fruit farming in Encosta da Serra, obtained similar results, indicating the influence of material rich in levels of this element.

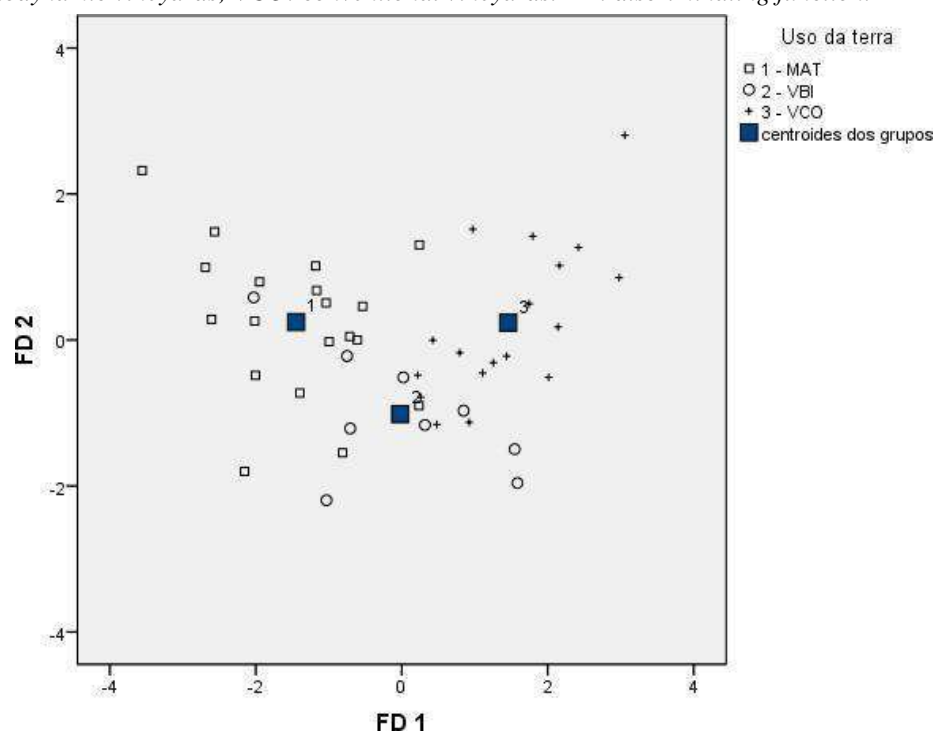
Table 1: Mean and standard deviation for sulfur contents and some micronutrients in soils of the Northeast Slope of Rio Grande do Sul, according to the type of use.

mg kg ⁻¹	S	Cu*	Zn*	Mn*
MAT	15.7 (6.3) ns	5,3 (10,2) B	5,0 (3,4) B	83,5 (45,8) A
VBI	11.5 (3.0) ns	20,6 (31,0) B	8.6 (6.1) AB	37,8 (33,2) B
VCO	12.9 (6.6) ns	76,9 (97,2) A	10,5 (6,9) A	30,5 (14,8) B

*Presentation of original data, analysis performed by non-parametric methods.

The values obtained for all the attributes in each of the 47 samples were analyzed together in a multivariate analysis. The discriminant analysis was performed in order to promote the reclassification of each sample, through the analysis of the vector corresponding to the values obtained by this sample, with the centroids of each group. For this analysis discriminating functions (FDs) were used, which define limits of resulting values for the characterization of each land use (Natural Forest, Biodynamic Vineyard, Conventional Vineyard) (Graph 4). FD 1 correlated with pH, Mn, Cu and P levels, while FD 2 had greater correlations with organic matter, clay and P levels.

Chart 4: Values of samples and centroids of land use types from discriminant analysis. MAT: natural forest; VBI: biodynamic vineyards; VCO: conventional vineyards. FD: discriminating function.



The distribution of the number of samples for each type of land use, from the results obtained by the FDs (Table 2). From the 47 representative samples of the glebas, 9 were altered or reclassified in relation to land use. These data

indicate a relatively high degree of coincidence between the field classification and that established by the FDs (around 80% of the glebas), which allows us to infer well defined and discriminated characteristics for each type of land use.

Table 2: Comparison of land use classifications by field verification and discriminant analysis.

	MAT	VBI	VCO	Field classification
MAT	17	2	0	19
VBI	2	6	1	9
VCO	0	4	15	19
FD Classification	19	12	16	

Theodoro et al. (2003) used the analysis of main components for coffee plantations with different types of management, compared with native forests, achieving a very clear discrimination between treatments, even those characterized as transition between organic and conventional production systems. In the present case, it is observed that the reclassified areas involve the use of VBO land, which from nine glebas detected in the field, presented in one case behavior more related to VCO, and in two cases more related to VHV.

On the other hand, four glebas with VCO and two glebas with MAT are characterized as being more related to the VBI. This data shows an intermediate character of these production systems, between VCO and VHV, which can also be seen by the centroid positions in table 2. This configuration may indicate the fulfillment of the objectives of adopting the biodynamic system, considering specifically the environmental aspect, since this system advocates the development and health of plant species from the integration with soil quality, expressed by the greater presence of biomass and capture and transmission of energy through biodynamic preparations (HERRENKIND, 2006).

IV. FINAL CONSIDERATIONS

The cultivation and management of the vineyards has led to important changes in the chemical characteristics of the soils. The effects were basically related to the use of correctives and fertilizers, especially those of higher solubility and faster availability for the plants. These were the cases of pH, higher in VCO, as well as the levels of P, Cu and Zn, the latter may even generate toxicity and losses by erosion or leaching.

On the other hand, the organic matter contents were directly influenced by the maintenance of biomass and biodiversity in the areas, resulting in the contribution and accumulation of organic material from the soil. This process occurred in a similar way in VHV and VBI slabs, with significant differences from the VCO. The joint analysis of the

attributes showed an intermediate condition of the VBI in relation to the VCO and VAT, confirming the tendency of loss of the initial characteristics of the soil from the cultivation, but maintaining several attributes in a condition closer to that observed under natural vegetation.

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Law Sources and CCS (Carbon Capture and Storage) Regulation in Brazil

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Abstract— *The present paper proposes a reflection on sources of law and regulation of Carbon Capture and Storage (CCS) activities in Brazil, considering the current framework in the country and to point out the need for interpretation processes based on the general principles law, comparative law and analogy for the application of law and its transformation into an efficient reality.*

Keywords— *Sources of law, Regulation, Carbon Capture and Storage (CCS).*

I. INTRODUCTION

The world of being often brought up the need for norms for the creation of the world of being (REALE, 2018). Legal awareness for the conversion of technical and scientific data and social utilities/needs in the context of climate change mitigation requires the delimitation of norms and rules that include the specificities of human activities.

Among these, we highlight in this article the novel Carbon Capture and Storage (CCS) activity, which in Brazil still lives its threshold, without conditioning norms. Therefore, thinking about the world of duty to be for CCS activities requires compliance with the law, with the stipulation of rules containing at least definitions of CO₂ ownership, with their respective rights and obligations, the role of competent regulatory authorities, the main requirements for environmental licensing, and its long-term liability allocation.

This paper proposes a reflection on sources of law and regulation of CCS activities, assuming that every source of law implies a normative structure of power and considering that there are four forms of power to be considered here, the Legislative power, the Judiciary power, Social power and bargaining power. Thus, the sources considered will be the legislative process, jurisdiction, legal uses and customs (here expressing the anonymous decision-making social power of the people) and the negotiating source or autonomy of the will.

Reflecting on the sources of law and the legal situation of CCS activities in Brazil makes it possible to analyze the existing framework in the country and to point out the need for hermeneutic processes based on the general principles of law, comparative law, and analogy for the application of law and its application. Transformation into efficient reality. It also enables the detection of overlaps

and gaps and the development of advances aimed at carrying out CCS activities in the country.

II. GENERAL LAW OF BRAZILIAN STANDARDS AND INTERPRETATION METHODS

An important point for the systematic understanding of the scope of the laws is repeal. It is the suppression of the obligatory force of the law, removing its effectiveness. The repeal of the law (gender), in its extension, can be of two species, total (abrogation) or partial (derogation). A law is repealed by another law, so revocation must emanate from the same source that approved the repealed act.

If the norm is constitutional in nature, only by the process of amendment to the Constitution can it be modified or revoked (CF, art. 60). A decree is repealed by another decree but can be repealed by the law, which is of higher hierarchy and the new law that repeals the previous one also repeals the decree that regulated it. This is the principle of hierarchy, it does not tolerate that an ordinary law survives a constitutional provision that contradicts it or that a regulatory norm subsists in offense to the legislative provision.

What characterizes the unexpressed revocation is the incompatibility of the new provisions with the existing ones, in which case the chronological criterion of the prevalence of the most recent applies. In addition, the specialty criterion is applied when a special rule overrides the general when it disciplines the same subject differently.

This is of particular importance to our study when the real antinomy occurs, that is, when the conflict between norms cannot be resolved by the use of the above criteria, and the predominant norm through mechanisms to fill the gaps must be determined. of the law (LINDB, arts. 4 and 5).

III. THE INTEGRATION OF LEGAL RULES

The legislator cannot predict all situations for the present and the future, because the law is dynamic and in constant motion, following the evolution of social life, which brings new facts and conflicts. This causes situations that are not specifically foreseen by the legislature and which demand resolution by the judge. Since the latter cannot refrain from making a decision under the pretext that the law is silent, it must make use of the mechanisms intended to fill the gaps in the law, leaving no case unresolved, given the logical fullness of the law, which are : the analogy, the customs and the general principles of the law.

Thus, according to Article 140 of the Code of Civil Procedure: "The judge does not exempt himself from ruling on grounds of lacuna or obscurity of the legal system." And yet, when the law is silent, according to article 4 of the LINDB "the judge shall decide the case according to the analogy, customs and general principles of law." The judge will only decide for equity in the cases provided for by law (CPC, art. 140, sole paragraph).

The distinction between analogy and extensive interpretation is necessary. The latter consists in extending the scope of the same rule to situations not expressly provided for, but understood by its spirit by a less literal interpretation. Gonçalves (2018) cites the example of article 25 of the Civil Code in which one can extend to the spouse the legitimacy conferred on the absent spouse to be their healer.

The analogy, in turn, implies recourse to another rule of the legal system because of the lack of an appropriate rule to solve the specific case. Gonçalves (2018) points out that the refusal to analogy is not unlimited, it cannot be applied in criminal law, except to benefit the defendant, nor in exceptional or exception laws or tax laws that impose taxes (CTN, art. 108, §1).

The use of analogy requires the presence of three requirements: a) the inexistence of a legal provision foreseeing and disciplining the hypothesis of the concrete case; b) similarity between the relationship not contemplated and another regulated by law; c) Identity of logical and legal foundations in the common point between the two situations.

It is customary to distinguish the legis (legal) analogy from the juris (legal) analogy. The first is the application of an existing standard intended to govern a case similar to the one foreseen. Its source is the isolated legal rule, which is applied to identical cases.

In the case of CCS, the possibility of applying the Solid Waste Act. The second form of analogy, namely the analogy juris (legal) is based on a set of rules, to obtain

elements that allow their application to the case unforeseen but similar, being more complex process, which seeks the solution in a plurality of norms, in an institute or in the collection of legislative diplomas, transposing the thought to the controversial case, under the inspiration of the same assumption.

Another distinction that deserves to be pointed out is that between analogy and equity. Equity is not a supplementary means of law's gap, it is not confused with equity in its broad sense, that which is confused with the idea of justice, in the strict sense is employed when the law itself expressly creates spaces or gaps for the judge (and here we mean the operators of the law in general) to formulate the most appropriate norm to the case. According to article 140 of the Code of Civil Procedure, "the judge shall only decide for equity in the cases provided for by law".

The costume rules are, secondarily to the law, also a supplementary source in our legal system, and the judge should resort to it after the possibilities to fill the gaps with the analogy are exhausted. It will not be necessary to make much comment on this because CCS activities in the Brazilian context do not contain the elements that make up the custom, namely: the repeated use or practice of behavior and the conviction of its obligation.

In case there is no solution in analogy or custom, the judge should seek the general principles of law for the supply of gaps. These are rules that are in the consciousness of peoples and are universally accepted, even unwritten, and their generic character guides the understanding of the legal system, its application, and integration, whether or not included in positive law (GONÇALVES, 2018).

For Maximiliano (2017), it is not enough to know the applicable rules to determine the meaning and the scope of the texts, they must be brought together in a harmonic whole, in a logical chain, offering them for study. "What is a clear law?" Answers Maximiliano (2017), which is the one whose meaning is expressed by the letter of the text. However, the lawyer points out that, to know if this happens, one must know the meaning, that is, interpret. Thus, for him, to conclude that there is no clear intention behind a clear text denatured by improper expressions, it is necessary to perform prior interpretative work.

The author goes on to say that sometimes when at first glance a device is translucent, it may be the pure personal, contingent impression with no solid foundation.

We must remember that the text of the general rule almost never fails to foresee the existence of exceptions. Thus, a law article should be evaluated by confronting it with others, applying the systematic process of

interpretation, studying the norms together, in the variety of their relations and the richness of their developments, adapting the old formulas to the contingencies of the present time. , using the juridical-social valleys (MAXIMILIANO, 2017).

According to Maximiliano, the rigidity of the norm is a necessary evil. It is up to Hermeneutics precisely to find the means of applying to wealth, to the infinite variety of real-life cases to the multiplicity of human relations, the objective and rigid abstract rule (MAXIMILIANO, 2017).

To this end, the author teaches (MAXIMILIANO, 2017) that to achieve the scope of all objective law, one must examine: a) the norm in its essence, content, and scope; b) the specific case and its circumstances; c) the adaptation of the precept to the hypothesis under consideration.

And yet, the adaptation of a precept to the specific case presupposes: a) Criticism, in order to ascertain the authenticity and then the constitutionality of the law, regulation or legal act; b) interpretation in order to discover the meaning and scope of the text; c) filling the gaps with the aid of analogy and the general principles of law; (d) consideration of possible questions on abrogation, or simple derogation of precepts, as well as on the authority of the express provisions, with respect to space and time.

According to Gonçalves, the requirement of greater certainty and security for legal relations has been provoking the supremacy of the law, the written rule emanating from the legislator, over other sources, even being considered the primary source of law. Thus, according to the author, legislation is the process of creating written legal norms of general observance, and therefore the legal source par excellence and the formal source is a different activity, the means by which the legal norm is legitimately positive. mandatory (GONÇALVES, 2018: 51).

Thus, the word “law” used in the broad sense is synonymous with a legal norm, comprehensive of every general rule of conduct, encompassing all acts of authority, such as the laws themselves, decrees, regulations, etc. (GONÇALVES, 2018). Strictly speaking, it only indicates the legal rule elaborated by the Legislative Power, by means of an adequate process, “an act of the legislative power that establishes norms of social behavior and, to be effective, must be promulgated and published in the Official Gazette, an ordered set of rules that presents itself as a written text”(AMARAL apud GONÇALVES, 2018).

For Venosa, the law is “a general rule of law, abstract and permanent, endowed with sanction, expressed by the

will of the competent authority, of an obligatory nature and written form” (VENOSA 2001: 33).

Its main characteristics are: generality (addressed to all citizens, indistinctly); imperative (when it requires action, imposes, when it wants an abstention, prohibits); authorization (authorizes the injured party for the violation to demand compliance or reparation for the wrong caused, legitimizing the use of the ability to coerce); permanence (not exhausted in one application and endures until revoked by another law); emanation of competent authority (the legislator is in charge of dictating the laws but has to observe the limits of competence provided for in the Federal Constitution) (GONÇALVES, 2018).

For Diniz, (DINIZ apud GONÇALVES, 2018: 52) the formal legal source “is the legislative process, which comprises the elaboration of all normative categories referred to in article 59 of the new Charter. As the law regulates its own creation or elaboration, the legislative process is foreseen in the Federal Constitution”.

Thus, the latter are edited by the Executive Power (CF, art. 84, XXVI), which exercises normative function, in the cases provided for in the Federal Constitution and will lose their effectiveness since the edition. If they are not converted into law within sixty days, extendable only once for the same period, and the National Congress shall discipline, by legislative decree, the legal relations arising therefrom (DINIZ apud GONÇALVES, 2018).

IV. INTERPRETATION METHODS: APPLICATION AND INTERPRETATION OF LEGAL RULES

Norms are generic and impersonal and contain an abstract command not specifically referring to concrete cases. When the fact is typical and fits perfectly into the abstract concept of the norm, the phenomenon of subsumption occurs. However, there are cases in which such framing does not occur, and the judge does not find any rule applicable to the sub judice hypothesis, and the normative integration must proceed.

In order to verify if the norm is applicable to the case under judgment (subsumption) or if it should proceed to normative integration, the judge tries to discover the meaning of the norm, interpreting it. To interpret is to discover the meaning and scope of the legal norm. For adherents of subjective interpretation, what is researched is the will of the legislator expressed in the law. Such a conception has not been accepted, because when the norm is old the will of the original legislator is usually surpassed (GONÇALVES, 2018).

For the same author, objective interpretations and free research of law are the most accepted. Objective

interpretation holds that it is not the will of the legislator that is intended, but the meaning of the norm, for the law separates from the author and attains objective existence. The free research, on the other hand, maintains that the judge must interpret it according to the moral and social legal conceptions of each era (GONÇALVES, 2018).

Interpretation can be made by the methods: grammatical, logical, systematic, historical and sociological. As for the first, the Superior Court has already held that "the merely literal interpretation must give way when colliding with other methods of greater robustness and scientificity" (RSTJ, 56/152: 01). The rational or logical seeks to extract the various possible interpretations, to eliminate those that seem absurd and that lead to a contradictory result in relation to other precepts.

Systematics holds that a law does not exist in isolation and must be interpreted in conjunction with others, sometimes taking into account the book, title, chapter, section, and paragraph in which the norm is found, as to the context in which it is located. The historical interpretation is based on the investigation of the antecedents of the norm, the legislative process, in order to discover its exact meaning, as well as the investigation of the circumstances that guided its elaboration, of economic, political and social order, as well as the dominant thought when of their formation.

The sociological or teleological interpretation aims to adapt the meaning or purpose of the norm to the new social requirements (GONÇALVES, 2018) and is contained in article 5 of the LINDB, which states that "in law enforcement, the judge will meet the social purposes to which it is intended and the demands of the common good" (BRAZIL, LINDB). The various methods of interpretation do not operate in isolation, do not repel each other, but complement each other. Regarding CCS activities, sociological or teleological interpretation should be taken into account (GONÇALVES, 2018).

V. ROLE OF THE STATE IN SETTING STANDARDS AND THE IMPORTANCE OF CCS REGULATION

The elementary notion of law is the realization of orderly coexistence, in which binding rules and limits to the action of the members of a society direct social coexistence. In this way, the law would help to consider what can, what should and should not be done in terms of human behavior. Ordained coexistence translates into the "common good", which, strictly speaking, is the ordination of what each man can accomplish without prejudice to the good of others, a harmonious composition of the good of

each with the good of all. As Reale puts it, "No one can engage in an activity without a right of reason," meaning "limit" as the limit, measure, motive or cause. (REALE, 2018: 05). Thus, there is in every human behavior the presence, although indirect, of the legal phenomenon. When cultural laws involve taking a stand before reality implying the recognition of the obligatory behavior, we have what is called a rule or norm (REALE, 2018: 29).

In theory, it is on the basis of economic, sociological, historical, demographics, etc. appraisals or valuations that the legislator (or more generally, the politician) designs norms, sanctioning those he considers should be obeyed (REALE, 2018). And, taking into account the multiplicity of actors involved in the creation of mandatory rules or norms, one can observe the influences and influences that technique, sciences, and productive activities have on legal facts, and, more importantly for the purpose of this article, for legal facts of environmental relevance.

The reasoning is that in times of compromise of natural resources and quality of life on the planet and the consolidation of an ecologically balanced right to the environment, the normative moment of ethics is stored in physical-mathematical or natural and cultural data, sociological, historical, economic and, above all, ethics, in this path, an ethic for sustainability.

Taking as its starting point the "Manifesto for Life - For an Ethics for Sustainability" of the United Nations Environment Program (UNEP), this "ethics for sustainability" should inspire new legal and institutional frameworks that reflect, respond to and adapt to the global, regional, national and local character of ecological dynamics (UNEP, 2002).

The value of what is "useful-vital" implies a complex of human activities in commerce, industry, agriculture, and a range of activities engaged in the production, circulation, and distribution of wealth (REALE, 2018). Norms and rules previously existing to certain actions are, thus, conditions and tools of freedom of action, hence the danger of legal vagueness for actions that directly or indirectly interfere with the destinies of the environment.

The subject of climate change and global warming began to be part of the international agenda in the 1980s, based on scientific studies that indicated an increase in the concentration of carbon dioxide in the atmosphere, associated with an increase in terrestrial temperature. Climate change is the cyclical change that occurs in the general climate of the planet and is verified through scientific records (ABNT, 2018).

In 1985, the United Nations General Assembly assigned to the United Nations Environment Program (UNEP) the task of devising environmental strategies for

the year 2000 and beyond, with input from the World Commission on Environment and Development, with the role of preparing a report on the global environment.

The Commission made up of 21 participants “chosen in their personal capacity and not as government representatives”, was chaired by the Norwegian Prime Minister, Gro Harlem Brundtland (CMMAD, 1988). The 1987 report, “Our Common Future,” aims to include environmental considerations in development decision-making (CMMAD, 1988).

Thus, at the XV Session of UNEP's Board of Directors, the Board of Directors proposes the definition of “sustainable development”, which among other components stands out: “Sustainable development also implies the maintenance, rational use and enhancement of the resource base. natural resources that underpin ecosystem recovery and economic growth.” (CMMAD, 1988: XV)

The Intergovernmental Panel on Climate Change (IPCC), established in 1988 by the World Meteorological Organization (WMO), issued a report in 2015 highlighting risk aspects of climate change and the urgent need to take steps to increase the global average temperature in the world. The 21st century does not exceed 2 ° C, remaining within a “carbon budget” estimated at 200GtCO₂e (IPCC, 2015; MACEDO, 2017).

In 1997, the Kyoto Protocol supported the international community in an attempt to curb greenhouse gas emissions by 5.2% compared to 1990 levels. It is worth stressing that internationally recognized greenhouse gas emissions are greenhouse gases, regulated by the Protocol are Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulfur Hexafluoride (SF₆) and two gas families, Hydrofluorocarbon (HFC) and Perfluorocarbon (PFC).

Following the end of the Kyoto Protocol in 2016, the Paris Agreement was signed by 175 countries in New York City, coming into force in November of the same year, and establishes a carbon budget distributed among countries to ensure that the global average temperature does not exceed 2 ° C to 2,100. Brazil, the signatory, presented, through the Ministry of the Environment, a base document for the definition of the strategy to implement the country's commitments from 2020, according to the Nationally Determined Contribution (NDC) (MACEDO, 2017).

In September 2016, Brazil completed the Paris Agreement ratification process by delivering to the United Nations the official commitments to “reduce greenhouse gas emissions by 37% below 2005 levels by 2025, with a contribution indicative approach to reducing greenhouse

gas emissions by 43% below 2005 levels by 2030 ”(MMA, 2018: 03).

Along these lines, to achieve this goal, Brazil needs to think about and adopt technologies such as Carbon Capture and Storage (CCS), according to Almeida et al. (2017), which may represent a strategic alternative for CO₂ reduction, especially for the energy sector. Nevertheless, knowledge about this technology is still poorly consolidated among the country, as well as the regulation of these activities.

As one of the main alternatives for reducing CO₂ emissions, the CCS technique has gained prominence by the ability to permanently store high volumes of CO₂ in appropriate geological formations (ALMEIDA et al., 2017, p. 2.). The authors point out that the technique consists of injecting compressed CO₂ (in the supercritical state) into rocks such as sandstones, shawls, dolomites, basalts or coal. To become CO₂ reservoirs, in addition to maintaining proper porosity and permeability, these rocks must have a satisfactory seal and stable geological environment to avoid compromising the integrity of the storage site (ALMEIDA et al., 2017, p. . 2.).

Therefore, storage can be viewed as a mining activity or activity similar to the injection of fluids into oil and gas reservoirs for advanced recovery. Classifying it in one way or another has different effects on the legal order.

The data of nature becomes culture and the historical process enables the human race to become aware of the non-renunciation of certain values considered universal, the “axiological or evaluative variants” such as those concerning the dignity of the human person, the safeguarding of individual and collective life. and its elevation to a planetary vision in ecological terms (REALE, 2018).

Thus, it is expected to be the task of the Brazilian State to create a normative environment appropriate to the rules of CCS activity, both by the legal apparatus and by subsequent regulations. However, before the realization of this state purpose, we must address in this article, as follows, which standards currently exist in Brazil that can be launched and used by CCS entrepreneurs.

In carrying out the first approach based on analogy, there are mentions close to the activity of CCS in Article 22 Federal Constitution of 1988 (CF / 88), regarding the Union's exclusive competence to legislate on “deposits, mines, other mineral resources and metallurgy”; as in Article 23, at the time of the common administrative competence of the Union, States, Federal District and Municipalities to “protect the environment and combat pollution”, in addition to “registering, monitoring and

supervising the concession of research and exploitation rights of water and mineral resources in their territories ”.

In article 24 of the CF, which deals with competing for legislative competence, we can also see room for CCS activities, at the moment one sees “conservation of nature, protection of soil and natural resources, protection of the environment and control of pollution” and “liability for environmental damage”.

Another reference by analogy is found in art. 177, when we have the Union monopoly over the activities of the oil and natural gas industry and other fluid hydrocarbons, regulated by the Petroleum Law (Law 9478/1997) and the Pre-Salt Law (Law 12351/2010).

CCS's activities are supported by Article 225 CF which states: “Everyone has the right to an ecologically balanced environment, a common good of the people and essential to a healthy quality of life. to defend it and preserve it for present and future generations.”

In addition to the provisions of the Constitution, it is important to go through the legislative and normative framework. Starting with the Civil Code which prescribes full and exclusive ownership until proven otherwise (Art. 1,231). In addition, art. 1,229 thus says:

Ownership of the land covers that of the corresponding airspace and subsoil at height and depth useful for its exercise, and the owner may not object to activities carried out by third parties at such a height or depth as to be of no interest to him. legitimate in stopping them.

However, according to art. 1,230. “Land ownership does not cover deposits, mines and other mineral resources, hydropower potentials, archaeological monuments and other assets referred to in special laws.” Thus, in considering CCS activities as integral to the concept of deposits, mines, resources or other property, it can be understood that this property is not presumed, needs to be proven and does not necessarily fit as full.

Law No. 12,305, of August 2, 2010, establishes the National Solid Waste Policy. Therefore, by classifying the CCS activity as residual, there is the application of the principles, objectives and instruments provided for in this Law, as well as the guidelines related to integrated management and management, the responsibilities of generators and public authorities and the instruments applicable economic

If CCS activity is designed as hazardous, installation and operation is required and may only be authorized or licensed by the competent authorities “if the person responsible has demonstrated at least the technical and economic ability and conditions to provide care. waste management. ”(art. 37). Legal entities are required to prepare a hazardous waste management plan and submit it

to the competent agency of the National Environment System (SISNAMA).

However, CCS activity is not regarded as dangerous, since carbon leakage, besides causing the damage reported in session 3, consistent with the intensification of the greenhouse effect.

Under the Mining Law, there is Decree-Law No. 227/67, which defines as the Union's competence “to manage mineral resources, the mineral production industry and the distribution, trade and consumption of mineral products”. If carbon storage is considered mining, in this case, this activity is governed by this Code. by the Minister of State of Mines and Energy (art. 7). Therefore, in accepting CCS activities as within the mining profile, the subject matter within that specific legislation is governed.

On the other hand, if it is seen as a complementary activity to the oil and gas sector, the Petroleum Law will apply, with CCS being viewed as a form of advanced well recovery.

Anyway, all these choices and profiles followed the environmental legislation, drafted from the National Environmental Policy, as well as the Resolutions of the National Environment Council (CONAMA), which are: Resolution No. 237/97, which deals with environmental licensing and Resolution No. 001/86, on environmental impact.

VI. CONCLUSION

According to Reale (2018), one of the purposes of the law is to preserve and guarantee such values and those that diffuse them, to this end, the norms of law, while delimiting actions, guarantee actions in delimited social spaces. For the author, when the State issues a rule of law setting limits on the behavior of men, it does not aim at the negative value of the limitation itself, but at the positive value of the possibility of wanting something in the previously circumscribed sphere, acquiring the right the power. to limit to release.

Edgar Morin warns that the need for a planetary policy and a planetary decision-making body has given rise to conferences such as those in Rio de Janeiro, Kyoto, Johannesburg and Copenhagen, which confirmed alarmist diagnoses without yet being able to impose reform measures in the face of total collapse. in natural resources (MORIN, 2013: 103). It is up to each State to implement actions that shelter trans individual interests and guarantees, and Law, in view of its crucial role in responding to such demands, needs to immerse itself in its mechanisms of application and integration of norms. Legal sources in this sense play a fundamental role.

Sustaining ecosystem recovery and economic growth are assumptions that should guide the production, circulation, and distribution of goods and services, and the existence of norms confers positive value on economic growth by sustaining ecosystem recovery. And among the actions that aim to meet the criteria of sustainable development of ecosystem recovery, maintaining economic growth and mitigating undesirable effects of anthropogenic origin on the environment, such as climate change and ocean acidification, are carbon capture, storage, and transport activities.

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Influence of three Endodontic Filling Techniques in Filling Simulated Side Canals

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Abstract— Root canal filling is one of the stages of endodontic treatment that deserves special attention, being responsible for the final sealing, avoiding recontamination and reinfection in that space. The objective of this research was to evaluate in vitro the influence of three endodontic filling techniques in the filling of simulated lateral canals, these being the Lateral Condensation Technique, Continuous Wave Technique and Hybrid Tagger Technique. Thirty lower premolar teeth were used, which were divided into three groups ($n = 10$) for comparisons of filling techniques. The chemical-mechanical preparation was carried out with Protaper Universal rotary files, then lateral canals at the apical, medium and cervical level were made with an LN drill. The teeth were filled and evaluated with digital radiography considering the amount of simulated canals that were filled by the filling material. The results were subjected to statistical analysis using the non-parametric Chi-square test, in which a statistical difference was considered when $p < 0.05$. The lateral condensation technique showed the lowest results with a statistically significant difference ($p < 0.05$), when compared to the Tagger hybrid and continuous wave, however there was no statistical difference between the Tagger hybrid technique and continuous wave ($p > 0.05$). It was concluded that none of the three techniques was able to fill all the simulated lateral channels. The continuous wave technique presented the largest amount of pre-filled lateral canals, followed by the Tagger hybrid technique and lateral condensation.

Keywords— Lateral canals. Endodontic cement. Obscuration techniques.

I. INTRODUCTION

The various techniques, studies and discoveries that constantly gain space in the scientific scope with regard to —health, focus on ensuring this for the individual in a safe and effective way. Scientific research has a significant role, as it contributes to a safe clinical practice for both the patient and the professional. It is in this perspective that advances in the dental field occur as new research is published. Endodontics in turn brings with it a substantial part of these studies, which result in the development of various techniques and materials.

As described by Alonso et al. (2005), in order to be successful in endodontic treatment, it is significant that all its phases are performed with mastery, and within these phases is the root canal filling. The filling, despite being one of the last stages of endodontic treatment, deserves special attention since it is responsible for the final sealing of the root canal, which will act as a barrier against the occurrence of recontamination and reinfection in that space.

The filling of the root canal, after adequate cleaning through the instrumentation, occurs with the use of gutta-percha cones combined with the obturator cement. Gutta-percha fills the central space that was modeled. The filling cement fills the irregularities of the root canal, promotes a better adaptation of the gutta-percha cone to

the dentin walls and is responsible for filling the lateral canals (ALONSO et al., 2005). For Camões et al. (2007), the three-dimensional hermetic filling of the root canal system is essential, since it prevents the microleakage of the periapical exudate into the space of the canal, preventing reinfection and creating a biologically favorable environment for tissue healing to occur.

As mentioned by Rebouças et al (2013), the lateral compression technique has been the most used root canal filling technique in recent years, being a technique well dominated in practice by clinicians and endodontists as well as being used as a standard technique for comparing the filling of the root canals.

Lopes and Siqueira (2015) describes that the lateral compaction technique seems to have been initially proposed by Callahan in 1914, being a technique that uses accessory cones placed laterally to a main cone and that through the use of spacers the spaces are created for the placement of accessory cones.

In view of the complicated morphology of the root canal system, such as anatomical irregularities, curvatures, atresias and various branches that hinder the three-dimensional filling of this entire system, the plastification of gutta-percha has been recommended in different techniques. Thus contributing to the complete filling of the pulp space, seeking a sealing resistant to the

penetration of fluids and microorganisms in the root canal system (LOPES and SIQUEIRA, 2015).

The hybrid Tagger technique consists of a combination of cold lateral compaction, followed by gutta-percha thermoplasticization. After obturation of the apical segment by lateral compaction, the obturation of the middle and cervical segments is completed through the application of a compactor that is activated in the root canal, in a clockwise direction, generating heat by friction, plasticizing the gutta-percha and promoting the compaction. lateral and apical view of the filling material (LOPES and SIQUEIRA, 2015).

The continuous wave technique promotes a good filling of the root canal, it uses the thermoplasticized gutta-percha that fits in the dentin irregularities. For this, a heat generating device is used which, through a cable, takes this heat to the side condenser called pluggers. The same plasticizes and condenses the gutta-percha, filling the apical third and then the middle and cervical thirds are filled with the plasticized gutta-percha inside the root canal (LEONARDO and LEONARDO, 2017).

Obturation techniques play a substantial role in endodontics. Thus, knowing and evaluating the efficacy of filling techniques that promote adequate pre-filling of lateral canals is significant for a good prognosis for endodontic treatment.

Therefore, this research aims to evaluate in vitro the influence of three endodontic filling techniques in the filling of simulated lateral canals.

II. METHODOLOGY

For the research, 30 lower premolar teeth were used, which were donated by patients and professional dental surgeons. After collection, the teeth were stored in a 1% thymol solution for 20 days before the start of the trial. All dental elements were radiographed (Schick - DMM Health - Brazil) and one week before the test, they underwent scraping with periodontics curettes (Millennium-Golgran, São Paulo -SP) to remove the remaining periodontal ligament (Figure 2) and prophylaxis was performed using a Robson brush (Microdont, São Paulo - SP) pumice stone and water.

After cleaning, the crown section of the teeth was performed, with a diamond tip (Dentsply / Maillefer, Ballaigues - Switzerland) in a high-speed motor (Kavo - Brazil) cooled with air / water spray. The length of the roots was standardized at 15mm with the aid of a digital caliper (MTX, Curitiba - PR).

For instrumentation, visual dentometry was determined. A file type K # 10 (Dentsply / Maillefer, Ballaigues - Switzerland) was introduced in each canal, until its visualization in the apical foramen.

The instrumentation was performed using ProTaper Universal rotary files (Den-tsply / Maillefer, Ballaigues - Switzerland) coupled to the X-SMART endodontic engine (Dentsply / Maillefer - Switzerland). The files used were SX in the cervical and middle third and S1, S2, (Figure 7) F1, F2, F3 at the determined working length.

After the chemical-mechanical preparation, lateral canals were made with an LN drill (Dentsply / Maillefer, Ballaigues - Switzerland) on all teeth (figure 9), 6 lateral canals, 3 on the mesial and 3 on the distal, 1 in each third (cervical, middle and apical).

During the cleaning and shaping of the root canals, they were irrigated at each instrument change with NaOCl 2.5% (Formula Mais, Palmas - TO) in a total of 20 ml of solution per experimental unit, 1 mm below the working length. After instrumentation, passive ultrasonic irrigation was performed (figure 10). As described by (Van der Sluis, 2010), using the 20.1 irrisonic insert (Helse - Brazil), inserting it 2mm of the working length at a frequency of 30,000 Hz. 3 cycles of 20 seconds were performed with NaOCl 2, 5% (5 ml), 3 20-second cycles with 17% liquid EDTA (5 ml) (Formula and Action - São Paulo - SP), proceeding with another 3 20-second cycles with 2.5% NaOCl (5 ml). Then, the canals were dried with an aspiration cannula and with absorbent paper tips.

After chemical-mechanical preparation, the teeth were divided into three groups at random to perform filling techniques. In group 1 the lateral compression technique was performed, in group 2 the hybrid Tagger technique and in group 3 the continuous wave technique. In the three experimental groups, Sealer 26 cement (Dentsply / Maillefer, Munich - Germany) was used.

Sealer 26 cement was spatulated on a glass plate, adding the powder gradually to the resin, until a smooth and homogeneous mixture was obtained which, when lifted using the spatula, breaks at a height of 1.5 to 2.5 cm above the glass plate. It's ideal proportion is approximately two to two to three parts of powder to one of resin per volume (LOPES and SIQUEIRA 2015). The filling cement was mixed in a glass plate with a flexible metallic spatula (Golgran, Millennium - Brazil).

GROUP I: Lateral condensation technique

The completion of the filling technique in this group was as described by Lopes and Siqueira (2015), where the sequence was followed:

Selection of the digital spacer; Selection and calibration in the CT (working length) of the main cone of gutta-percha (Tanari, Manacapuru - AM); Disinfection of gutta-percha cones in 2.5% sodium hypochlorite solution for 10 minutes; Main cone test where visual inspection and tactile criteria were performed since the main cone should

lock in the CT; Drying the flue with absorbent cones # 30, preparing Sealer 26 filling cement (Dentsply / Maillefer, Munich - Germany); Placement of the main cone wrapped in the filling cement; Lateral compaction with digital spacers and placement of accessory cones; Cut the gutta-percha close to the pulp chamber with a heated compactor in a lamp, followed by final vertical compaction with cold pressers.

GROUP II: Hybrid Tagger Technique

In this group, following the Tagger hybrid technique protocol described by Lopes and Siqueira (2015):

Selection and calibration in the CT (working length) of the main gutta-percha cone (Tanari, Manacapuru - AM); Disinfection of gutta-percha cones in 2.5% sodium hypochlorite solution for 10 minutes; Drying the flue with absorbent paper cones # 30, preparing Sealer 26 filling cement (Dentsply / Maillefer, Munich - Germany); Adaptation of the main cone in the root canal in the working length (CT) wrapped in Sealer 26 cement (Dentsply / Maillefer, Munich - Germany); Lateral compaction of the apical segment using accessory cones (Tanari, Manacapuru - AM); Cutting excess gutta-percha outside the root canal; Insertion of the digital endodontic spacer (Dentsply / Maillefer, Ballaigues - Switzerland), followed by the immediate insertion of the compactor in the established space.

The McSpadden 040-21mm condenser (Dentsply / Maillefer, Ballaigues - Switzerland) was attached to a low-rotation contra-angle and inserted into the root canal to the point where it encountered resistance, and then it was retracted about 1mm and turned clockwise. After 1 second, the compactor was driven in an apical direction for 1 to 2 mm, being then removed from the root canal with gentle lateral pressure. After that, the filling mass was compacted at the mouth of the root canal with Schilder condensers (Odous De Deus - Brazil), preceded by the removal of remnants in the pulp chamber. Then, the pulp chamber was cleaned.

GROUP III: Continuous wave technique

This technique was performed in two stages: Downpack and Backfill. The device Termo Pack II (Easy, Belo Horizonte - Brazil) was used, following the manufacturer's recommendations.

Below is the sequence performed following the description of Lopes and Siqueira in 2015 for this technique:

Selection and calibration in the CT (working length) of the FM gutta-percha cone (Tanari, Manacapuru - AM); Disinfection of gutta-percha cones in 2.5% sodium hypochlorite solution for 10 minutes; Drying the flue with absorbent paper cones # 30, preparing Sealer 26 filling cement (Dentsply / Maillefer, Munich - Germany); Positioning of the main cone wrapped in the filling cement in the root canal. Cut the outer portion of the cone with the heated plugger condenser.

1st Stage: Downpack

The plugger condenser was inserted in the thermo condenser, inserted in the canal, heating the gutta-percha until reaching a depth of 5mm below the working length, with a temperature of 200 ° C; After 5 seconds with laterality movements, it was removed from the inside of the root canal, breaking the gutta-percha; The 40/80 condenser instrument (Easy, Belo Horizonte - Brazil) was used to condense the apical plug.

2nd Stage: Backfill

The thermal injector left the gutta-percha preheated to 180 ° C, the metal tip was then selected, being 5 mm from the actual working length; 2/3 of the canal was filled with heated gutta-percha; Condensation of gutta-percha with a Paiva condenser (Gol-gran / Millennium - São Paulo - SP).

After the filling techniques were performed, the dental elements of the three groups were stored in a humid environment (37 ° oven), inside a box with a gauze base moistened for 15 days to allow the cement to set. After these days, the teeth were radiographed through digital radiography (Schick - DMM Health - Brazil) for the quantification of the lateral canals filled in each technique tested in this research.

Analysis of digital images

Digital radiographs were taken in the vestibule-lingual position using digital x-ray (Schick - DMM Health - Brazil). These images were evaluated and the pre-filling of the lateral canals was counted using two previously calibrated examiners. Where, the channels presenting their complete filling (radiopacity of the filling material within the canals) were considered as filled, and the others not completely filled (radiolucency within the canals) as not filled (figure 01).

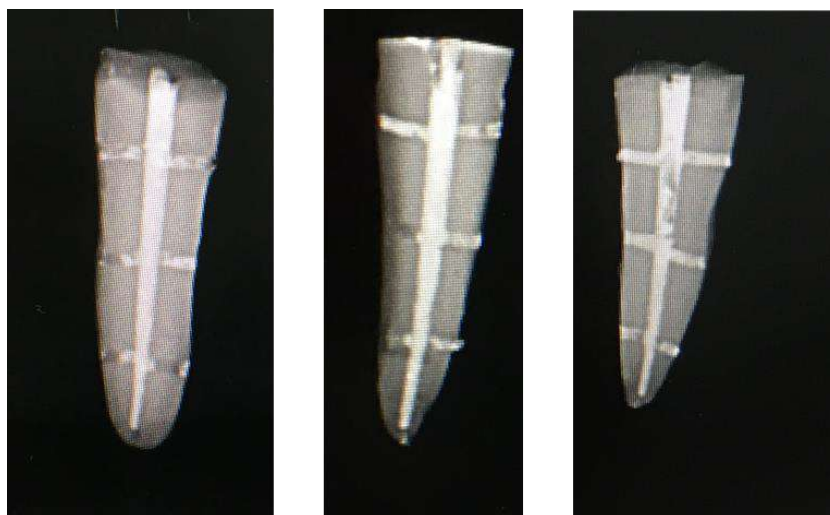


Fig.1: Radiographic images of the filled teeth: A - Lateral compression technique; B - Tagger hybrid technique; C - Continuous wave technique.

Source: Own authorship

STATISTICAL ANALYSIS

The efficacy of the filling of these canals was assessed by means of digital radiography and classified considering the number of simulated canals that were filled with the filling material at different heights. Tables were made from the observation of the radiographs and later the results were submitted to statistical analysis, using the non-parametric Chi-square test, in which the statistical difference was considered when $p < 0.05$, according to the same method

used by Rebouças et al. 2013, when he also evaluated the filling of lateral canals using different techniques.

III. RESULTS

The results showed that the lateral condensation technique presented most of the canals that were not filled (Table 1), and that it presented the largest number of canals in the middle third at the level of 7 mm on the left.

Table 1. Lateral Condensation Technique (Group I) - filling of lateral canals

Teeth	11mm	11mm	7mm	7mm	3mm	3mm
	Left	Right	Left	Right	Left	Right
1	yes	no	yes	no	no	yes
2	no	no	yes	yes	no	no
3	yes	no	yes	yes	yes	yes
4	yes	no	yes	yes	no	no
5	yes	yes	no	no	no	no
6	no	no	no	no	no	no
7	no	yes	no	yes	yes	yes
8	yes	yes	no	yes	no	no
9	no	no	yes	yes	yes	yes
10	yes	no	yes	yes	yes	yes

Source: Own authorship

The hybrid Tagger technique performed better than the lateral condensation technique, with the filling of most canals at the cervical level (Table 2).

Table 2. Hybrid Tagger Technique (Group II) - filling of lateral canals

Teeth	11mm	11mm	7mm	7mm	3mm	3mm
	Left	Right	Left	Right	Left	Right
1	yes	yes	yes	yes	yes	yes

2	yes	yes	no	no	yes	no
3	yes	no	no	yes	yes	yes
4	yes	yes	no	no	yes	yes
5	yes	yes	yes	no	yes	no
6	yes	yes	yes	no	yes	yes
7	yes	yes	yes	no	yes	yes
8	yes	yes	yes	yes	yes	yes
9	yes	yes	yes	no	no	yes
10	yes	yes	yes	yes	yes	no

Source: Own authorship

The continuous wave technique showed the highest frequency of lateral canals filled between the three techniques (Table 3).

Table 3. Continuous Wave Technique (Group III) - filling of lateral canals

Teeth	11mm	11mm	7mm	7mm	3mm	3mm
	Left	Right	Left	Right	Left	Right
1	yes	yes	yes	no	yes	yes
2	yes	yes	yes	yes	yes	yes
3	yes	yes	yes	no	no	yes
4	yes	yes	yes	yes	yes	no
5	yes	yes	yes	yes	yes	no
6	yes	yes	yes	yes	yes	yes
7	yes	no	yes	no	no	no
8	yes	no	yes	yes	yes	yes
9	yes	yes	yes	yes	yes	no
10	yes	yes	yes	no	yes	yes

Source: Own authorship

From these tables, the data were subjected to statistical analysis by the non-parametric Chi-square test. In the comparisons between groups, the lateral condensation technique showed statistically significant differences ($p < 0.05$) when comparing the Tagger hybrid technique only in the apical third (at 3 mm from the apex). There was a

statistically significant difference ($p < 0.05$) in the middle third (at 7 mm from the apex), between the lateral condensation and continuous wave techniques (Table 4). Among the hybrid Tagger and continuous wave techniques, no statistically significant differences were found ($p > 0.05$) (Table 4).

Table 4. Group I x II x III - Comparison between the same variables between groups

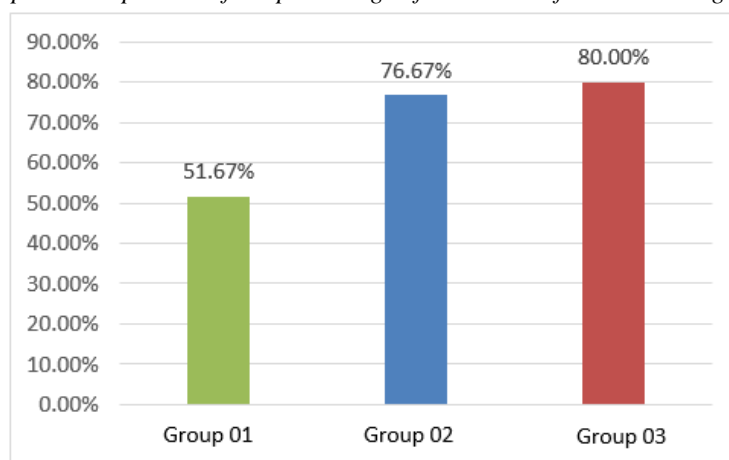
Distance from root apex	Cross	Statistical Significance Level
3 mm	Group I x Group II	$p = 0.0000^*$
3 mm	Group I x Group III	$p = 0.4167$
3 mm	Group II x Group III	$p = 0.0794$
7 mm	Group I x Group II	$p = 0.1786$
7 mm	Group I x Group III	$p = 0.0174^*$
7 mm	Group II x Group III	$p = 0.1190$
11 mm	Group I x Group II	$p = 0.4762$
11 mm	Group I x Group III	$p = 0.0666$
11 mm	Group II x Group III	$p = 0.6250$

* Represents statistically significant difference ($p < 0.05$)

Source: Own Authorship

Among the three groups, group III (continuous wave technique) showed the highest percentage of filled canals (Graph 1).

Graph 1. Comparison of the percentage of side canals filled between groups



Source: Own Authorship

Group I (lateral condensation technique), showed the lowest filling frequency among the other techniques performed here.

IV. DISCUSSION

It is significant to emphasize the importance of the root canal filling stage, considering that the final objective is the elimination of empty spaces previously occupied by the dental pulp, these spaces when not filled correctly can serve as niches for the proliferation of microorganisms. (Lopes and Siqueira, 2015). It is therefore substantial that the dentist increasingly acquires knowledge about the techniques and materials used in this phase of endodontic therapy, as it is a broad subject, and it is relevant to highlight the importance of research on this theme.

The complicated morphology of the root canal system, where the lateral and accessory canals are found, constitutes communication routes between the interior of the root canal and the periodontium. Therefore, several studies such as that by Silva et al. (2013) for example, which aims to address issues such as sanitation and the proper filling of these branches, has gained space within endodontics, considering that there are different techniques that are modified and created all with the intention of seeking the success of endodontic treatment.

The evaluation method chosen to be used in the present study was digital radiography. As mentioned by Rebouças et al (2013), greater speed and fidelity of the image are characteristics of digital radiography, thus being a method of comparative evaluation between filling techniques, as it is possible to have a good view of the distribution of the material. obturator along the entire length of the root canal.

The choice of using extracted human teeth instead of teeth or resin blocks was due to the fact that they

provide greater proximity to the anatomical variations of the root canal system. The drill used to make the simulated lateral canals was the LN (Dentsply / Maillefer, Ballaigues - Switzerland), because it has already been used in other studies such as that by Oliveira et al. (2018), and the ease of making the canals through these drills.

The simulation of simulated lateral canals has already been carried out in other studies using different methods, such as K # files with modified cutting tips, (MORGENTAL et al., 2008; RAYMUNDO et al., 2005), different from the present study in which a drill was used LN, being also a method already used in other research (Oliveira et al., 2018) aiming at the same objective. Notwithstanding, despite the different methods of making the simulated lateral canals, no research was found in the literature during the course of this study to make lateral canals in order to know which method would be the most suitable for this type of research.

The instrumentation technique chosen to be performed in this work was the rotary system through ProTaper Universal files (Dentsply / Maillefer, Ballaigues - Switzerland), as it is considered a fast execution technique in comparison with manual instrumentation techniques as mentioned by Lopes and Siqueira (2015), also taking into account the amount of teeth used in the research and the time in which we had to carry out the test. Other advantages, such as a greater taper and enlargement of the root canal, were taken into account, as it is a factor that favors, according to the same author, the selection of the main cone and the three-dimensional filling of the root canal.

The irrigation solutions have the function to contribute to the sanitation of the root canal through the antibacterial action and also contribute to the lubrication of the canal during the instrumentation, thus promoting an environment conducive to a better adhesion of the filling materials. Therefore, the most used protocols in the literature preconized the use of sodium hypochlorite (Neelakantan et al., 2015), the irrigating solution chosen to be used in this research was 2.5% sodium hypochlorite.

In order to have a greater standardization of the samples, the same filling material was used in all groups: gutta-percha cones (Tanari, Manacapuru - AM) and Sealer 26 filling cement (Dentsply / Maillefer, Munich - Germany). The insertion method of the obturator cement was the same in all groups so that it would not influence the results, being the insertion technique with the main cone.

The AH plus cement is considered the gold standard of endodontics, standing out for its characteristics such as radiopacity (LOPES and SIQUEIRA, 2015). However, the cement used in this research was Sealer 26, which is also considered a cement with excellent characteristics, contributing to a good sealing of the root canal branches. Despite this, one cannot rule out the hypothesis that the characteristics of the filling cement influence the flow and radiopacity of the filled canals.

The filling insertion technique can significantly influence the filling of lateral canals. As shown by Oliveira et al. in 2018, when he compared the insertion techniques of obturator cement in relation to the obturation of lateral canals, the one that showed the best results the insertion through the gutta-percha cone. Therefore, this is also the most used method in endodontics, being the one of choice in carrying out this research.

During instrumentation of the root canal, the formation of considerable amounts of cut remains consisting of very small particles of mineralized collagen matrix may occur, which we know as smear layer. The removal of this layer is necessary so that the adhesion of the filling material is not compromised, since the dentinal tubules will be properly unobstructed and properly cleaned. Therefore, the use of EDTA at 17% is considered quite effective (Nunes et al. 2008; Esteves et al. 2013), in the research EDTA17% was used together with ultrasonic activation in order to enhance smear removal layer, following the protocol of (Van der Sluis et al. 2010).

As emphasized by Van der Sluis et al. (2010) in their study, the use of passive ultrasonic irrigation (PUI) is important since it results in an increase in the temperature of the irrigant, bringing better results, with a better ability to dissolve tissue, remove tissue pulp, bacteria and smear layer when sodium hypochlorite is used as an irrigant.

Although the current filling techniques that recommend the use of thermoplasticized gutta-percha, are gaining space due to obtaining satisfactory results in filling the root canal system, the lateral compression technique remains the most used in recent years, being considered a technique standard for the comparison of filling between root canals, as highlighted by Rebouças et al (2013) and Lopes and Siqueira (2015).

Nevertheless, the lateral compaction technique does not promote a homogeneous mass such as that which we are able to obtain in the execution of the hybrid Tagger and continuous wave techniques, thus making the latter two promote a more three-dimensional filling of the root canal system. In the technique of lateral condensation, the filling of branches such as the lateral canals and accessories takes place by pressing the gutta-percha cone to the walls of the conduit, promoting the flow of the filling cement into the canals. As mentioned by some authors such as Miranda et al. (2013) and which is proven in research such as that of Brosco et al. (2003) and Silva et al. (2013) in which they demonstrate a better obturation capacity of lateral canals through techniques that use thermoplasticized gutta-percha.

Bramante et al. in 1999, he evaluated the filling of lateral canals using the technique of placing cement in the canal, using the standard technique of lateral compaction in the filling stage, the insertion of the filling cement with the gutta-percha cone showed satisfactory results when compared to others methods. In 2018 Oliveira et al. the same conclusion was also reached, with this it can be inferred that in this research the insertion method of filling cement may have contributed to the filling of the lateral canals, especially in the lateral compaction technique, considering that in the hybrid techniques of Tagger and wave continuous it was found that the canals were filled with gutta-percha together with endodontic cement.

From the results presented in this research, it was found that obturation using the continuous wave technique showed a higher frequency of obturation of the lateral canals in comparison with the hybrid techniques of Tagger and lateral compaction, in agreement with the study by Rebouças et al. in 2013, where he points out that in the lateral condensation technique the filling of the lateral canals was only due to the filling cement, which also occurred in this study. However, in the studies of Lima, Porto and Santos in 2004, it was found that between the techniques of continuous wave and lateral condensation the sealing capacity of the root canal was similar.

The hybrid technique of Tagger as proven by some authors (MORGENTAL et al., 2008; Raymundo et al., 2005), promotes a good filling of the lateral canals and is a relatively easy technique to perform, agreeing with this

study, in view that it presented better filling capacity of the lateral canals compared to the lateral condensation technique.

The Tagger continuous and hybrid wave techniques did not show statistically significant differences regarding the filling of simulated lateral canals in this study, also agreeing with the results found by Rebouças et al. in 2013, and Raymundo et al. in 2005.

Many of the studies, even using different methods of making artificial lateral canals, brought results similar to those found in this study. (MORGEN-TAL et al., 2008; RAYMUNDO et al., 2005; REBOUÇAS et al., 2013).

There is still little evidence of studies similar to this one, and because it is an in vitro study, it is worth highlighting the need for more research in order to conflict and consolidate the results obtained here.

V. CONCLUSION

It can be concluded from the results presented in the research that the Continuous Wave technique presented better capacity to fill simulated lateral canals, followed by the Tagger hybrid technique and lateral condensation. None of the three techniques was able to fill all the simulated side canals.

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Environmental Conservation Proposal (PCA) for the Casa Nova/BA paleodunar complex: a study with fishermen and riverine people from the São Francisco River

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Abstract— This work presents the results obtained from the execution of the Project entitled “Proposal for Environmental Conservation (PCA) for the paleodunar complex of Casa Nova with fishermen and riverine residents of the São Francisco River”. The objective was to prepare an Environmental Conservation Proposal (PCA) for that area, with the construction of the PCA and the elaboration of a Management, Control, Revitalization and Environmental Conservation Plan, based on the analysis of the natural and anthropogenic processes that permeate the ecosystem, interpreting the causes and consequences of the existing socio-environmental impacts, aiming at training inhabitants and fishermen on the riverside. It is a sustainable environmental technology that will be built from the knowledge and study of the area, its categorization and the indications proposed by the community (riverine and fishermen) of each area in the paleodunar ecosystem. The methodological bases that support such research are based on the Geosystemic Theory recommended by Sotchava (1977) and, the Ecodynamic Method elaborated by Tricart (1977), in addition to the GTP Theory (Geosystem - Territory - Landscape) defended by Bertrand and Bertran (2007), in the method the Geoecology of Landscapes (Rodriguez et al, 2010), the National Environmental Policy (1981), the National Environmental Education Policy (1999), and the Bardin Theory (2011) aimed at analyzing the content and discourse of the participants.

Keywords— Environment, Society, Nature, Paleodunas, Brazil.

I. INTRODUCTION

Most of its length, the Caatinga ecosystem is characterized by a hot and semi-arid climate (BSh), strongly seasonal, with less than 1,000 mm of rain/year, distributed in an irregular way. In contrast to the low and erratic rainfall, the potential evapotranspiration is very high, ranging from 1,500 to 2,000 mm/year.

As a result of this natural dynamic, the vegetation is subject to seasonal water deficiency, aggravated in the years with prolonged drought. Despite the harsh conditions, the caatinga biome presents a surprising diversity of environments, provided by a mosaic of vegetation types, (tree and shrub, dry and humid forest,

executioner, open formations with dominance of cacti and bromeliads, among others), in the areas of the highest and most varied relief.

The paleodunar complex in the municipality of Casa Nova in the State of Bahia/ Brazil, part of the Ecoregion Dunas and Veredas of the Lower Middle São Francisco, and belonging to the Environmental Protection Area (APA) Lago de Sobradinho. This complex has suffered numerous degradations over time, and is currently much more intensified, due to the overvaluation of tourism and trade. However, it is essential to demonstrate to the surrounding community, the riverside dwellers, fishermen and constituted authorities of the municipality, the origin

of this ecosystem, how it took millions of years to form, and how it will be impossible to be recovered, if the necessary measures are not taken now. In addition, the complex is an “open sky” laboratory for studies related to paleoenvironments, paleoventos, paleoeras and paleodunas.

By ecoregion, it is called a relatively large unit of land and water delineated by the biotic and abiotic factors that regulate the structure and function of the natural communities that are found there, therefore, it is a geographic block that encompasses several biological systems, diverse among themselves, but that differs from others in that they have large biotic processes that connect them in some way (VELLOSO; SAMPAIO; PEREYN, 2002).

According to Velloso; Sampaio and Pereyn (2002) the caatinga ecosystem is subdivided into eight ecoregions, namely: 1. Campo Maior Complex; 2. Ibiapaba Complex - Araripe; 3. Northern Country Depression; 4. Borborema Plateau; 5. Southern Country Depression; 6. São Francisco Dunes; 7. Chapada Diamantina Complex; 8. Raso da Catarina.

In this sense, this research aimed at the construction of an Environmental Conservation Proposal for the Casa Nova paleodunar complex, through the elaboration of a Management, Control, Revitalization and Environmental Conservation Plan, based on the analysis of the natural and anthropogenic processes that permeate the ecosystem, interpreting causes and consequences of the

existing socio-environmental impacts, aiming at training inhabitants and fishermen on the riverside.

The methodological bases that support such research are based on the Geosystemic Theory advocated by Sotchava (1977) and, the Ecodynamic Method developed by Tricart (1977), in addition to the GTP Theory (Geosystem - Territory - Landscape) defended by Bertrand (1997), in Politics National Environmental Policy (1981), the National Environmental Education Policy (1999), and Bardin Theory (2011) aimed at content analysis and participants' discourse.

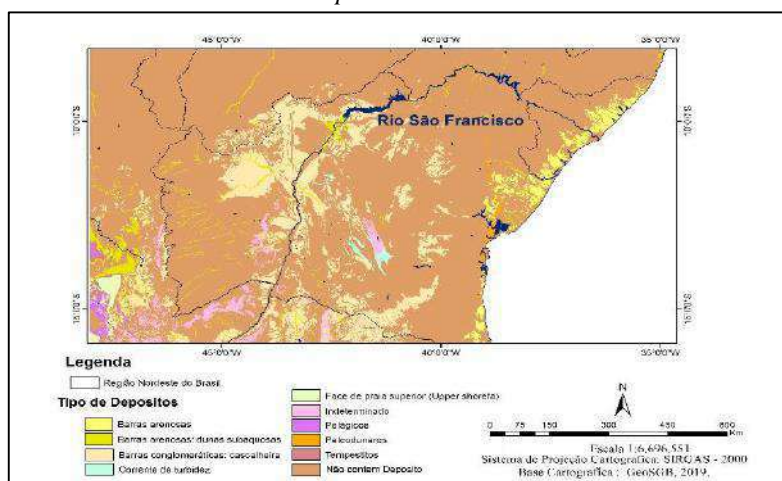
The main results found point to the essential need to demonstrate to the surrounding community, to the riverside dwellers, fishermen and constituted authorities of the municipality, the origin of this paleo-ecosystem, how it took millions of years to form, and to suggest suggestions on how it will be impossible to implement measures urgent conservation of the area through the environmental impacts already caused in the researched paleo-ecosystem, aiming to mitigate the impacts arising from the lack of socio-environmental management in the respective area, being urgent the implantation of a PCA.

II. MATERIALS AND METHODS

Location

The paleodunar complex in the municipality of Casa Nova in the State of Bahia/Brazil, part of the Ecoregion Dunas and Veredas of the Lower Middle São Francisco, and belonging to the Environmental Protection Area (APA) Lago de Sobradinho.

Map 1 – Research Location



Source: Pacheco (2020)

The municipality of Casa Nova/BA, is located at latitude 09°09'43 "S and longitude 40°58'15" W, in the Integrated Administrative Development Region (RIDE) of Polo Petrolina/PE and Juazeiro/BA. It has a semi-arid tropical climate, with an average annual rainfall of about

485 mm, with an average annual temperature of 25.4°C. Its altitude is 417 m (IBGE, 2010).

Research Typology

The methodological bases that support such research are based on the Geosystemic Theory recommended by Sotchava (1977) and, the Ecodynamic Method elaborated by Tricart (1977), in addition to the GTP Theory (Geosystem - Territory - Landscape) defended by Bertrand and Bertrand (2007), in the method the Geoecology of Landscapes (Rodriguez et al, 2010), the National Environmental Policy (1981), the National Environmental Education Policy (1999), and the Bardin Theory (2011) aimed at analyzing the content and discourse of the participants.

In 1973 Sotchava introduced the term geosystem to trace the physical-geographical sphere as a system. According to this author, geosystems are natural territorial system that are distinguished in geographic surroundings, in different dimensional orders, generally in the regional and topological dimensions. They are subsystems of geographic coverage, being itself a planetary-level geosystem (SOTCHAVA, 1977). Thus, geosystemic treatment aims, a priori, to integrate through a stage of analysis of natural and man-made variables.

Tricart's ecodynamic method, on the other hand, represents a relevant feasibility of applying the systemic method for the study of the dynamics of physical landscapes. For Tricart (1977, p. 32) "an ecodynamic unit is characterized by a certain dynamics of the environment that has more or less imperative repercussions on biocenoses". It also complements that "the concept of ecodynamic units is integrated into the concept of ecosystem".

However, environmental research for the geographer implies an understanding of the relationship between society and nature, taking into account the systemic method to explain about the elements that make up the geographical landscape, which results in a dynamic unit and its interrelationships between the physical elements, biological and anthropogenic. It was in this perspective that Bertrand and Bertran in 2007 developed a new conceptual framework for geosystem, which he called GTP (Geosystem - Territory - Landscape), where both can be analyzed separately, but are intrinsically integrated.

According to Rodrigues et al (2010), Landscape Geoecology provides the necessary foundations for the elaboration of theoretical and methodological bases of environmental planning and management. Therefore, it subsidizes the construction of models, such as the one built above, aiming at the incorporation of sustainability in the eco-environment management process, as in this case, dunes.

In this way, the theories described above served as a founding element for the elaboration of this project, so it understands that the basis of support for any research

needs to be supported by renowned theorists who have already validated research on this theme.

Starting from these premises and, according to Triviños (1987, p. 101), "the instruments used in the research, the questionnaire, the interview, among others, for the collection of information, are illuminated by the concepts of a theory". Based on this statement, it is important to emphasize that this research will use interviews with social actors, in addition to analyzing various aspects of its ecodynamic profile.

Based on the objectives, the aforementioned research is presented as descriptive, which aims to observe, record, analyze and correlate phenomena or facts, without interfering in the analyzed environment, being the most used type of research in the social sciences (VIEIRA, 2002; MALHOTRA, 2001).

However, as for the purposes, it is exploratory and activist, because it aims to carry out a bibliographic survey and interviews, in addition to providing greater familiarity with the problem, all of which is followed by an inventory. Thus, it is an exploratory, descriptive and activist research.

Exploratory because no scientifically produced information was found to meet the needs of the proposed research. Descriptive because it aims to meet and describe the actors of a specific market as well as understand their behavior for the formulation of strategies, as well as portraying the socio-environmental impacts that the ecoregion Dunas do São Francisco has been suffering for decades (VERGARA, 1988, p. 35). Activist because it also aims to inventory the paleodune region so that there is a preservation and restoration of the entire area affected by natural and, mainly, anthropogenic actions.

The object of this investigation is a geomorphological microportion of the northeastern semiarid (the paleodune fields), more precisely located in the Municipality of Casa Nova/BA, making this geographical boundary with the State of Pernambuco.

Based on these assumptions, the following path was traced to achieve the proposed objectives: initially, the theorists who approach the theories that served as a basis were read, as well as the authors who approach the processes that give rise to fields of fluvial coastal paleodunas. For that, there was a choice of scientific articles published in Scielo, Google Scholar and some books by renowned authors that deal with these issues using the following keywords: "paleodunas", "geosystemic", "semiarid", "ecosystems", "ecoregion". After reading, filing and discussion, he went on to field research.

In the field research, there was a systematic analysis of four parameters considered crucial: surface

structure of the landscape, land use, vegetation and surface processes. For each of the parameters mentioned, a categorical level of balance corresponds, numerically defined, in order to measure the intensity of the diagnosed processes in a macroscopic way, according to the classification of Tricart (1977). These levels will be categorized in an increasing order of environmental instability: 1. Stable areas; 2. Intergrade areas; 3. Strongly unstable areas. After searching for data in loco, they will be analyzed and discussed, where the obtained results will tell the level of stability of the research focus area.

For analysis and discussion of the research, the data obtained in the field were used and a comparison was made between the data found in the field and that discussed by the theorists listed as the basis for such research. That done, the PCA was developed for the paleo-ecosystem.

In addition, environmental actions were promoted on the spot with the participation of the riverside community involved in the research. Finally, the real situation of this fluvial landscape is concluded, thus

tracing the profile of the landscape and its degree of stability, perpetuated by an inventory so that there is a preservation and restoration of the degraded paleodune area, o it is one of the natural postcards from the Vale do Submédio São Francisco and why not say, from the Brazilian Northeast.

III. RESULTS AND DISCUSSIONS

The results of the obtained natural impacts indicate that the area of the studied paleodune fields has the three levels of stability recommended by Tricart (1977): stable, with dense vegetation cover (Figure 1a); intergrades that are in a transition phase between the stable and unstable environment (Figure 1b); and strongly unstable, presented in a degradation stage, without consistent vegetation cover and vulnerable to anthropogenic impacts (Figure 1c). For each environment characterized, a strategic plan for coexistence sustainability was indicated, that is, a proposal for the conservation of the ecoregion.

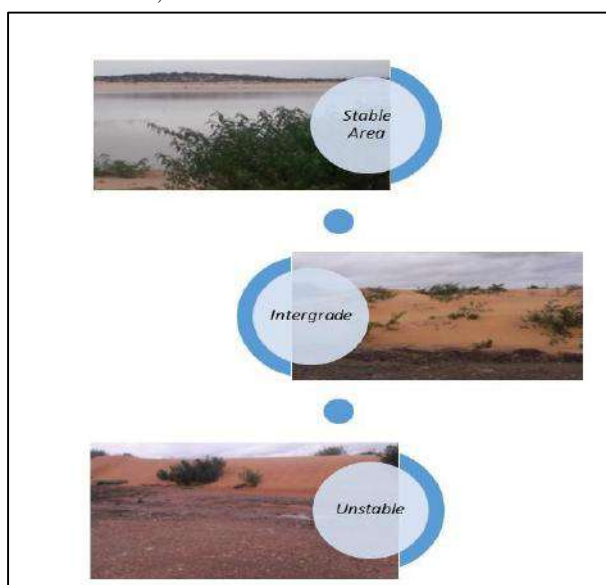


Fig.1: Categorization of Areas

Source: Pacheco (2019)

As for anthropogenic impacts, the following impacts were verified through on-site research (Figure 2):



Fig.2: Anthropogenic impacts
 Source: Pacheco (2019)

Regarding the environmental actions carried out in the Paleodunar Complex, the following was done: 1. Placement of recyclable dumps in the area of the Dunas of Casa Nova by the students of the school partner in the project; 2. Placement of environmental awareness plaques

in the Casa Nova Dunes area by students from the partner school; 3. Planting of native vegetation seedlings by riverside dwellers and fishermen in the Colony of Fishermen Z 42, as shown in figure 3.



Fig.3: Environmental actions in loco
 Source: Autores (2020)

In addition, there was a mobilization of the riverside fishermen community in the Colony of Fishermen Z42 of Casa Nova-BA, where they were discussed with them about the origin and relevance of the

paleodunar complex, as well as the São Francisco River for their economic survival. It also addressed the need for specific actions in loco, aiming at the conservation of local nature.



Fig.4: Explanation at the Fishermen's Colony

Source: Autores (2019)

There was also an analysis of social discussions at the meeting. Bardin (2011, p. 170) points out the discourse as “all communication studied not only at the level of its elementary constituent elements (the word for example)

but also and above all at an equal and superior level, to the phrase (propositions, statements, strings)”.

Finally, an Environmental Conservation Plan (PCA) was drawn up for each area [stable, intergrade and highly unstable] categorized in the complex.

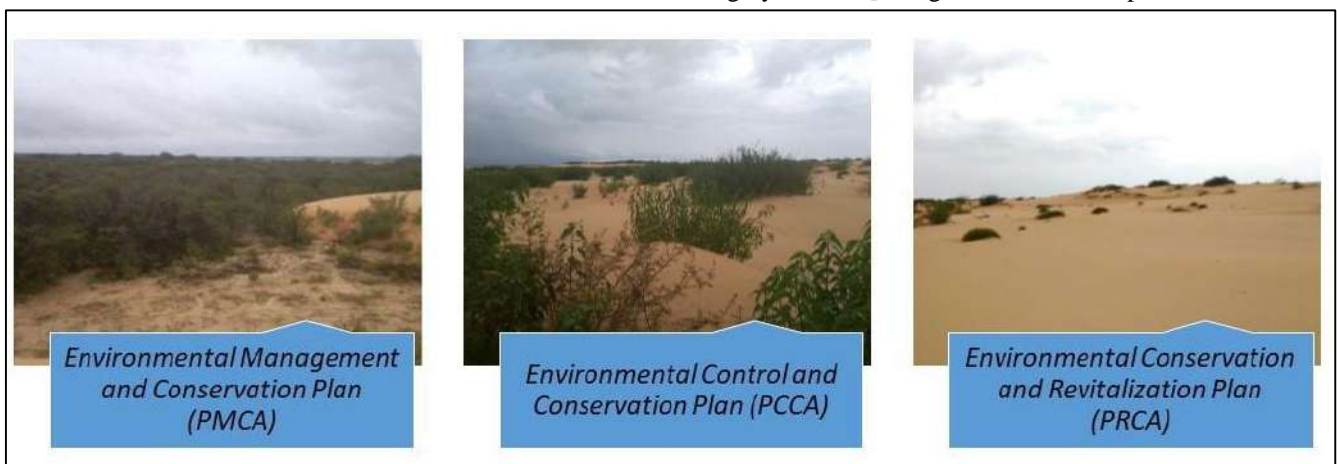


Fig. 5: PCA for the categorized área

Source: Pacheco (2019)

From analysis and observation in loco, it was possible to make an evaluation of the chosen area, characterizing it according to the classification of environments by Jean Tricart (1977). According to Tricart, the environment can be classified ecodynamically as

follows: a) stable means, b) intergraded means, c) strongly unstable means.

For Tricart (1977, p. 35) a stable medium or the notion of stability “applies to the modeled, to the atmosphere-lithosphere interface. Modeling evolves

slowly, often in an insidious way, hardly noticeable. Mechanical processes act little and always slowly ". Therefore, only precise measures, difficult to carry out, can put them in evidence. Morphodynamically stable media are found in regions with a series of conditions:

Vegetation cover sufficiently closed to oppose an effective brake to trigger the mechanical processes of morphogenesis;

Moderate dissection, without violent incision of water courses, without vigorous sapping of rivers, and slopes of slow evolution;

Absence of volcanic manifestations capable of triggering morphodynamic paroxysms of more or less catastrophic aspects (TRICART, 1977, p. 36).

Based on these assumptions, it is possible to state that the weaker the dissection intensity, the greater the complexity of the model and the soil, because the conditions will favor the permanence of relics. In this sense, it is not possible to visualize any stable cut in the researched place, on the contrary, below we show a small cut of an integrated area, according to the characterization of Tricart and that is part of the studied object.

It is also worth mentioning that the area of the Dunes of Velho Chico or "Paleodunar Complex of Casa Nova" is in a regrettable degenerative situation, due to the civilizing culture of the tourists who visit the area, making intervention necessary through the application of the PCA so that there is conservation and regeneration of the devastated area.

IV. CONCLUSIONS

About half of the landscape has been degraded by human action and 15% to 20% is in a high degree of degradation (with risk of desertification). "The region lost its natural wealth without generating wealth for the local population, still one of the poorest in the country", says biologist José Maria Cardoso da Silva, from the Federal University of Pernambuco (UFPE).

It can be concluded that the coexistence of the surrounding population with the eco-environment dunes is not sustainable and, therefore, there is no real concern with conservation. Many of them understand that dunes are just heaped sand and do not even know that they live in an area of environmental protection, and that they need to take care of the natural environment where they are inserted as social subjects. It is essential to have an intervention on the conservation of sand, before the implementation of what CONAMA (2012) [23] Resolution n. 10, December 1988, in its article 6.

It is crucial to consider the applicability and / or improvement of Environmental Education (EA) in the curriculum of local schools, considering that this is an

important tool to mediate the relationship of residents with the environment. Finally, it is of fundamental importance for the APA to implement the proposed conservation management (inventory the area in question) suggested for the three environments (characterized) existing in the ecoregion, in order to conserve what is still possible from the natural aspects and restore what it is already in an advanced state of environmental degradation.

Therefore, it is of great relevance to deepen our knowledge, in practice, about the ecosystem that we have in the Region in which we operate (Northeast), as well as to unveil the geomorphological, microclimatic, floristic and fauna diversity, in addition to diagnosing the socio-environmental impacts that such ecoregions of the caatinga have been suffering for decades, due to the natural and mainly anthropogenic action, in addition to inventorying this region so that there is a preservation and restoration of its ecosystem.

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Influence of Single Cone Techniques and Continuous Wave of Obturation on the resistance of Endodontic Cements union to Radicular Dentin

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Abstract— Endodontic obturation has the purpose to fill three-dimensional root canal system. The search for this objective resulted in the emergence of different techniques. The study proposed to evaluate, in vitro, the influence of Single Cone and Continuous Wave techniques on the adhesion of EndoSequence BC (Brasseler USA, Savannah, USA), Pulp Canal Sealer EWT (SybronEndo, Orange USA) and AH Plus (Dentsply, USA) to the dentinal walls of the root canals of extracted human teeth. Seventy-two human premolars were divided into 6 experimental groups ($n = 12$). The teeth were instrumented and obturated in a standardized way by means of the single cone technique or the continuous wave technique according to the specification of each group: a) EBC-OC Group: EndoSequence BC + Continuous Wave; B) PC-OC Group: Pulp Canal Sealer EWT + Continuous Wave; C) AH-OC Group: AH Plus + Continuous Wave; D) EBC-CU Group: EndoSequence BC + Single Cone; E) PC-CU Group: Pulp Canal Sealer EWT + Single Cone; F) AH-CU Group: AH Plus + Single Cone. The teeth were sectioned into approximately 1.0mm thick slices and the adhesion of the sealer to the dentin walls was measured using the push-out shear test. The failure mode was observed by visual inspection of a 12,5X magnification optics microscope. Data on union resistance by the group push-out test were submitted to statistical analysis by two-way ANOVA, post hoc and Mann-Whitney tests. There were no significant differences between the sealers when the Continuous Wave technique was employed ($p=0.783$); in the Single Cone technique the EndoSequence BC sealer had the highest bond strength, which was limited to the apical third, while the lowest bond strength values were attributed to the Pulp Canal Sealer EWT. The chi-square test revealed that the EndoSequence BC sealer showed an adhesive failure mode at the sealer/gutta percha interface in a proportion significantly higher than the Pulp Canal Sealer EWT, which, on the other hand, showed a predominance of adhesive failure mode at the dentin/sealer interface ($p < 0.05$). The single cone technique showed better adhesion of the EndoSequence and AH Plus sealers when compared to the continuous wave technique.

Keywords— Continuous Wave, Single Cone, endodontic sealer, push-out test, bond strength.

I. INTRODUCTION

One of the objectives of endodontic treatment is the three-dimensional filling of root canals, however, this objective is difficult to be achieved due to some variables, mainly related to the anatomical complexity of the root canals system and dentin irregularities. Various materials have been proposed for filling the intraradicular space and most techniques include a main material (commonly represented by gutta-percha) and an endodontic cement. Regardless of the choice of technique, cement is essential in filling, as it promotes sealing, thus preventing the infiltration of tissue fluids (Cohen, Hargreaves, 2011).

Among the many desirable properties for endodontic cement is the adhesive force both at the

cement-dentin interface and at the cement-gutta-percha interface. The cement must also have cohesive strength to maintain the filling set (Saleh et al, 2003). According to Grossman (1976), for an endodontic cement to be ideal, it is necessary to promote a good seal, have dimensional stability, have sufficient working time, be insoluble in contact with tissues and fluids, present adhesion and be biocompatible. However, there is no endodontic cement with all the ideal physical, chemical and biological characteristics available on the market.

Endodontic cements can be classified according to their composition into cements based on zinc oxide and eugenol, based on epoxy resin, based on calcium

hydroxide, based on silicone, based on methacrylate or based on silicate. calcium (Barbizam, 2006).

Cements based on zinc oxide and eugenol have been used for a long time (Grossman, 1976; Cohen, 2011), have good microbial activity and exhibit a long setting time. One of the cements based on zinc oxide and eugenol is the Pulp Canal Sealer EWT (SybronEndo, Orange, USA) which is widespread and commonly used among clinicians.

Presented in the form of paste, AH Plus cement (Dentsply, USA) is a resin cement, based on the epoxy amine resin. This cement has high radiopacity, low solubility, little contraction, good adaptation to the root canal walls, dimensional stability, antimicrobial activity and good biological behavior (AL-Kathar et al, 1995; Almeida, 1997).

Bioceramic cement, represented by the trademark EndoSequence BC is an endodontic cement that was launched, with calcium silicate, zirconium oxide, calcium phosphate, calcium hydroxide and thickening agents in its composition. To take prey it is necessary to have water in an environment such as the dentinal tubules. EndoSequence BC is described in the literature as having antimicrobial activity due to high pH, hydrophilicity, active diffusion of calcium hydroxide, in addition to being biocompatible (Zhou, et al. 2015). Cements based on tricalcium silicate, such as EndoSequence BC are hydrophilic, their properties are improved in the presence of moisture. A particularity of these cements is their potential to express bioactivity, with the ability to form hydroxyapatite during the setting process and, thus, join the filling material to the dentin (Loushine et al. 2011; Candeiro et al. 2012; Amir et al. 2016).

Gutta-percha, although widely used in filling the root canal system, has low adhesion and for this reason it is used with endodontic cement (Pommel et al. 2003). Modern filling techniques aim to obtain a smaller cement film and a greater amount of gutta-percha, since cement represents the fragile portion of the filling (Shilder, 2006).

The thermoplasticization of gutta-percha using the Continuous Wave technique is widely used, as this promotes the complete filling of the irregularities of the canals, in addition to practicality in the execution (DeLong et al. 2015).

The Continuous Wave technique aims to improve the filling result, as the heated gutta-percha promotes better adaptation to the canal. Its method of execution recommends the use of a single cone and a heat source, filling is performed by softening the gutta-percha and pressing with a heated presser foot, and its effectiveness can be measured by apical sealing and filling of lateral canals (Guess et al. 2003).

Viapiana et al. (2014) stated that, in addition to homogenizing the gutta-percha inside the canals, the thermoplasticization increases its density. However, when heat is applied to plasticize the main filling material, the cements are subjected to a drastic change in heat, which can alter their properties and cause damage around the dentinal tissues. Beltes et al. (2008) reported, in their research, that the increase in temperature did not affect the shear strength of a resin cement (AH26), on the other hand, observed the change in viscosity.

Few studies have evaluated the influence of the Single Cone and Continuous Wave techniques through the thermoplasticization of gutta-percha in the final result of adhesion of endodontic cements to dentinal walls. Therefore, there is a gap in the relevant literature on the subject, and it is relevant to study the issue.

II. MATERIALS AND METHODS

This research was initiated after it's approval by the ethics committee, with the number CAE:55581516300005374. For this work, 72 freshly extracted human uniradicular and circular premolars were used, which were distributed in six experimental groups of 12 specimens each. This choice was based on the result of the sample calculation and power test. The lower premolars were placed in a 0.1% thymol solution that was obtained directly from the patients (who needed extractions for therapeutic reasons) by explaining the research and signing the Free and Informed Consent Form (ICF). Radiographs in the mesio-distal and buccal-lingual directions were performed to confirm the presence of a single straight circular canal. Through the 8X magnification operating microscope, the absence of cracks, fractures and external apical resorption along the entire surface of each root was confirmed.

One week before the tests, the root surfaces were scraped and smoothed with periodontal curettes to remove any remaining periodontal ligament and were subjected to prophylaxis, using Robson's brush with pumice paste and water. After cleaning, the teeth were sectioned with a double-sided diamond disc attached to a straight chuck and micromotor, cooled with air / water spray. The length of the roots was standardized at 15 mm in the apex-cervical direction with the aid of a digital caliper.

For instrumentation, visual dentometry was determined. A file type K # 15 was introduced in each canal, until its visualization in the apical foramen. The working length was determined at 0.5 mm below the apical foramen.

Instrumentation was performed using ProTaper Next rotary files attached to the X-SMART engine. The files used were X1, X2, X3, X4 and X5 in order to obtain an

apical matrix corresponding to the diameter 50 / 0.6. The torque and speed of the rotating files were in accordance with the manufacturer's determination, with torque equal to 3.0 Ncm and speed equal to 300 min. The movement of the file was the entry and exit.

During the cleaning and shaping of the root canals, irrigation was performed at each instrument change with 2.5% NaOCl, in a total of 20 mL of solution per experimental unit, 1 mm below the working length. After instrumentation, passive ultrasonic irrigation was performed as previously described (Van der Sluis, 2010) using the Irrisonic insert (20.01), inserted at 2 mm of the working length at a frequency of 30,000 Hz. 3 cycles of 20 seconds were performed. with 2.5% NaOCl (5 mL), 3 cycles of 20 seconds with 17% liquid EDTA (5 mL), proceeding with an additional 3 20-second cycles with 2.5% NaOCl (5 mL). Then, the canals were dried with a suction cannula and capillary tip attached to a high-power suction cup and with # 50 absorbent paper tips.

The use of 3 different cements resulted in the creation of 6 experimental groups containing 12 teeth in each group (n = 12). The teeth were randomly distributed to form groups using a specific program (<http://www.random.org>)

- a) EBC-OC Group (n = 12): EndoSequence BC Cement + Continuous Wave
- b) PC-OC Group (n = 12): Cement Pulp Canal Sealer EWT + Continuous Wave
- c) AH-OC Group (n = 12): AH Plus Cement + Continuous Wave
- d) EBC-CU Group (n = 12): Cement EndoSequence BC + Single Cone
- e) PC-CU Group (n = 12): Cement Pulp Canal Sealer EWT + Single Cone
- f) AH-CU Group (n = 12): AH Plus Cement + Single Cone

The cements were spatulated or inserted into the root canal according to the manufacturer's recommendations. For the handling of the cements, a sterile glass plate and a flexible spatula number 24 were used.

EBC-OC Group: The EndoSequence BC cement was inserted with the aid of a syringe and insertion point in the channel according to the manufacturer's recommendations, a 50.06 gutta-percha cone was placed and then the portion was cut cone of the cone with the heated plugger condenser. The Continuous Wave Technique was performed following 2 steps: Downpack and Backfill (Christopher et al. 2005), for this purpose the Beta Main Device and Alpha II devices (figure 12) were used following the manufacturer's recommendations.

For the Downpack phase, which was carried out by the Alpha II device, the Plugger condenser was inserted in the thermocondenser, heating the gutta-percha until reaching a depth of 5mm below the working length at a temperature of 200 ° C (Christopher et al. 2005), it was waited for 5 seconds with a laterality movement and immediately afterwards it was removed from the interior of the canal, breaking the gutta-percha. The Condenser 40/80 instrument was used to condense the apical plug. For the Backfill phase, the Beta Main Device was used. The thermal injector left the gutta-percha preheated to 180 ° C, the 25-gauge metal tip was selected, which was 5mm from the actual working length, and the 2/3 of the canal was filled with heated gutta-percha using the gun, shortly thereafter, the heated gutta-percha was condensed with the Paiva condenser number 4.

PC-OC Group: The Pulp Canal Sealer EWT cement was handled following the manufacturer's guidelines and was inserted together with the main gutta-percha cone. The obturation technique used was the Continuous Wave already described in the EBC-OC group, using the Beta Main Device and Alpha II devices.

H-OC Group: The AH Plus cement (figure 14) was handled following the manufacturer's guidelines and was inserted together with the main gutta-percha cone. The obturation technique employed was that of Onda Continua already described in the EBC-OC and PC-OC groups, using Beta Main Device and Alpha II devices.

EBC-CU Group: The canals were filled using the Single Cone Technique, the 50.06 gutta-percha cone was used. The cement was EndoSequence BC, which has already been manipulated, according to the manufacturer's instructions, and was inserted into the mouth of the canal with the tip of the intracanal syringe, in an amount measured from one or two markings on the embolus. The gutta-percha cone was inserted slowly into the canal up to the working length, cut at the mouth of the channel with the Paiva condenser number 4 heated and condensed with the same cold instrument.

PC-CU Group: The canals were filled using the Single Cone Technique, the 50.06 gutta-percha cone (VDW, Munich - Germany) was used. The cement was the Pulp Canal Sealer EWT (SybronEndo, Orange USA) was mixed according to the manufacturer's recommendations. The cement was taken next to the main gutta-percha cone, cut at the mouth of the canal with the Paiva condenser number 4, heated and condensed with the same cold instrument.

AH-CU Group: The canals were filled using the Single Cone Technique, the 50.06 gutta-percha cone was used. The cement was AH Plus which was manipulated in equal portions of the pastes until the consistency of bullet

wire was obtained. The cement was taken next to the main gutta-percha cone, cut at the mouth of the canal with the Paiva condenser number 4, heated and condensed with the same cold instrument.

After filling, all teeth were stored in an oven with relative humidity of the air at about 37 ° C (figure 17), for a period of 30 days, to allow the complete setting of the endodontic cement, according to the protocol of aging followed by Rios et al. 2014.

The roots were individually positioned on acrylic plates and then fixed with sticky wax in order to allow a more precise cut (Guedes Filho, 2012).

Each root was sectioned perpendicularly along the long axis through the Diamond Wafering Blade High Concentration 4 "x .012 x ½ disc (102 mm X 0.3 mm X 127 mm) that was coupled to the metallographic cutter - Isomet 1000 in order to obtain a slice of approximately 1.0mm thick of the cervical, middle and apical thirds of each root. Right after each cut, the slices were identified with overhead pens, with different colors for each third on the face facing the cervical and kept in a humid environment according to the respective group and third for 24 hours.

For the extrusion resistance test, a slice of each third was subjected to an axial compression loading. The specimens were positioned on a stainless steel metallic base containing a 2.0mm internal diameter hole in the central region. The whole set was positioned on the base of the universal testing machine EMIC DL 2000 (figure 20) with a load of 100 Kilonewton (kN). The slices were arranged so that the load was applied in an apical to coronal direction, avoiding interference imposed by the root canal taper. A metal rod with an active tip of 1.0 mm for the cervical third, and 0.5 mm in diameter for the

middle and apical thirds was fixed on the machine and positioned in the center of the gutta-percha mass.

The shear strength test by extrusion was conducted at a speed of 1.0 mm / min until failure occurred. The required force was obtained in Kilogram-force (kgf) and converted to Megapascal (MPa) by dividing the force by the root canal area. The kgf values were multiplied by 0.0980655 which corresponds to the conversion factor from kgf to Newton (N) and the area will be calculated using the formula: $A = \pi (R + r) [h/2 + (R - r) 2] 0.5$, where π was the constant 3.14, R was the radius of the cemented gutta-percha facing the coronal region, r was the radius of the cemented gutta-percha facing the apical region and h was the thickness of the slice. The largest, smallest radius and thickness of each slice were individually measured using a digital calibrator. The results of the values obtained were tabulated in a data collection spreadsheet and submitted to statistical interpretation.

After the mechanical shear test by extrusion (push-out), the failure mode of each slice was analyzed using an operating microscope with 12.5X magnification and they were classified as: Adhesive at the cement / dentin interface; Adhesive at the cement / gutta-percha interface; Mixed, combination of the two adhesive failures and Without cement, if no cement was found in dentin and gutta-percha.

The statistical analysis of comparisons between cements as a function of root thirds was performed using two-way analysis of variance (two-way ANOVA) and a post hoc test that allowed "two by two comparisons" between groups, where significance was found statistic ($\alpha = 0.05$). To compare the two techniques used in each cement, the Mann-Whitney test was used.

III. RESULTS

Table 1. Arithmetic means, standard deviations and statistical analysis between the sample groups (MPa).

	EndoSequence BC		Pulp Canal Sealer EWT		AH Plus	
	OC	cone único	OC	cone único	OC	cone único
Cervical	0,37 ± 0,23	0,36 ± 0,29	0,45 ± 0,29	0,10 ± 0,09	0,90 ± 0,17	0,91 ± 0,20
	Aa	Aa	Aa	Ba	Aa	Aa
Medium	0,43 ± 0,29	0,24 ± 0,35	0,56 ± 0,40	0,15 ± 0,17	0,95 ± 0,57	0,95 ± 0,62
	Aa	Aa	Aa	Aab	Aa	Ba
Apical	0,40 ± 0,52	1,57 ± 1,07	0,47 ± 0,58	0,38 ± 0,47	0,79 ± 0,01	0,90 ± 0,18
	Aa	Ab	Aa	Bb	Aa	Aa
Total	0,40 ± 0,36	0,72 ± 0,89	0,49 ± 0,43	0,21 ± 0,31	0,54 ± 0,61	0,74 ± 0,56
	Aa	Ab	Aa	Bb	Aa	Ab

Obs: OC = continuous wave. Different capital letters in the totals indicate significant differences between cements, with the same technique, while different lower letters indicate statistical significance between techniques when the same cement was

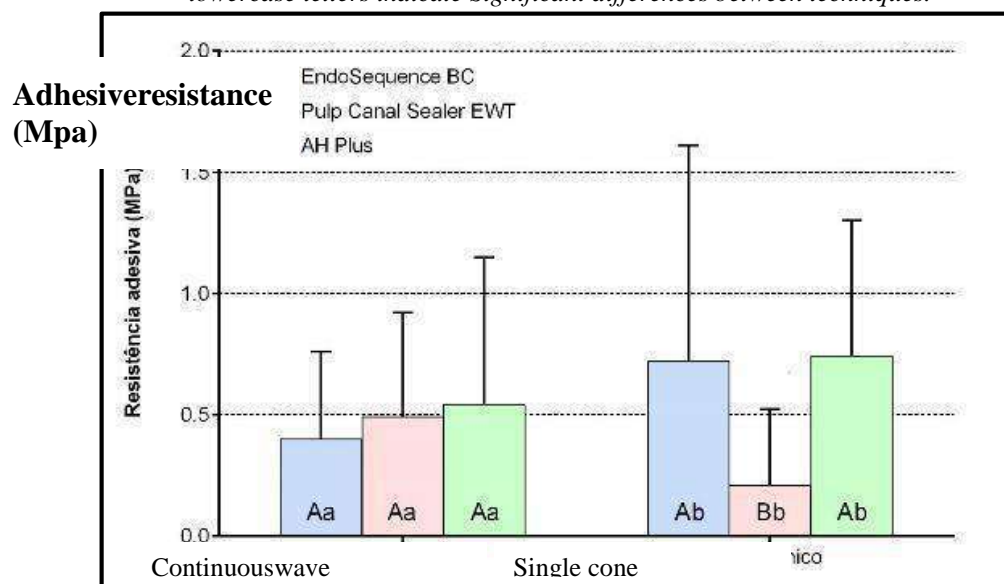
used. Different capital letters in the root thirds indicate significant differences between cements, using the same technique. Different lowercase letters in the root thirds indicate significant differences in the same cement, using the same technique.

Source: Ownauthorship.

The Kruskal-Wallis test applied to the different cements indicated that there were no significant differences between them when the continuous wave technique was used ($p = 0.783$). When the single cone technique was used, significant differences were detected ($p < 0.001$), with Dunn's multiple comparisons post hoc test revealing that Pulp Canal Sealer EWT cement had lower adhesion values than EndoSequence BC and AH Plus cements.

Between each cement, the continuous wave and single cone techniques were compared by the Mann-Whitney test, which revealed differences between them when the EndoSequence BC cement was used ($p = 0.581$). The techniques using the Pulp Canal Sealer EWT or AH Plus cements also show significant differences between them ($p = 0.001$ and $p = 0.031$, respectively). Graph 1 illustrates the results obtained for comparisons between cements and techniques.

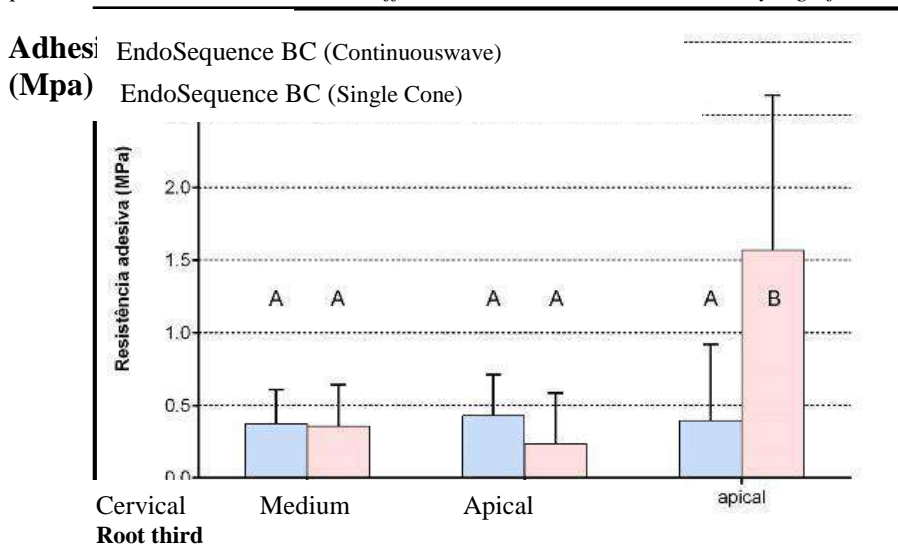
Graph 1 - Bond strength of the tested cements, using continuous wave and single cone techniques. The vertical line represents the standard deviation. Different capital letters indicate significant differences between cements. Different lowercase letters indicate Significant differences between techniques.



Source: Own authorship.

The comparison between the root thirds of the filled teeth with EndoSequence BC cement showed that there were no significant differences when the continuous wave technique was used ($p = 0.323$); when the single cone technique was used, the apical third showed greater adhesive resistance ($p < 0.001$), as shown in Graph 2.

Graph 2 - Adhesive strength of EndoSequence BC cement, used in different techniques, in each root third. The vertical line represents the standard deviation. Different letters indicate a statistically significant difference.

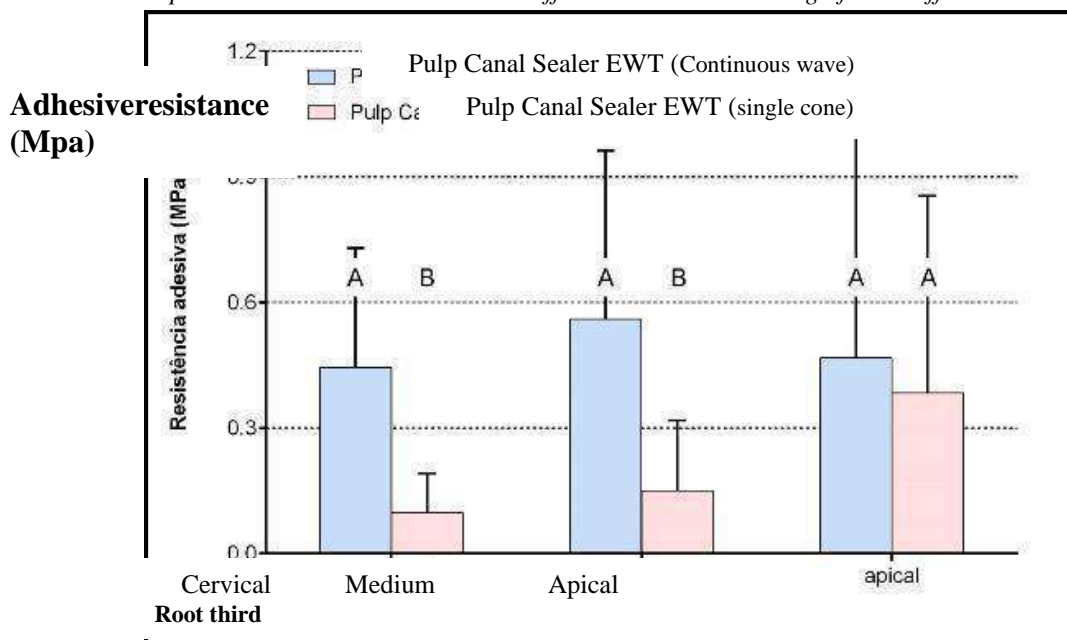


Source: Own authorship.

The Pulp Canal Sealer EWT cement showed significant differences between the techniques in the cervical and middle thirds ($p = 0.007$), with lower values of bond strength, however, it did not show significant difference when the Continuous Wave technique was used

regardless of the third ($p > 0.05$). With regard to the Single Cone technique, the apical third obtained greater results when compared to the cervical and middle thirds, as shown in Graph 3.

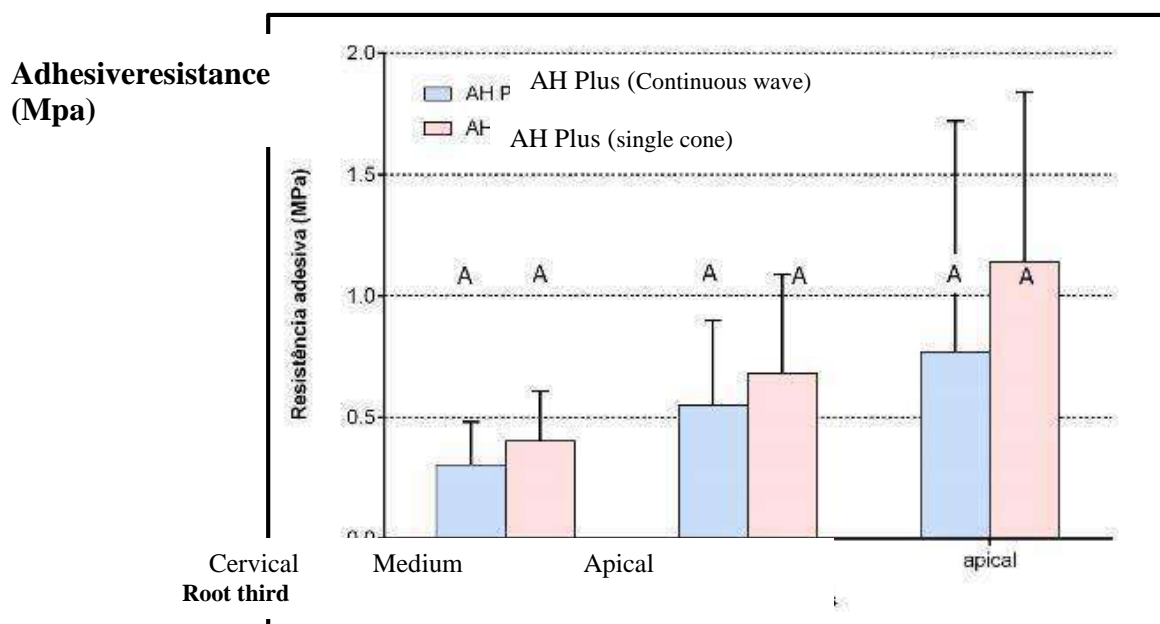
Graph 3 - Adhesive strength of Pulp Canal Sealer EWT cement, used in different techniques, in each root third. The vertical line represents the standard deviation. Different letters indicate significant differences.



Source: Own authorship.

The AH Plus cement did not present significant differences between the techniques studied, in any of the root thirds ($p > 0.05$). Graph 4 shows these data.

Graph 4 - Adhesive strength of AH Plus cement, used in different techniques, in each root third. The vertical line represents the standard deviation. Equal letters indicate that there is no statistical difference.



Source: Own authorship.

Failure Mode Analysis after Push-out Test

The analysis using the chi-square test revealed significant differences between the experimental groups ($p < 0.001$), indicated in Table 2.

Table 2. Failure mode distribution

Group	Dentin/CementAdhesiv e	gutta-percha /Cement Adhesive	Mixed	Withoutcement
EBC-OC	0 Aa	8Aa	19Aa	12Aa
PC-OC	12Ba	6Aa	4Ba	16Aa
AH-OC	5Aa	5Aa	13Aa	16Aa
EBC-CU	0Aa	28Ab	6Ab	0Ab
PC-CU	13Ba	5Ba	20Bb	0Ab
AH-CU	5Aa	11Cb	23Bb	0Ab

EBC - Endosequence BC; PC - Pulp Canal Sealer; AH - AH Plus; OC - continuous wave; CU - single cone. Different capital letters denote significant differences between cements using the same filling technique, while lower case letters indicate differences between filling techniques in the same cement.

Source: Own authorship.

Between different cements

The frequencies of each occurrence observed for the different cements are recorded in Table 3.

Table 3. Absolute (relative) frequencies of each occurrence observed for the different cements tested

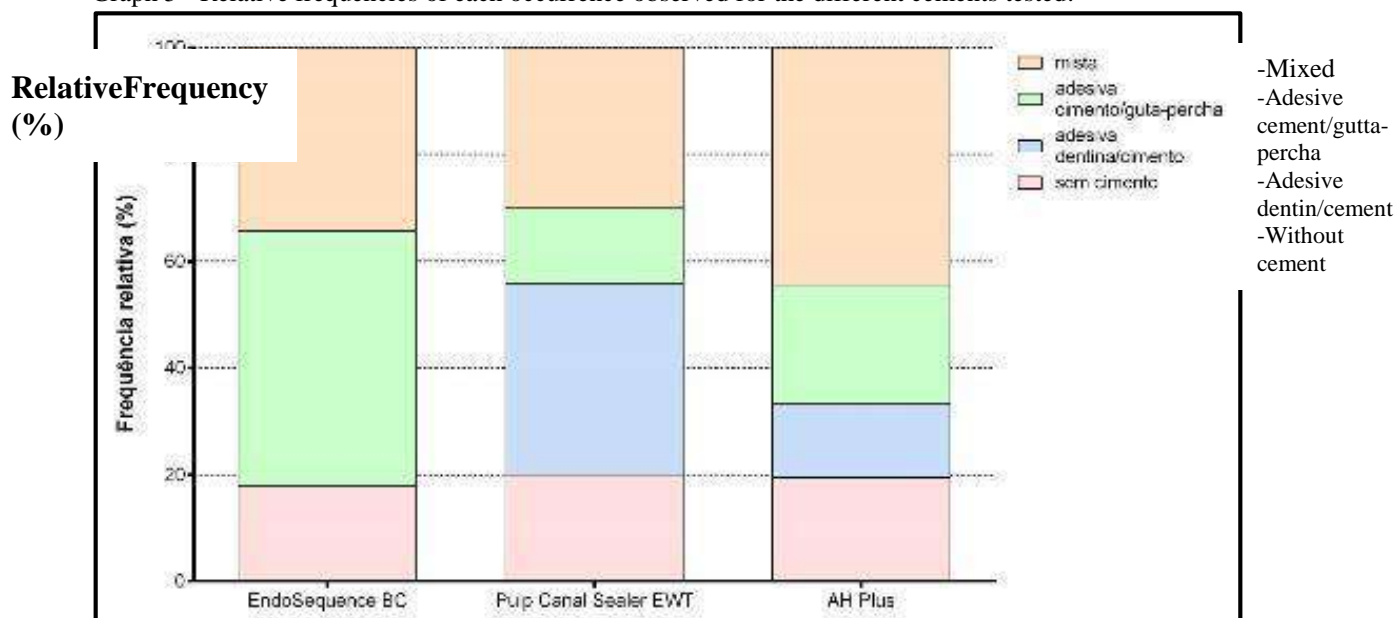
	Failure mode				
	Adhesive				Total
	Adhesive dentin cement / gutta-percha			Mixed	
	Without cement	/ cement			
EndoSequence BC	12 (5,7%)	0 (0,0%)	32 (15,3%)	23 (11,0%)	67 (32,1%)

Pulp Canal Sealer	14 (6,7%)	25 (12,0%)	10 (4,8%)	21 (10,0%)	70 (33,5%)
AH Plus	14 (6,7%)	10 (4,8%)	16 (7,7%)	32 (15,3%)	72 (34,4%)
Total	40 (19,1%)	35 (16,7%)	58 (27,8%)	76 (36,4%)	209 (100,0%)

Source: Own authorship.

The distribution of these occurrences, separated by cements, is illustrated in Graph 5.

Graph 5 - Relative frequencies of each occurrence observed for the different cements tested.



Source: Own authorship.

The analysis using the chi-square test revealed that the EndoSequence BC cement showed an adhesive failure mode at the cement / gutta-percha interface in a significantly higher proportion than the Pulp Canal Sealer EWT cement, which in contrast presented more adhesive failure mode at the dentin interface / cement ($p < 0.05$).

Between different techniques

The frequencies of each occurrence observed for the different techniques are recorded in Table 4.

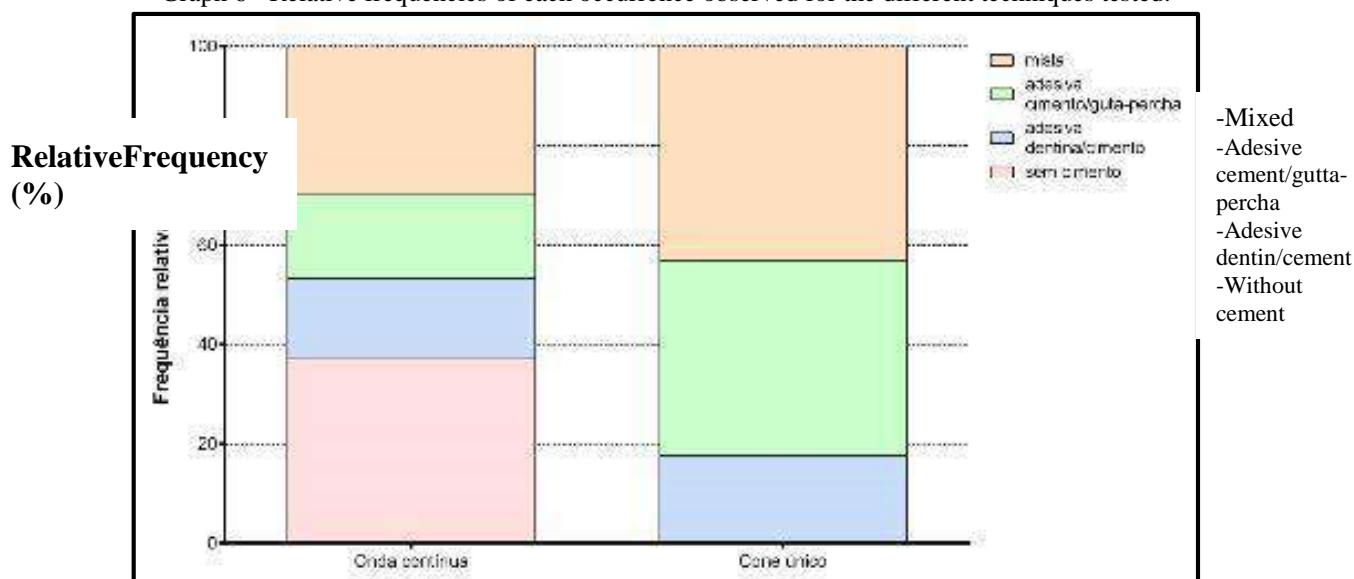
Table 4 - Absolute (relative) frequencies of each occurrence observed for the different techniques tested

	Failure mode				Total
	Without cement	Adhesive dentin / cement	Adhesive gutta-percha / cement	Mixed	
ContinuousWave	40 (19,1%)	17 (8,1%)	18 (8,6%)	32 (15,3%)	107 (51,2%)
Single Cone	0 (0,0%)	18 (8,6%)	40 (19,1%)	44 (21,1%)	102 (48,8%)
Total	40 (19,1%)	35 (16,7%)	58 (27,8%)	76 (36,4%)	209 (100,0%)

Source: Own authorship

The distribution of these occurrences, separated by filling techniques, is illustrated in Graph 6

Graph 6 - Relative frequencies of each occurrence observed for the different techniques tested.



Source: Own authorship

Continuous Wave

Single Cone

The analysis using the chi-square test revealed that the techniques have significantly different failure modes ($p < 0.001$).

Between different thirds

The frequencies of each occurrence observed for the different thirds are recorded in Table 5.

Table 5. Absolute (relative) frequencies of each occurrence observed for the different thirds.

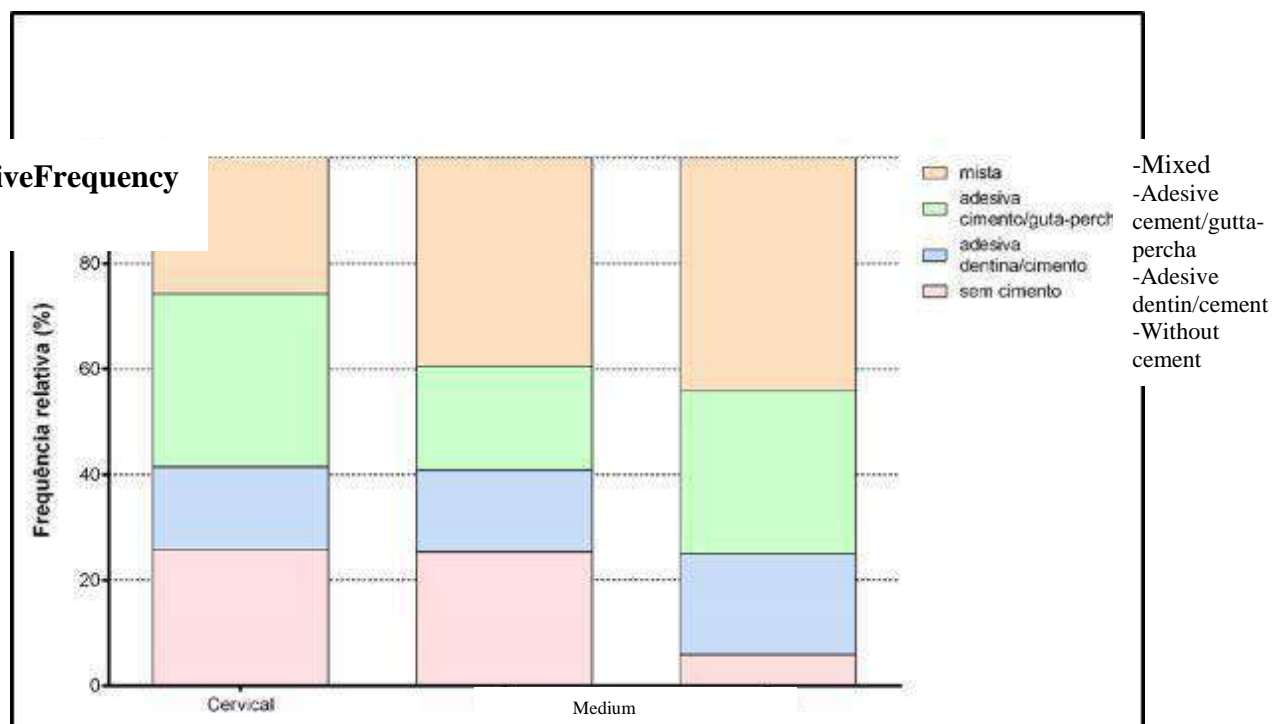
	Failure mode				Total
	Without cement	Adhesive dentin / cement	Adhesive gutta-percha / cement	Mixed	
Cervical	18 (8,6%)	11 (5,3%)	23 (11,0%)	18 (8,6%)	70 (33,5%)
Medium	18 (8,6%)	11 (5,3%)	14 (6,7%)	28 (13,4%)	71 (34,0%)
Apical	4 (1,9%)	13 (6,2%)	21 (10,0%)	30 (14,4%)	68 (32,5%)
Total	40 (19,1%)	35 (16,7%)	58 (27,8%)	76 (36,4%)	209 (100,0%)

Source: Own authorship

The distribution of these occurrences, separated by thirds, is illustrated in Graph 7.

Graph 7 - Relative frequencies of each occurrence observed for the different thirds.

Relative Frequency (%)



Source: Own authorship

The analysis using the chi-square test revealed that the thirds have a significantly different failure mode ($p < 0.016$), with the cervical third different from the apical third.

IV. DISCUSSION

The aim of this study was to evaluate the influence of the Single Cone and Continuous Wave techniques on the adhesion of the EndoSequence BC, Pulp Canal Sealer EWT and AH Plus cements to the dentinal walls of the root canals of human teeth extracted through the push-out test. Good adhesion of the filling material is an indication of a better filling of the root canal (De-Deus et al. 2009). Grossman (1976) pointed out that most endodontic cements have this characteristic, however, there is a difference in the degree of adhesion from one cement to another.

According to the results presented, the null hypothesis was rejected, as there was a significant difference between the techniques of single cone filling and continuous wave.

The teeth chosen for this research were lower premolars, which according to Goldberg et al. (2002) the use of extracted teeth in experimental work better simulates clinical conditions. These teeth are found in greater quantity, because in some situations, their extraction is indicated for orthodontic reasons. In this study, the choice of lower premolar teeth followed a pre-established criterion: newly extracted, single and straight canal, absence of cracks, absence of fractures and absence of external resorption.

The chemical-mechanical preparation was performed using rotary instrumentation in a standardized way with the Protaper Next files, in order to obtain an apical preparation corresponding to the X5 instrument (50.06) that was used as a final file in the enlargement of the lower premolars, with the purpose of obtaining an apical preparation corresponding to the diameter of the punch pin of the EMIC test machine, used during the push-out test, the diameter of the punch pin used in the apical third was 0.5mm. The use of nickel-titanium rotary instruments with different tips and tapers, provides a more conical modeling of the root canal, in addition to the ease and agility in the execution of the technique (Pommel et al. 2003; Lea et al. 2005; Delong et al. 2015).

In addition to exerting antibacterial activity, irrigants serve as lubricants during instrumentation and influence the sealing and adhesion of filling materials, the most used protocols in the literature recommend the use of the substance Sodium Hypochlorite (Neelakantan et al. 2015), in this research it was 2.5% sodium hypochlorite was used.

The presence of the smear layer on the dentinal walls can impair the adhesion of the cements and favor marginal infiltration, therefore, its removal is recommended in order to facilitate the penetration of endodontic cements, promoting a greater mechanical embryo between the filling material and the root dentin. To

achieve this goal the use of 17% EDTA is considered to be quite effective (Alfredo et al. 2008; Nunes et al. 2008; Haragushiku et al. 2010), for the research 17% EDTA was used, together with ultrasonic activation to enhance the smear layer removal, following the protocol of (Van der Sluis et al. 2010).

Van der Sluis et al. (2010) emphasizes in his study the importance of using passive ultrasonic irrigation (PUI), as it results in increasing the temperature of the irrigant, improving the tissue dissolution capacity, the removal of pulp tissue, bacteria and smear layer when the Sodium hypochlorite is used as an irrigant. Sodium hypochlorite is a highly alkaline compound and its pH value contributes to the stability of the solution (Beltz et al. 2003; Vianna et al. 2004).

More concentrated sodium hypochlorite solutions have been shown to be more effective compared to less concentrated solutions, as long as their pH is kept constant (Lopes and Siqueira, 2010). In the present study, the PUI protocol was used, with HELSE's Irrisonic ultrasonic insert, as an irrigating solution, sodium hypochlorite was used at a concentration of 2.5%. The use of PUI in sodium hypochlorite and EDTA solutions may have contributed to the removal of the smear layer, obtaining a better mechanical embryo of the filling material with the dentinal wall.

According to Trope et al. 2015, gutta-percha is still the main choice for filling, but due to its low adhesion to dentin, it requires a cement to obtain better long-term results.

Researchers studying the adhesion of endodontic cement (Grossman 1976; Tagger et al. 2002; Tagger et al. 2003; Pommel et al. 2003; Beltes et al. 2008; De-Deus et al. 2009) are unanimous in emphasizing the importance of this property for the filling material to fulfill its purpose of generating an adhesive interface between the filling material and the dentinal wall. Endodontic cements must have good adhesive and sealing properties (Saleh et al. 2003).

AH Plus cement is considered the gold standard in the literature and has high flow, good setting time and viscosity. The good adhesion results obtained with this cement are based on the possibility of creating a covalent chemical bond between an open epoxy ring and some amine group exposed in the collagen present in the root dentin (De-Deus et al. 2009; Candeiro et al. 2012).

EndoSequence BC endodontic cement was recently launched and presents a new perspective on filling the canals. It is a pre-manipulated bioceramic cement, which was designed to take prey only when exposed to a humid environment, with the ideal humidity present inside the dentinal tubules. Among the EndoSequence BC

properties, there is the potential to develop bioactivity with dentin, which is the formation of mineral tags when in contact with the humidity of dentinal tissues, generating more adhesive potential (Loushine et al. 2011; Candeiro et al. 2012; Xuereb 2015).

Cements based on zinc oxide and eugenol have a history of successful use. They exhibit a long setting time, can stain the tooth structure and contract when taking prey. An advantage of cements based on zinc oxide and eugenol is their antimicrobial activity (Hargreaves, Cohen. 2011). Pulp Canal Sealer EWT cement was formulated to avoid the problem of too fast setting, due to high temperature and humidity, after mixing, this cement allows a working time between 6 and 8 hours. The increase in working time is due to the incorporation of essential oils in the liquid component. It can be used in hot and cold condensation techniques (Kaplowitz 1994; Tagger et al. 2003; Hargreaves, Cohen. 2011). This research was concerned with investigating these three modalities of endodontic cements given their clinical importance and scientific support.

The obturation phase of the root canals aims to fill the root canals three-dimensionally so that there are no spaces in the filling material, contributing to possible microleakage (Pommel et al. 2001; Guess et al. 2003; Collins et al. 2006).

The techniques that use heat for the plasticization of gutta-percha, such as the Continuous Wave Technique, were developed in order to better fill irregularities when compared to cold techniques, such as the single cone technique (Tonamaru et al. 2012; Viapina et al. 2014; Viapiana et al. 2015). According to Souza et al. (2009), in general terms, gutta-percha compaction techniques are preferable, as they maximize the amount of gutta-percha, resulting in a thin layer of cement on the root canal walls.

During the Continuous Wave technique, the penetration of a heated plugger is important for the success of this technique, the penetration recommendations are between 5 to 7mm of the working length, which facilitates the heating of the gutta-percha and its adaptation to the walls of the root canal (Guess et al. 2003; DeLong et al. 2015). In this study, the penetration of the plugger was 5 mm from the working length.

On the other hand, an advantage of the technique in which only a cone is used that approximates the geometry of mechanized instrumentation systems, however, the use of a cement with good adhesive and flow properties is necessary (Monticelli et al. 2007). For this research, the use of the 50.06 cone was standardized in all elements of the groups.

The use of a universal testing machine for tests of adhesion of dental materials to the dental structure was emphasized by Grossman et al. 1976, being used by several researchers (De Deus et al. 2009; Carneiro et al. 2013; Gurgel-Filho et al. 2014; Stelzer et al. 2014; Neelakantan et al. 2015; Scelza et al. 2015). In the present study, in order to assess the adhesion of endodontic cements, the Push-out test was used.

The Push-out test determines the degree of retention of the root canal filling material, which reflects the quality standard of adhesion achieved between the filling material and the root dentin. However, this test has some limitations, such as the non-uniform creation of tensions over the union interfaces (Pane et al. 2013; Chen et al. 2013).

During the study, some measures were taken to minimize these limitations produced by the test, dental elements with similar internal anatomy were selected, the thickness of the slices was around 1mm, the diameter of the perforator was standardized in the cervical, medium thirds (1mm in diameter) and apical (0.5mm in diameter), in addition to standardization of the chemical-mechanical preparation and the main cone of gutta-percha.

The results obtained by means of the mechanical push-out test, indicated that there were no significant differences between the cements when the Continuous Wave technique was used, as shown in Graph 1. It is inferred that this finding was probably due to the partial removal of endodontic cement of the cervical and middle thirds of the root canal during the Downpack phase of the Continuous Wave technique, promoting similar adhesion for these groups. These findings are similar to the study by DeLong et al. (2015) in which the authors also evaluated the adhesiveness of EndoSequence BC and AH Plus cements.

Still, it is possible that the Continuous Wave Technique has altered the adhesive properties of cements. The heat source mechanically removed the cement, reducing or eliminating it from the canal. This may explain the high frequency of failure mode without cement in the groups in which the Continuous Wave technique was used. The application of heat can also affect the properties of cements, thus affecting their adhesion forces (Viapiana et al. 2015).

Failure modes were consistent with other studies that showed adhesive and mixed failures (Shokouhinejad et al. 2013; Formosa et al. 2014; DeLong et al. 2015). No single cement sample was found in the Single Cone technique, which indicates that the filling technique employed is the reason for these findings, due to the greater amount of cement for the execution of the technique. When analyzing the failure modes of the

EndoSequence BC cement, it did not present any adhesive failure at the dentin / cement interface, which can be explained by the bioactivity property that this cement develops in the presence of moisture (Loushine et al. 2011; Candeiro et al. 2012; Xuereb 2015). The Pulp Canal Sealer EWT cement presented a higher frequency of occurrence in the adhesive failure mode at the dentin / cement interface, which can be explained due to the lower result achieved in the bond strength when compared to the EndoSequence BC and AH Plus cements.

Cements based on Tricalcium Silicate, as an example, EndoSequence BC are nanoparticles and develop bioactivity in the presence of moisture. To do this, they must be used with the filling technique without the application of heat, as the presence of heat can cause evaporation of the moisture present in the dentinal tubules. Which explains the best results of this cement when the Single Cone technique was used, according to graph 2 (Khalil et al. 2016; Almeida et al. 2017).

The bioactivity that the EndoSequence BC cement promotes refers to the production of an apatite layer, which when in contact with tissue fluids reduces the flaws in the contact interfaces, increasing their bond strength (Silva et al. 2016; Almeida et al. 2017). In the study, it was observed that the EndoSequence BC cement showed statistically greater bond strength in the apical third, when the Single Cone technique was applied, according to graph 2. These results can be explained due to the use of a thin layer of cement and the application of the technique, where it is necessary to lock the cone, the force generated by the gutta-percha cone in the cement, allows greater flow to the dentinal tubules and consequently greater mechanical embryo.

In general, the Pulp Canal Sealer EWT cement presented the lowest bond strength results when compared to EndoSequence BC and AH Plus cements. According to the authors (Tagger et al. 2002; Zhou, et al. 2015; Silva et al. 2016; Almeida et al. 2017), bioceramic cements and epoxy resin cements show superiority in the dentin adhesion property, forming a strong connection with the root dentin. According to the analysis of graph 3, the Pulp Canal Sealer EWT cement showed significant differences between the filling techniques in the cervical and middle thirds, presenting the best results when the Continuous Wave technique was used, these findings indicate that the use of gutta - melted and compacted filler for filling root canals promotes greater adaptation to irregularities and recesses (Lee et al. 2002).

New studies, with technological innovations should be carried out in order to research filling techniques and filling materials, in order to improve the efficiency of

this operative stage and obtain better clinical success rates for endodontic therapy.

V. CONCLUSION

It can be concluded according to the results presented that the Single Cone Technique showed better adhesiveness of the EndoSequence BC and AH Plus cements when compared to the Continuous Wave Technique.

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A Typological Approach for Technological Innovation in Logistics in the Industry 4.0 Scenario

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Abstract— This paper discusses the nature of logistics and their evolution based on technological innovation in industry 4.0 environment and seeks to relate to the future logistics transition models. It proposes a typology for logistics operations based on technological innovation in five dimensions. The objective is to show how this typological development can provide a useful approach for the integration of the various aspects of technology as a pillar of sustainability in a company operation.

Keywords— Cyber-physical systems, Global logistics, Industry 4.0, Internet of things.

I. INTRODUCTION

At a time in which the synchrony between production and consumption of products and services was overtaken by the geographic question, availability at different times and locations became preponderant along with information in time and space within the logistic chain.

Logistics therefore provides a connection between the subsequent stages of the supply chain consisting of links from the supply of the raw materials to the point of consumption of the final customers as well as the reverse flow of products, enabling the reuse of the materials or the components themselves (closed loop reverse chain).

However, this process is not necessarily performed by just one industry, but it encompasses a number of separate companies that are distributed to organizations that operate together across the business network.

Current supply chains are generally globalized and involve organizations that provide, produce, market, distribute and deliver logistics services around the world.

Thus, this paper seeks to analyze the way in which trade, production and logistics services have become a global business and its future transition based on technological innovation.

It also seeks to argue that, in the face of today's challenges, the need for a fundamental repositioning of the business model and the way in which production and logistics can be organized as well as the management of the corresponding information based on new technologies, which can contribute to the sustainability of operations in this constantly changing environment.

Zijm and Klumpp (2015) highlight the interconnection of three well-known development systems formed by

social, ecological and economic sustainability (people, planet, profit) and other trends such as the individualization of the process (peer-to-peer, customization, and personalized services) and business automation/scanning (artificial intelligence, cyber-physical systems and the Internet of Things-IoT).

II. TYPOLOGIES

As noted by Doty and Glick (1994), typologies are a unique form of theory based on a set of ideal types. Typologies have proved to be very popular in research management with many well-known examples, such as those of Porter (1980, 1985), Miles and Snow (1978) and Mintzberg (1979, 1983). They are also popular in the field of research with well-known examples that are the ones that propose different types of services (Chase, 1978, 1981, Chase & Tansik, 1983).

In this way, the present work does not aim to develop a set of ideal types, but to suggest how typologies can help educators, researchers and managers interested in logistics operations, their management concepts, models and applications.

As such, this article follows the standards of Adam Jr. (1983) who in discussing organizational issues and methods notes that limiting any typology in production/operations where it does not provide an integrative theory for the discipline itself.

Therefore, the objective of this research is modest in typology, but it aims at bringing together the various aspects of logistics innovation in the industry 4.0 environment insofar as the propositions can be developed

from the formation of the theory and then tested in the field (Adam Jr., 1983).

III. BUSINESS PROCESS DIGITALIZATION

For Demil and Lecocq (2010), a business model is a tool where it is up to companies to adapt to an innovation and suggest two different views according to research.

The first is a “static approach”, where the business model within an industry is characterized by e-business. The other is called the “transformational approach” and requires progressive improvements to create internal consistency and/or to adapt to the environment. It includes technological innovations where they often require new business models in order to be successful in the market.

Therefore, Teece (2010) complements that the new business models can properly represent a form of innovation. This means that innovative companies should stand out not only in the development of products or technologies, but also to discover appropriate business model for innovation. In other words, Chesbrough (2010) argues that the innovation process and the business model are complementary to the success of a new product or service.

Digitalization has enabled the combination of these features and functions of industries and traditional products in a myriad of new paths.

COST (Cooperation in the Field of Science and Technology Research – Europe) stresses that the direct consequence of the digitalization of business processes in the instantaneous communication era is that the workflow of the production system can be installed in a location in a significantly profitable way.

It points to multiple implications in general, since both society and the production system must be rebuilt in this “Lego” world in which new forms of thinking are uncovered based on the distributed instantaneous communication system (relationship forums and virtual games).

In this way, new business models – many unexpectedly – will be invented. The most visible impact of the Digital Revolution is that of instant virtual communications around the world where distances are greatly reduced. Thus, the business life cycle, processes including products and services have also been increasingly shortened.

Therefore, flexibility has been the most appropriate new password – the flexibility of skills, technology itself, the labor market and trade regulations and agreements, and labor relations. At the corporate level, the digitalization of business processes is one of the factors that contribute to the operationalization of strategic efforts aimed at the innovation of processes at lower costs. Moreover,

digitalization involves both the incorporation of new technologies into the organization as well as its integration with existing processes, forming a convergence between the product and its processes (Orlikowski, 1992, Roberts & Grabowski, 1996, Weick, 1990).

Prahalad and Ramakrishnan (2003) identified new competitive spaces for innovation that offer new opportunities for sustainable growth and value creation.

They presented competency spaces in addition to the company comprised of an extensive network including suppliers, business entities and partners and consumer communities. They remember that companies can differentiate themselves not only through the quality and cost of their products and services, but also through their ability to co-create unique experience environments with consumers, called the solutions space.

They emphasize innovation based on solutions beyond the physical product, resources and functions incorporated in hardware, but in knowledge accumulated by the company, that is, based on “soft knowledge”. In this way, a vendor solution may involve responsibilities for one of the subsystems of a customer or for the entire business environment as a business portal highlighted in the Fig. 1.

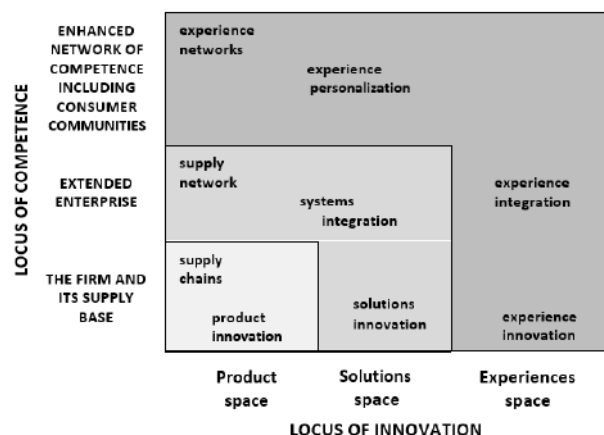


Fig. 1: New Competitive Space for Innovation. Source: Prahalad and Ramakrishnan (2003).

IV. INTERCONNECTION OF PROCESSES

Machines, devices, sensors and people are connected through IoT (Giusto, 2010) and IoP – Internet of People (Vilarinho, 2013) forming IoE – Internet of Everything (Santos & Villalonga, 2015).

Wireless technologies play a prominent role in the increasing interaction of business processes as they allow ubiquitous access to Internet. Objects and people interconnected via IoE are able to share information as the basis of collaboration to achieve common goals (Giusto, 2010). Schuh (2013) cites three types of collaboration

within IoE: human-human; human-machine; and machine-machine collaboration.

In order to connect machines, devices, sensors and people to each other, it is of great importance to establish a standard communication that is common to all. These standards allow the flexible combination between modular machines from different suppliers (Zuehlke, 2010). This modularization enables industry-smart 4.0 plants to adapt to the fluctuating demands of the market or small batch of custom orders.

The convergence of industrial production and information and communication technology known as Industry 4.0 is currently one of the most frequent discussion topics among practitioners and academics in the area of operations (Drat & Horch, 2014).

The term Industry 4.0 was first used at the Hannover Fair in 2011 following the first Industrial Revolution by “Mechanization” as a result of the invention of the steam engine, the second with the “mass production” with the help of electricity and the third through the use of microelectronics and IT (Information Technology) (Dais, 2014).

The promoters of this idea as an association of representatives of business, politics and academy, supported the initiative as an approach to strengthen the competitiveness of the German economy (Kagermann, 2011).

Industry 4.0 is expected to improve the key industrial processes involved in manufacturing, engineering, the supply chain of materials and the management of the product and service life cycle.

Activated through communication between people, machines and resources, the fourth industrial revolution is characterized by a paradigm shift from centralized control to decentralized production processes.

As a result, intelligent products know the history of their own production, from their current state and destination, proactively guide the production processes by instructing the machines to perform the necessary tasks and drive the conveyor belts for shipping to the next stage of production (Kagermann, 2015).

The transformation of the digital industry into the Internet environment is undergoing intense progress, but artificial intelligence, the big data and total connectivity will bring about a complete transformation of the industry according to Almada-Lobo (2016); Schlechtendahl et al. (2015) by the following factors:

1. Digitalization of production – use of information systems for Production Planning and Management;

2. Automation systems for data collection directly from the production line and the use of the machines;

3. Automatic data exchange by connecting the factory floor to the global supply chain.

We are now contemplating the dawn of the fourth Industrial Revolution with the use of Cyber- Physical Systems (CPS) and Internet of Things (IoT) and Virtual Services.

The integration of cyber technologies that make Internet-enabled products facilitate innovative services to achieve, among other things, Internet-based diagnostics, maintenance and operation processes in a cost-effective and efficient manner.

In addition, it encourages the emergence of new business models, operational concepts and intelligent controls focusing on the user and their individual needs.

Lee (2008) identifies in the central objective of Industry 4.0 the emergence of digital factories that would be characterized by the connection and incorporation of the heterogeneous and autonomous devices.

A CPS consists of a control unit, usually one or more microcontrollers, which control sensors and actuators that are needed to interact with the real world, and to process the collected data. These embedded systems also require a Communication Interface for data exchange with embedded systems or a cloud.

Data exchange is the most important feature of a CPS, since data can be linked and assessed centrally. In other words, a CPS is an embedded system that is able to send and receive data over the network. CPS connected to the Internet is often referred to as the “Internet of Things”. CPS tracks the inevitable trend of collecting and making information available everywhere in real time in the networked world. Embedded systems such as smartphones, automobiles and home appliances are the inseparable part of modern life and will be in the process of being remotely controlled.

This remote access to the process data can also be adopted for the very maintenance of these systems. The remote diagnosis information helps the service team in identifying the tool and spare part accurately and issuing requisition to the infrastructure with the help of the corresponding communication system. There are a number of existing and still applicable fields of application for CPS, such as medical equipment, driver safety and driver assistance, industrial process control and automation systems, power supply and the optimum use of renewable energies.

V. TRANSPARENCY OF INFORMATION

Activated by the growing number of interconnected objects and people (Lasi et al., 2014), the fusion of the physical and virtual world allows for a new form of information transparency (Kagermann, 2015). Through the connection between the data sensor and the model of digitalized plants, the virtual copy of the physical plants is created.

Thus, context sensitive information is indispensable among IoE actors to make appropriate decisions. Context systems perform tasks based on information from the physical and virtual world. Examples of information from the virtual world are electronic documents, drawings, and simulation models. While from the physical world we will have Information on the position or conditions of a production tool (Lucke et al., 2008).

To analyze the physical world, raw sensor data must be aggregated into other values and interpreted in the context of the information.

In order to create greater transparency, the results of data analysis should be incorporated into service systems accessible to all IoE participants (Gorecky, 2014). For critical processes real-time information is of paramount importance (Bauernhansl, 2014).

VI. DECENTRALIZED DECISION-MAKING

Decentralized decisions are based on the interconnection of objects and people, as well as the transparency of information inside and outside the premises of a production. The combination of decentralized and interconnected decision making allows simultaneous access to local and global information with full productivity (Malone, 1999).

IoE participants perform tasks as autonomously as possible. Only exceptionally, some interference or in the emergence of conflicting objectives, tasks are delegated to a higher level (Hompel & Otto, 2014).

From the technical point of view, the decision making is allowed by the CPS, which are automated systems capable of allowing the connection between the operations of physical reality with the Information and communication systems (Radhakisan & Gill, 2011, German National Academy of Science and Engineering, 2011, Lee, 2008).

Embedded computers, sensors and actuators allow the monitoring and control of the physical world autonomously (Lee, 2008).

These technological developments interact with each other, where each is characterized by its respective objectives and limitations. For example, when the aim is to reduce production costs, the limitations are also in terms of, for example, a reflection on wage costs.

The life cycles of commercial products tend to be shorter and shorter. At the same time, greater reuse of products, components, and materials can be observed, either through secondary (electronic) markets or in the so-called closed-loop supply chains (cradle-to-cradle, circular economy).

Mass customization is an important aspect of today's consumer markets fueled by sharp technological developments. The rapid advance of e-commerce is another feature of today's markets, and with mixed consequences, since on the one hand it reduces the number of links in the supply chain, but on the other hand, without proper regulation of the flows of goods or the reverse, it causes an increase in urban congestion and pollution.

Finally, we can mention the concept of sharing economy, that is, the notion that customers no longer buy a real product, but only the service that the product represents (eg cloud computing, music streaming, car sharing, among others). These phenomena will have a profound impact on the ecological footprint of mankind and on the design and planning of future supply chains.

VII. INNOVATION IN LOGISTICS

Current supply chains and logistics systems are global, partly due to scarce natural resources and not evenly distributed in terms of type and geographic location, but certainly also because of the differences in the cost of labor between emerging and mature economies.

According to Nakatani and Chuang (2005), logistics innovation began in the 1980s, initially with the introduction of the WMS and TMS systems, where logistics management became possible through the computerization of warehousing and transportation processes, the process of customs clearance and various processes related to the digitalization and the consequent systematization and integration of all foreign trade activity.

The emergence of outsourced logistics providers/operators is observed, aggregating all operations with the gradual adoption of handling, storage and management technologies towards the twenty-first century as shown in the Fig. 2.

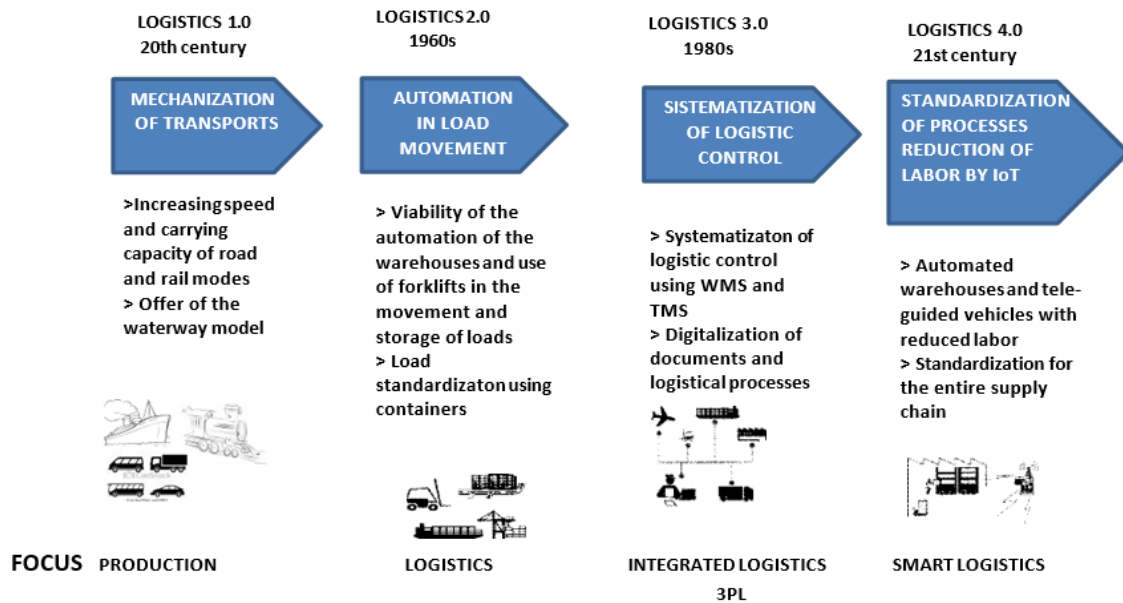


Fig. 2: Transition of Logistics by Innovation. Source: Logistics Systems (2017).

36 years after the first logistical theories, we can see in the 21st century the era of Logistics 4.0 with the evolution of IoT technology towards automation and complete standardization of logistics processes.

Radio Frequency Identification (RFID) is an identification technology used to track goods along the supply chain (Michael & McCathie, 2005).

RFID and sensors can work together as the main component of a ubiquitous system. RFID tags record the information that sensors collect from an object and its environment, and transfer it to a reader. With wireless sensor networks, objects such as products, parts, vehicles or machines become intelligent.

They issue alerts on any incidents that could cause damage such as dropping, abnormal temperature rise causing changes to perishable products, or any type of violation of security seals. With intelligent objects, all systems from equipment to the corporate level, tend to be restructured. Systems become more responsive and accountable for any kind of problems that may arise.

RFID tags allow item, pallet or container-level control (Ustundag & Tanyas 2009). Singer (2003) identifies four important factors with the use of RFID technology: operational efficiency, accuracy, visibility, and security.

In fact, RFID tags can replace bar codes in the very near future (Kapoor et al., 2009) with advantages, as it does not require a direct line of sight between the label and the reader, thus allowing multiple and simultaneous reading through non-metallic materials and are resistant to ambient temperature and other external factors such as humidity. They can also be read and reprogrammed several times (Kärkkäinen, 2003).

In addition, battery-assisted RFID tags can monitor environmental variables such as temperatures and bacteria levels (Michael & McCathie, 2005).

The ultra-high-frequency RFID system (UHF RFID) allows the simultaneous reading of a large number of labels, increasing the volume of processing, integration with other systems and consequently increasing the productivity of the operation (Wu et al., 2006).

The world is currently experiencing the fourth Industrial Revolution in terms of cyber physical systems. These systems make up the automation that enable innovative features and access to the cyber world through networking dramatically changing our daily lives.

It requires organizations to understand how connected consumers can serve as a critical foundation for companies to identify sociodemographic and psychological views and factors that may influence their decision making regarding the use of connected products or services. Industry 4.0 organizations that have not yet taken action from conventional marketing for content marketing now have the opportunity to direct strategies towards the new business environment (Court, 2015; Rocco & Bush, 2016).

In this context, new business models, work processes and development methods that are currently unimaginable will bring about important changes in society and in people. In this way, family life, current processes of globalization, market structure and capital will tend to be redefined. However, Industry 4.0 simultaneously exhibits features that represent the challenges of developing cyber-physical systems, reliability, security, and data protection.

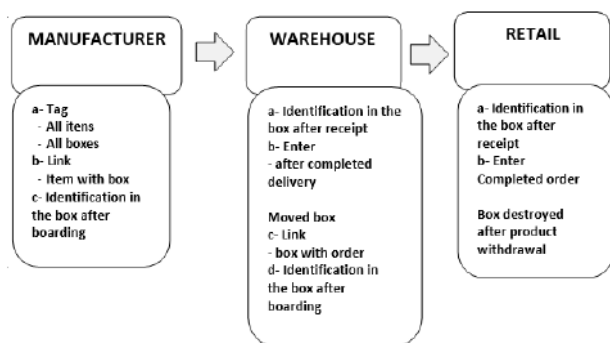


Fig. 3: RFID Scenario in SCM. Source: Nilgun et al. (2014).

An important factor is the dynamics of the profitability of operations. The main reason is the external factors, such as costs of specialized labor in the face of changes in the needs of users and customers, in the profile itself according to the change in the nature of the processes by technological innovation.

On the other hand, internal factors such as flexible leadership in the conduct of work adjusted to the reality of the environment and in the specificities of each project that requires perseverance, fighting spirit and courage for change.

Advanced technology provides an operation by the “efficiency” and “flexibility” in a friendly way in which people, robots, and artificial intelligence provide the extension of human boundaries according to the following chart.

In the next-generation business model, an integrated and interconnected system in the supply chain operation through robots, sensors and 3D printers in the process of storing, moving and tracking cargo and real-time information has been considered.

IoT can improve logistics and supply chain efficiency by providing detailed and up-to-date information in real time by mitigating the whip effect (Flugel & Gehrmann, 2009) by reducing unexpected occurrences and improving traceability of goods (Zhengxia & Laisheng, 2010).

However, to complete this scenario, it is necessary to get compliance in the process, regulation of operations, unification of standards, rules, procedures in the manufacturing and logistics industries, intellectual property rights, other issues such as finances, among others. By collaborative creation beyond manufacturing and logistics, it is believed to be necessary to create a new form of business to be competitive and become winners in the next generation.

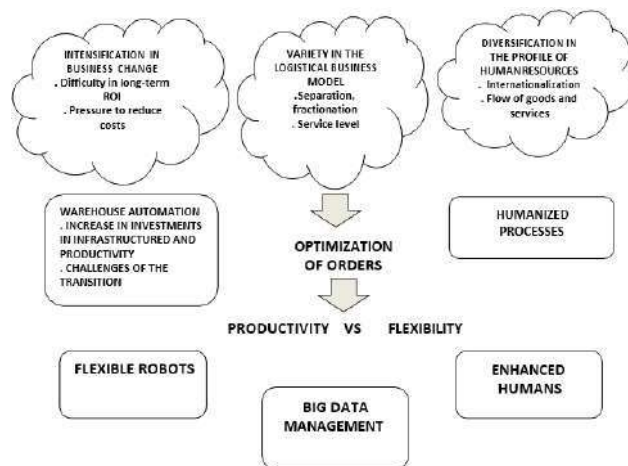


Fig. 4: Humanitarian Logistics: Compatibility of Efficiency and Flexibility with State-of-the-art Technology. Source: Adapted from Logistics Systems (2017).

In the moment the logistics environment is undergoing dramatic changes, the challenges that are unveiled in the field of supply chain management and logistics, the processes expand and diversify and require careful monitoring by the organizational managers.

It is observed as a result that future supply chains are global when necessary and local when possible. On the other hand, global supply chains will remain unavoidable in cases where food production conditions are only feasible in some regions of the world or when minerals are only locally available.

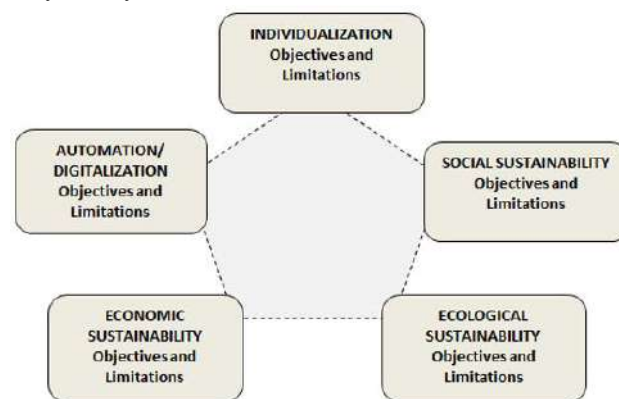


Fig. 5: Five Forces for the Future Logistics. Source: Zijm and Klumpp (2015).

They will also continue to exist where material processing consumes such an immense amount of energy that it is only sustainable in places where energy is plentiful and sustainable, such as geothermal energy, water power generation or long periods of intense sun.

VIII. CONCLUSION

The purpose of this article was to evaluate the importance and influence of Industry 4.0 and the technologies connected to the Internet in the creation of added value for organizations and society. In fact, the fourth industrial revolution is happening and require each company and each individual a reflection and planning of what is expected or desired from the intelligent design of devices connected to the Internet. The present study represents an important theoretical contribution to the understanding of industry 4.0 and technologies connected to the Internet.

The fundamentals were based on literature review and the assumption that the IoT technology's business value is significantly higher than is reflected primarily by the number of devices that can be connected in cyberspace.

Technological innovation and intelligent information systems, as expected with the concept of physical Internet, depend heavily on the presence of a competent workforce. This brings a new level of interdependence to technological innovation – as well as new business models based on e-commerce, cloud computing and Industry 4.0 – and knowledge and competence of logistics and management personnel.

As the dynamics and changes in supply chains increase as described, a new form of competence will also gain more importance: Not the “concrete facts” of stored information and fixed concepts that are taught today can be valuable for business purposes, “soft facts” and skills such as adaptability (of mind – followed by the supply chain), flexibility and creativity can be announced in the future as the main competencies needed for logistics.

The purpose of this automation is to tailor products and services to individual customers, which will increase the added value for organizations and customers themselves (Kagermann, 2015, Yu et al., 2015). Therefore, IoT technology allows the creation of products, services and business models that promise gains for virtually all industries (Dutton, 2014).

Future research can contribute to refining the meaning of many of the concepts. In this area, issues such as logistics 4.0, and ways of measuring the contribution to the definition of the business model are essential attributes of this dynamic within the limits of a company's operations.

Much research is being done in the field of industry 4.0 together with its development, where this typology is largely multidisciplinary and offers opportunities for the researchers to develop approaches incorporating all areas of the typology matrix to examine what organizations are doing or need to do to become truly sustainable.

In this way, the use of typology could expand and modify the more restricted approaches currently in use.

As a limitation of the research, as Doty and Glick (1994) point out, the typology does not propose ideal types, as these would be an area for future research. Typological research usually aims to develop ideal types and give names to groups of organizations that emerge in this type of research.

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Salient Modeling at offshore Breakwater for oblique wave using least Square weighted Residual Method

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Abstract— This research is the continuation of previous research by the writer using polynomial approach with the purpose of fixing various constraints in the previous method.

The salient equation used in this research is similar to the one used in the previous research, i.e. the principle of static equilibrium coastline where the tangent of the stable coastline is similar to the tangent of the crestline.

In the previous method, the salient equation was approached with a polynomial equation, then polynomial coefficient is obtained by applying the first differential (tangent) of the polynomial in various points with the number of points that is in accordance with the number of polynomial coefficient. There is an obstacle in this method, i.e. the setting of boundary condition points that should be done with trial and error

In this research the tangent equation of the salient is approached with polynomial equation using five points of sample. Salient equation is also approached with polynomial. To obtain polynomial coefficient, the first differential of the salient equation is equalized with tangent equation of the salient and Least Square Weighted Residual Method is applied. Unlike previous research, there is no constraint in this research using this method. Comparison with the result of the research from previous researches shows a conformity of the result of the model with the result of the previous research.

Keywords— Static Equilibrium, Weighted Residual Method.

I. INTRODUCTION

Offshore breakwater is a breakwater constructed parallel with the coast. Even though it is called offshore breakwater, the position of the construction is quite close with the coast, where the construction efficiency is very much determined by the distance between the breakwater and the original coastline. On the coast protected by offshore breakwater, sediment deposit will be formed which is called salient. The success of coastal protection using offshore breakwater is determined by salient Y_s that was formed (Fig.1), where the height of the salient is determined by the length of breakwater L_s and the distance between breakwater and the original coastline or breakwater distance X .

Considering that breakwater is constructed quite close with the coast where the crestline is almost parallel with the coast or the wave direction is almost perpendicular to the coast (Fig.2), therefore in this research a breakwater is developed for a wave that is perpendicular to the coast.

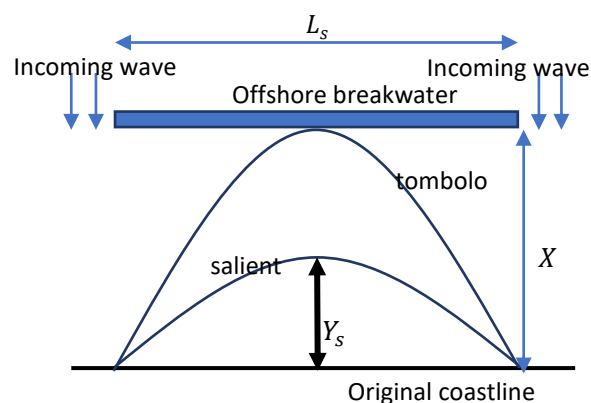


Fig.1. Offshore breakwater and salient

This research is working on an assumption that longshore sediment transport is the primary cause of the changes in coastline. Longshore sediment transport equation of some researcher, such as Komar, P.D., (1998), Shore Protection Manual (SPM), (1984), Van Rijn, Leo C. (2013), Mill-Homens, J., Ranasinghe, R., Van Thiel de Vries, J.S.M. and Stive, M.J.F., (2013), is the sine function of the breaker crest line angle where the value of Longshore sediment transport is zero or no longshore sediment transport if the breaker crestline is parallel to or forming

zero angle against the coastline. In other words, in a stable coastline, the tangent of breaker crestline is similar to the tangent of the coastline (Fig.2). This condition becomes the basis of salient equation in this research.

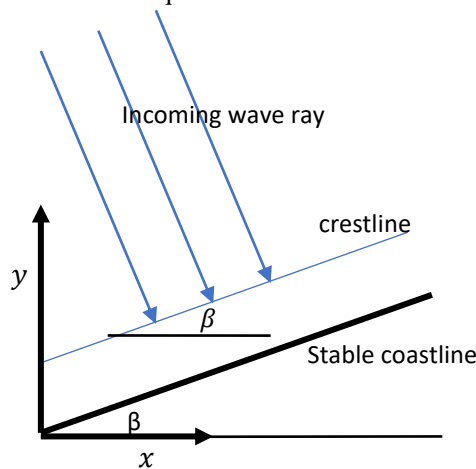


Fig. 2. Crestline of oblique waves

This research aims at obtaining the method of salient height Y_s (Fig.1) for a breaker length L_s , at a breakwater distance X . This research is the continuation of a previous research by the writer where in the previous research polynomial approach was applied where the value of the polynomial coefficient is obtained by applying stable coastline equation on various points (boundary point) on the original coastline. In the previous research, the difficulty was found in determining boundary points. In this research, salient equation is also approached with polynomial, where polynomial coefficient is obtained by using Least Square Weighted Residual Method with Galerkin procedure (Stassa, F.L. (1985)), whereas the tangent of salient is approached with a polynomial equation using five sample points.

Some previous researchers have made relation between (L_s, X) with salient height Y_s but in qualitative form i.e. relation (L_s, X) with the type of salient that was formed. Those researchers are Ahrens, J.P, and Cox, J. (1990), Van Rijn, L.C. (2013), Inman, L.D., and Frautschy, Nir, Y. (1982), . The result of the researches especially from Ahrens, J.P, and Cox, J. (1990), Van Rijn, was used as a comparator of the result of the model where the result of the comparison shows a compatibility of model result with the result of the two researchers.

II. SOME LONGSHORE SEDIMENT TRANSPORT EQUATIONS

As has been mentioned in the previous section that longshore sediment transport equations from some researchers are the sine function of breaker crest line. The

next section will show some longshore sediment transport equations.

1. Komar 1998

$$Q = 0.46 \rho g^{3/2} H_b^{5/2} \sin \theta_{br} \cos \theta_{br} \dots (1)$$

g = gravity acceleration (9.81 m/sec²)

H_b = breaker height (m)

θ_{br} = wave angle at breaker line (angle between wave crest line and coastline)

2. Shore Protection Manual (1984)

$$I = K E C_{g,br} \sin \theta_{br} \cos \theta_{br} \dots (2)$$

I = longshore transport rate (immersed weight)

$$E = \frac{1}{8} \rho g (H_{rms,br})^2 \quad \text{wave energy}$$

H_{rms} = rms wave height at breaker line

$C_{g,br}$ = wave group celerity at breaker line

θ_{br} = wave angle at breaker line (angle between wave crest line and coastline)

$$K = 0.77$$

3. Van Rijn

$$Q_{t,mass} = 128 (H_{s,br})^{2.5} \sin(2\theta_{br}) \dots (3)$$

$Q_{t,mass}$ = longshore transport rate (dry mass kg/s)

$H_{s,br}$ = significant wave height at breaker line (m)

θ_{br} = wave angle at breaker line (angle between wave crest line and coastline)

4. Modified Kamphuis (Mill-Homens et al., 2013)

$$Q_{t,mass} = 0.15 \left(\frac{\rho_s}{\rho_s - \rho} \right) T_p^{0.89} (\tan \beta)^{0.86} d_{50}^{-0.69} H_{s,br}^{2.75} (\sin 2\theta_{br})^{0.5} \dots (4)$$

$Q_{t,mass}$ = longshore transport rate (dry mass kg/s)

ρ_s = sand density (2650 kg/m³)

ρ = sea water density (1030 kg/m³)

T_p = peak wave period (sec.)

$\tan \beta$ = beach slope

d_{50} = median particle size in surf zone (m)

$H_{s,br}$ = significant wave height at breaker line (m)

θ_{br} = wave angle at breaker line (angle between wave crest line and coastline)

Eqs. (1), (2), (3) and (4) show that longshore sediment transport is a sine function of breaker line angel, i.e. $\sin \theta_{br}$ with a value of zero if crest line is parallel to or similar to the coastline. Therefore, the tangent of salient will be similar to the tangent of the diffracted crestline.

III. SOME RESULTS OF THE PREVIOUS STUDIES

There have been many researches on salient formation at offshore breakwater. This section will present some results of previous researches that will be used as comparator on the model development. The results are in the form of qualitative relation between $\frac{L_s}{X}$ and salient without mentioning wave angel.

3.1. Ahrens and Cox (1990)

Ahrens and Cox (1990) used the beach response index classification scheme of Pope and Dean (1986) to develop a predictive relationship for beach response based on ratio of the breakwater segment length to breakwater distance from original shoreline (Table 1). The relationship defining a beach response index I_s is :

$$I_s = e^{(1.72 - \frac{L_s}{X})} \dots\dots(5)$$

Table 1. The value of $\frac{L_s}{X}$ and salient formation, Ahrens and Cox (1990)

I_s	$\frac{L_s}{X}$	Salient formation
1	4,2	Permanent tombolo
2	2,5	Periodic tombolo
3	1,52	Well-developed salient
4	0,81	Subdued salient
5	0,27	No sinuosity

3.2. Leo C. Van Rijn (2013)

The result of Leo C. Van Rijn research (2013) related to this research is on the relation between the value of $\frac{L_s}{X}$ and salient formation (Table 2) , i.e. as follows

Table 2. The Value of $\frac{L_s}{X}$ and salient formation, Leo C. Van Rijn (2013)

$\frac{L_s}{X}$	Salient formation
> 3	Permanent tombolo
$2 < \frac{L_s}{X} < 3$	Permanent or periodic tombolo
$1 < \frac{L_s}{X} < 2$	Well developed salient
$0.5 < \frac{L_s}{X} < 1$	Weak to well developed salient
$0.2 < \frac{L_s}{X} < 0.5$	Incipient to weak salient
$\frac{L_s}{X} < 0.2$	No effect

3.3. Others

Inman and Frautschy (1966)

$$\frac{L_s}{X} \leq 0.17 - 0.33 : \text{no accretion}$$

Nir (1982)

$$\frac{L_s}{X} < 0.5 : \text{no depositional condition}$$

SPM (1984)

$$\frac{L_s}{X} < 1 : \text{tombolo formation prevented}$$

$$\frac{L_s}{X} > 2 : \text{tombolo formation certain}$$

There is a conformity between Ahren and Cox criteria (1990) and Leo C. Van Rijn criteria (2013), whereas Inman and Proudcey (1966), Nir (1982) and SPM (1984) also conform with both criteria.

IV. SALIENT EQUATIONS

The change in the coastline is primarily caused by littoral sediment transportation. Littoral sediment transportation equations are the functions of tangent crestline against coastline and among others are equations from, Komar, P.D., (1998), Shore Protection Manual (SPM), (1984), Van Rijn, Leo C. (2013), Mill-Homens, J.,Ranasinghe, R., Van Thiel de Vries, J.S.M. and Stive , M.J.F., (2013).With this form of littoral sediment transportation, the tangent of the stable coastline is similar to the tangent of the crestline forming it, or for $y(x)$ the stable coastline equation whereas β is crestline angle and hence the stable coastline equation is,

$$\frac{dy}{dx} = \tan\beta \dots\dots(6)$$

Coastline behind breakwater will evolve into a stable coastline in the form of salient or tombolo, where the tangent of the coastline is in line with Eq.(6).

In the previous research (Hutahaeen (2020)), salient $y(x)$ equation was approached with polynomial, i.e. $y(x) = \sum_{i=0}^n c_i x^i$. Then polynomial coefficient c_i was obtained by applying Eq.(6) on a number of n boundary points by calculating beforehand the value of $\tan\beta_i$, with calculation method presented in section (4.1). The difficulty in this method is on the setting of boundary points where different boundary points produced different salient height Y_s .

4.1. Tangent Crestline Equation on Breakwater Lee.

Salient model in this research is developed with an assumption that salient is formed by diffracted wave, therefore it requires tangent from diffracted wave that can reach the coastline. In the calculation of this crestline angle, an assumption was applied that the tangent crestline on a point with x abscissa on original coastline is fixed, even though y ordinate changes due to the changes in bathymetry in the process of salient formation.

The second assumption on the calculation of this crestline angle is that crestline angle is symmetrical, with its center

in the middle of the offshore breakwater where the tangent crestline in the midpoint of the breakwater is zero. Tangent crestline equation is stated with polynomial equation,

$$\tan(\beta(x)) = \sum_{i=0}^{np} c_i x^i \quad \dots\dots(7)$$

Hence (6) becomes,

$$\frac{dy}{dx} = \sum_{i=0}^{np} c_i x^i \quad \dots\dots(8)$$

np is the number of polynomial term where the degree of polynomial is $np - 1$ and in this research $np = 5$ was used. The calculation of polynomial constant c_i was applied with least square method using 5 (five) interpolation points as on Table 3 and Fig.3., with the definition of crestline angle in Fig.4..

Table 3. Interpolation points of crestline angle

No	x	$\tan\beta$
1	0	0
2	$0.25L_s$	$\frac{0.25L_s}{X}$
3	$0.5L_s$	0
4	$0.75L_s$	$-\frac{0.25L_s}{X}$
5	L_s	0

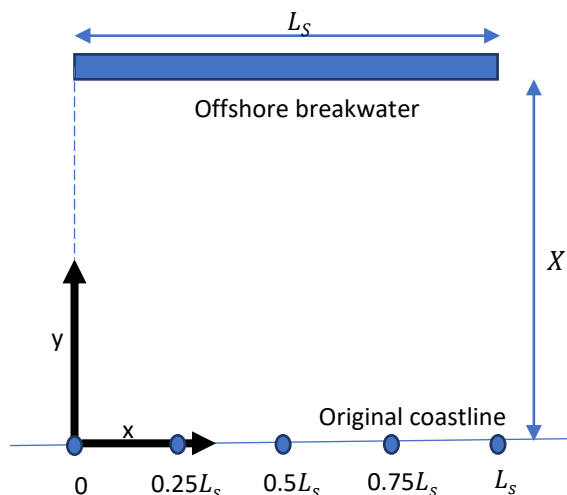


Fig.3. Interpolation points of crestline tangent

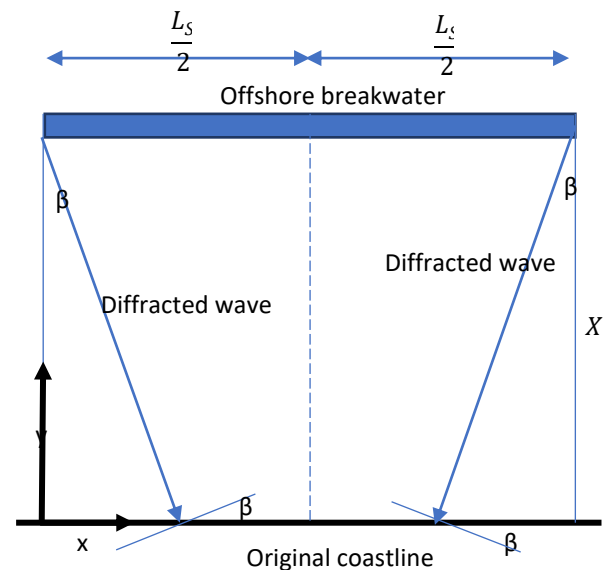


Fig.4. Crestline angle of the diffracted wave

As an example, the result of the interpolation of the tangent value crestline angle for $L_s = 50$ m, with $X = 25$ m and $X = 50$ m is presented in Fig (3). Fig.3 shows that the value of $\frac{dy}{dx} = \tan(\beta(x))$ at $X = 25$ m is bigger than at $X = 50$ m which shows that the salient curve for $X = 25$ m is bigger than the salient curve at $X = 50$ m. This also shows that the closer the position of breakwater to the coastline, the higher the salient height Y_s will be.

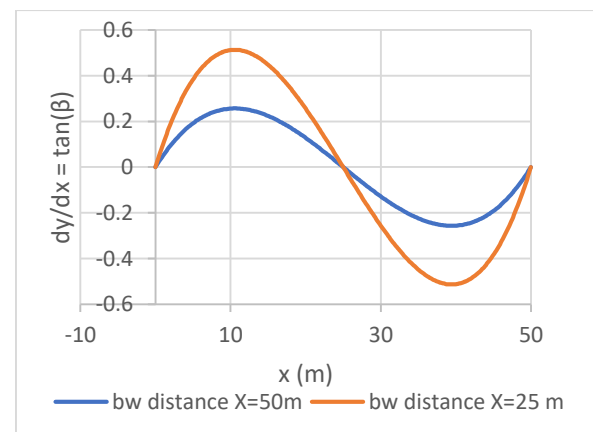


Fig 4. The value of $\frac{dy}{dx} = \tan(\beta(x))$ at $L_s = 50$ m, with breakwater distance $X = 25$ m and $X = 50$ m

V. THE SOLVING OF SALIENT EQUATION WITH WEIGHTED RESIDUAL METHOD

Salient equation $y(x)$ cannot be obtained by integrating the right side of (3) since there are two boundary conditions at the ends of the domain. Hence, (3) will be solved with an approximate method, i.e. Weighted

Residual Method with Galerkin method. Theory on this Weighted Residual Method refers to [5].

5.1. Approximation Equation

In solving differential equation using Weighted Residual Method, the solution is approached with a polynomial, i.e.

$$\bar{y}(x) = \sum_{i=1}^n a_i N_i = [N_i] \{a_i\} \dots (9)$$

$$N_i(x) = x^i(L-x) \dots (10)$$

This approximation equation meets the boundary condition at the ends of the domain, i.e. $y = 0$ at $x = 0$ and at $x = L$, where L is the length of breakwater L_S . n is the number of the terms where in this research $n = 4$.

Substitute approximation equation (9) to salient equation (8), will result in an error of R ,

$$\frac{d\bar{y}}{dx} - \sum_{i=0}^{np} c_i x^i = R \dots (11)$$

Substitute (4) to (5) will result in an error of R ,

$$\left[\frac{dN_i}{dx} \right] \{a_i\} - \sum_{i=0}^{np} c_i x^i = R \dots (12)$$

Equation to obtain the values of polynomial coefficient a_i is obtained by minimizing error R where in this research, the Least Square method is done.

5.2. Minimize Error with Least Square Method

To minimize error, the Least Square Method is done, i.e.

$$I = \int_0^{L_S} R^2 dx$$

$$\frac{\partial I}{\partial a_k} = 0$$

$$\int_0^{L_S} \frac{\partial R}{\partial a_k} R dx = 0 \quad \dots \text{for } k = 1 \text{ to } n$$

$$\int_0^{L_S} \left\{ \frac{dN}{dx} \right\} R dx = 0 \quad \dots (12)$$

Substitute Eq. (11) to Eq. (12)

$$\int_0^{L_S} \left\{ \frac{dN}{dx} \right\} \left(\left[\frac{dN}{dx} \right] \{a_i\} - \sum_{i=0}^{np} c_i x^i \right) dx = 0 \quad \dots (13)$$

or

$$\int_0^{L_S} \left\{ \frac{dN}{dx} \right\} \left[\frac{dN}{dx} \right] dx \{a_i\} = \int_0^{L_S} \left\{ \frac{dN}{dx} \right\} \left(\sum_{i=0}^{np} c_i x^i \right) dx \dots (14)$$

$$[K] = \int_0^{L_S} \left\{ \frac{dN}{dx} \right\} \left[\frac{dN}{dx} \right] dx \dots (15)$$

$$\{F\} = \int_0^{L_S} \left\{ \frac{dN}{dx} \right\} \left(\sum_{i=0}^{np} c_i x^i \right) dx \dots (16)$$

(15) and (16) formed n linear equation system with variabel a_i i.e.

$$[K] \{a\} = \{F\} \quad \dots (17)$$

Equation (17) can be solved with Gauss elimination method or the like, obtain the value of coefficients a_i ,

Then the coefficients are substituted to Eq. (9), obtain salient equation.

VI. RESULT OF THE MODEL

Fig. 5 presents the profile of salient, the result of the model, for breakwater length $L_S = 50$ m, breakwater distance $X = 50$ m and $X = 25$ m. Where $X = 50$ m salient height $Y_S = 4.167$ m is obtained, whereas at $X = 25$ m, salient height $Y_S = 8.333$ m is obtained.

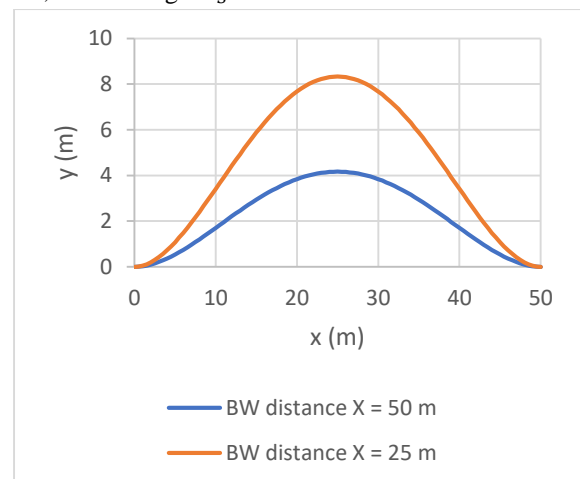


Fig. 5. The profile of salient for breakwater length $L_S = 50$ m, breakwater distance $X = 50$ m and $X = 25$ m.

Table 4 presents the result of the calculation for breakwater length $L_S = 50$ m, whereas breakwater distance X varies. At $\frac{L_S}{X} = 3.5$, where breakwater distance $X = 14,286$ m, $Y_S = 14,583$ m is obtained where actually Y_S cannot exceed X . This shows that tombolo permanent has been formed, as mentioned in the results of research [6] (Table 1.) and [7] (Table 2).

Table 5 presents the result of the calculation for changing length of breakwater, whereas breakwater distance $X = 50$ m. Similar result is obtained namely at $\frac{L_S}{X} = 3.5$ permanent salient is formed.

However, there is a difference between the result on Table 4 and on Table 5. As an example, on Table 4 at $\frac{L_S}{X} = 1.5$, where $L_S = 50$ m and $X = 33.33$, $Y_S = 6.25$ m is obtained, whereas on Table 5., at $\frac{L_S}{X} = 1.5$, where $L_S = 75$ m and $X = 50$, $Y_S = 9.375$ m is obtained. This result shows that in the salient formation, breakwater length plays more role than breakwater distance.

Table 4. The result of the calculation of salient height Y_s , for $L_s = 50$ m.

$\frac{L_s}{X}$	X (m)	L_s (m)	Y_s (m)
0,25	200	50	1,042
0,5	100	50	2,083
0,75	66,667	50	3,125
1	50	50	4,167
1,25	40	50	5,208
1,5	33,333	50	6,25
1,75	28,571	50	7,292
2	25	50	8,333
2,25	22,222	50	9,375
2,5	20	50	10,417
2,75	18,182	50	11,458
3	16,667	50	12,5
3,25	15,385	50	13,542
3,5	14,286	50	14,583

Table 5. The result of the calculation of salient Y_s , for $X = 50$ m.

$\frac{L_s}{X}$	X (m)	L_s (m)	Y_s (m)
0,25	50	12,5	0,26
0,5	50	25	1,042
0,75	50	37,5	2,344
1	50	50	4,167
1,25	50	62,5	6,51
1,5	50	75	9,375
1,75	50	87,5	12,76
2	50	100	16,667
2,25	50	112,5	21,094
2,5	50	125	26,042
2,75	50	137,5	31,51
3	50	150	37,5
3,25	50	162,5	44,01
3,5	50	175	51,042

VII. CONCLUSION

In the salient modeling using Least Square Weighted Residual Method and with salient tangent approach with a polynomial function, salient can be modeled with a result that is suitable with the results of previous research. In addition, there is no obstacle in the setting of boundary point and solution stabilization as contained in the previous author's research.

This research also found out that breakwater length is more decisive than breakwater distance, where the similar comparison value between breakwater length and

breakwater distance will result in higher salient for longer breakwater length.

As for further research, what needed is development of a model for a wave forming an angle with breakwater.

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Urban Neoshamanism: Updating the Sacred Jurema in Northeast Brazil

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Abstract— Contemporary urban life has shown an increasing discomfort to individuals who have been experiencing almost epidemic symptoms of stress, depression and persistent melancholy as a result of experiences increasingly removed from a satisfactory and comfortable human sense. We study here the involvement of two individuals from quite different origins involved in the search for this meaning and who found in neoshamanism a way of returning to Nature and fullness, still inserted in the urban social life to which they belong. Although of Italian origin, Garone comes to Brazil and from revelations given by the jurema itself as an entity, he receives a call for the creation of his own neoshamanic line, associating techniques experienced in several countries with his own experience of these revelations. He was responsible for the establishment of four more groups here in Brazil and another one in Italy. Nilma is a Brazilian descendant of the Anambés, people from a traditional indigenous community in Pará. Her original group did not have a tradition of using power plants. Biologist with a postgraduate degree in Human Ecology also found in the neoshamanic use of Jurema, the rescue of his identity and ancestral reconnection. Their reunion was motivated by the anthropological studies of their academic formation. Both find in the northeastern origin of this sacrament an identification that brings them to their coexistence, and both start to take up residence in the region. The two cases addressed demonstrate the need for a new meaning of religiosity in the urban environment, which can be catalyzed by the use of power plants, if necessary modified for uses in adapted environments, even if they are far from their ancestral origin. Both have in the Santo Daime Doctrine a gateway established to access a ritualistic way that allowed the development of two different lines of neoshamanism based on the use of Jurema. Both adapt to their own environment a different manifestation, revealed by the ritual itself for each one.

Keywords— Neoxamanism, Jurema, Urban, Power plants.

I. INTRODUCTION

The shamanic dimension is part of the evolutionary process of the human species. Neoshamanism seems to multiply in its narrative / discourse, from indigenous shamanism to current religions, gaining new outlines today, especially in urban areas. This article presents an analysis of how these neo-shamanic groups researched in this work are constituted in their narrative, therefore in their discourse.

Interviews were conducted with two leaders of neo-shamanic groups in two cities in the Northeast of Brazil: Aracaju in Sergipe, and Paulo Afonso in Bahia.

The first of them, Filippo Garrone, lives in the city of Barra dos Coqueiros in the State of Sergipe, a shaman of Italian origin who knew shamanism through his search for the energies of the world and all his invisibility. At a very young age he dedicated himself to esoteric practices and from an inner need that arose naturally, he met the Santo Daime, which was a watershed for him, as he carried out a direct experience with all that invisible that became visible

and that constituted if not only in seeing, but realizing his visionary perception of everything he knew existed and now in a strong manifestation of his pristine questions.

With his first contact with shamanic lines, he immersed himself deeply in the Santo Daime doctrine, left other spiritual works and dedicated himself to knowledge with ayahuasca tea coming to the Brazilian Amazon four times in order to participate in works in Céu do Mapiá (The main church of the Santo Daime doctrine in Acre). He felt that the referred doctrine was a way of learning how sacred plants work, how they should behave within a rite and the foundation of why working with these plants, functioning as a school that one day would end in a true higher impulse of spirituality said by ayahuasca in Santo Daime. Despite the deep and natural experience with Santo Daime, he felt gratitude for the doctrine in his spirit, however, this religious form would not be his identity.

After all the experience described, in conversations and research regarding power plants, he really got to know jurema through an anthropologist from Rio de Janeiro

named Pedro Luz, who introduced him to the Jurema plant about 15 years ago, in João Pessoa in Paraíba, where he had remarkable experience, in which he understood that this was the plant and the superior understanding he was looking for, becoming a son of Jurema, as a sacred and master plant. Based on his interest in the plant, Pedro Luz taught the basic formula of preparing the jurema, made on the home stove and then, in his absence, he improved his assessment over the 15 years with guidance from Jurema himself, which he has been using as shamanic form of work to this day.

During this time of immersion in the jurema as a sacred plant, he created study groups that were physically structured in 2012 at the Sacred House located in Barra dos Coqueiros in the State of Sergipe, in addition to the groups that help in the discovery of the sacred power of Jurema, object of this research, currently maintaining shamanic works described as 'juremeira' family, in a more refined way as to the formula presented by itself as being sacred and its effects.

The second interviewee was the indigenous Nilma, master in Human Ecology, biologist, born in the Paraense Amazon. His shamanic trajectory started in the Master's Degree at the State University of Bahia in the subjectivity and contemporaneity discipline from the knowledge of the Jurema plant, of which until then she did not know its properties, as he had not experienced any power plant. In the extra-class activity, he tried jurema for the first time, and from that he received a call to work with this plant, and started to seek to better understand and experience in work with Garrone in Barra dos Coqueiros and in the Umbanda Itassussé Center in Aracaju, both located in the State of Sergipe.

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Currently living in Paulo Afonso, in the face of the ancestral calling and his search for self-knowledge and openness to the spiritual world with the help of Jurema, she created the shamanic group Luz da Floresta where she lives doing works with songs that she received in the strength of the sacrament, in addition to meditations and

mantras. The group created three years ago is composed of 15 members who consecrate Jurema with the leader.

The study also reveals the evolution of the ritual itself from the experiences of each one. This evolution at the same time adapts their practices to the living environment of both as well as including their own personal history.

II. OF THE JUREMEIRA RAINBOW FAMILY

Questioned about the origin of the formula of the Jurema they use, Garrone clarifies:

So! It comes from a research that was done in the 60's by scientists from Brazil, the Netherlands and other countries. They wanted to find a formula made with safe plants, that is, plants that have been used by men for millennia with stable alkaloids. There are various ways of preparing the tea of Black Jurema with the Syrian Rue, which is the *Peganum Harmala*. However, the traditional indigenous communities of Brazil have never used this formula, it exists only from the 60s, and was created by scientists who were inspired by the biochemical combination for the preparation of Ayahuasca. The formula, as it was passed on to us, stems from a similar biochemical study, made by scientists. These scientists were half shamans (laughs). It is a formula that prepares the apparatus, i.e. the body in the best way to be able to access the state of consciousness.

We have noticed that the neoxamanic Jurema centers that have been organized in the Northeast and in different parts of Brazil, have incorporated this new way of preparing the Sacred Jurema tea that was born in the alchemy of the laboratories of different Brazilian universities.

Garrone, still talking about the construction of this formula, highlights the importance of researcher Pedro Luz, one of his great references, stating that he taught Yatra, and that he was part of the group of researchers who developed the formula that combines the Syrian Rue and Black Jurema. About his relationship with Yatra, he reports:

The first time I took jurema was with her, in Holland. She served a first Daime service and then pure Jurema. After that I met Pedro Luz, a person who transmitted to me a significant part of the knowledge about the Jurema tea that I use in our Neoxamanic group.

Yatra da Silveira Barbosa, to whom he refers, is quoted by Grünwald (2018) who comments on her daimist origin. Yatra had difficulties in obtaining permission from the Santo Daime church headquarters in

Acre for the non-religious use of Ayahuasca in the Netherlands. This use was related to the treatment of alcohol and heavy drug addiction in that country. Then, it was developed the substitutive use of jurema, with the help of Dutch researchers, who potentiated its effect from an alternative inhibitor, the *Perganum Harmala*.

The same author talks about the uses of Jurema in the 1930s, when the ethnicity of the indigenous people was praised as fundamental in its cosmology. The author also reports that in the same decade there was a diffusion of the Toré's practices among the Indians of the Northeast and that it remains until today.

From a biochemical point of view, as with Ayahuasca tea, rich in DMT (dimethyltryptamine) and MAO inhibitors, Jurema tea is also abundant in DMT, and to achieve the inhibitory effect on the human organism of these molecules, the indigenous people have developed combinations with different species, such as wild passionfruit. The differential of this new formula is the use of potent inhibitors (betacarbolins) contained in the Syrian Rue inserted from the work done by European researchers as the best alternative to the use of Jagube and as an MAO inhibitor in Ayahuasca.

As a researcher and experimenter of these different ways of preparing Black Jurema tea, I can state that this new neoxamanic formula, developed by the aforementioned researchers, has an amazingly greater potency than that obtained in traditional formulations.

I asked Garrone about this, who realized that the active principle of the Pergamum is equivalent to that of the Jagube and that it worked as an MAO inhibitor in the preparation of Ayahuasca. He answered that this study was conducted in Brazil by Pedro Luz, an important botanical doctor, who learned how to make this form of Jurema from his studies. He also pointed out that he had never met an anthropologist who had already experience with sacred plants. However, Pedro Luz not only knew about them but made constant use of them, and invited him to make use of the Sacred Jurema tea in his home in the city of João Pessoa in the state of Paraíba.

As observed in Garrone's narrative, his encounter with Jurema is interpreted as a "calling", from what he calls "Mama Jurema", to him a sacred spiritual being. About this "calling", he describes that:

I'm not sure how to explain it. I don't quite understand. When I started to feel it, I got a chill and realized it was something for me. I was at the conference and I went after him, but I didn't find him by chance of fate. I tried the tea, which was used by the Indians for millennia. But I didn't belong to that culture. Although I came from an

outside tradition, I was very curious. Nowadays, I recognize the courage I had to get into this story and I feel blessed.

As is common in the accounts of subjects who consecrate plants of power, the manifestations of spirituality in the case of the Sacred Jurema acts in the subject's existence in a profound way, changing senses, strengthening certain beliefs that, in many cases, flow into a strong anchoring process. This was Garrone's experience, who despite the Italian nationality and the wide experience in traveling through different parts of the world, chose to live in Brazil and taking as his mission the cause of the Sacred Jurema. As we observed in one of his accounts:

I was so happy using the plant. I heard something inside me, an ancient wisdom that I needed to know and serve those who are entitled to it. Those who come close, those who want to consecrate and have the willingness to face this world within, should feel a trade with this plant to serve, because it is pure love and servitude. This awakened many things inside me and I went through many difficulties, but Jurema and the "juremeiros" helped me.

One of the variables that we can point out for Garrone to have changed his life and still structured a nucleus of the Sacred Jurema in the municipality of Barra dos Coqueiros/Sergipe, was this calling and the benefit that this plant, this Sacred being, brought to his life. As his speech below proves, he feels responsible for making it possible for others to find the sacred power of this ancient tea:

I realize that the vast majority of the people who come to me, from their accounts, enter one way and leave another, much better than they were before. We don't ask about their beliefs, but we realize that, in a certain way, the Jurema it contributes to the encounter with their soul so that they become better people. This already worths, even if the person achieves her objective, most times this person will look for us and will continue to take the Jurema. Some never come back, as my godson who became evangelic. It is far from my knowledge, but I know that Jurema helped him to know his path.

The speeches are specific. Foucault (2007) speaks that the operation of the speeches are not defined in our reading, but each one has its own peculiarity, being analyzed by theories, and even so, they do not attend to all idiosyncrasies, since they can transit under several other speeches in their external side, changing their constitution and ordination. Therefore, we highlight that what we could

capture in our analysis was one among infinite meanings of Garrone's speech about the Sacred Jurema.

Speaking a bit more about his experience with the shamanism and the Jurema, Garrone said:

I follow my heart, it feels these spiritual things, that don't need to be measured by rationality. It is a sensibility connected to the Earth and nature because I remember when I was a child and I didn't like a visit, I would go to the backyard, refuting with the nature to be in peace.

It is clear the power of this spiritual dimension in the transformations that Garrone lived, in which the Jurema plays a fundamental role. He highlights that even his own spirituality was built through his connection with the Earth, with nature. These are factors he can remember clearly and to expose in his speech. It is about a constitutive relation of a subject with the exterior world around him, even in childhood, that has a great significance to him.

The construction of the individual is a well-spoken theme in society. However, what about his deconstruction? Is it possible to construct while deconstructing yourself? Derrida (2001) affirms that it is and understands deconstruction as theoretical thinking which intends to eliminate hierarchical frameworks that sustain many occidental mindsets. This philosopher reflects about these relations punctuating the need for inverting hierarchies of meaning. Garrone's meeting with the Jurema was a watershed experience that produced a new meaning to his existence.

Nowadays, according to his report, Garrone calls himself a Jurema "planter". He says that Jurema is a luminous plant and that it should be planted within people's souls. He defines his mission in these terms. And he completes:

I feel I'm a planter, so when I realize that someone is prepared and wants to study seriously, if there is a possibility to expand in the group, I go there and plant this seed. But this rarely happens, it's not that simple and not everyone can just start to drink the tea, not everyone adapts to that. We know that it's not like that, that it's necessary a certain dedication and to be willing to take care of others, and also to be organized to this financially speaking. Besides, it is necessary to make room to this seed.

III. OF THE FOREST LIGHT VILLAGE

The second interviewed was Nilma. Among other issues, she approached her self-knowledge within the neoxamnanic groups. She's also a native leadership from the amazonic Anambé ethnicity. She was born on the

riverbank of Tocantins River, in the city of Mocajuba, in the state of Pará. Though she has indigenous origin, she didn't accept herself as one due to the stigma related to her culture, but she started to understand her path from the experiences with Jurema. When questioned about her objective entering this "works" with the Sacred Jurema, she answered:

I believe no one have achieved one's objective of life yet, right? I think this is an ongoing walking here, since we learn something everyday, and everyday we're seeking for something... So, I believe everybody is just like me, we're seeking a meaning and that's why I'll keep consecrating the Jurema, I believe so, forever. Because She helps us along the way. It is about healing, you know? And I must reinforce that our main purpose is here, on the way with Jurema, on the light of the Forest. It is about self-knowledge, really, it's about surrendering and understanding a this ecosystem as part of a whole, as a whole cosmos.

Studying the role of religion, Mora, Trad and Boas (2012) debate the hymn of Padrinho Sebastião Mota's Hymnal which says: "the more you push from me, the more I must give you". Just like Nilma points out, in our relation with plants of power, particularly with the Sacred Jurema, the more we seek knowledge the more we receive from this "Force". It means that we are talking about a guide in life, a master, a teacher.

On this bias, the feeling of fragility before life, the human finitude and other episodes of our existence are worries brought by our urbanized species, but there are better integrated with the use of entheogens. Nilma spoke about self-knowledge, love and respect to each other and to the ecosystem. She pointed out that we can elevate our own lives by living this relation with the sacred. Thus we can highlight the role that these shamanic experiences, religion, spirituality, play in various processes in the life of the human being.

It is known, Religion implicates indoctrination, but, as observed in Nilma's speech, the Jurema would not be an indoctrination itself, but a discipline called by her, "the discipline of love". According to Nilma, mother nature teaches humans how to use the "medicines" of the Earth. So, to her, the Jurema is a learning to liberation rather than an indoctrination.

Highlighting the healing power of this plant, she clarifies:

The use of this drink in urban centers is like light in the desert of the souls... It's living water for those who are thirsty of life. It opens doors, it liberates us from the illusion of separation. Jurema's altar is the

heart of whom consecrates it. In the village, Jurema is beyond a beverage. She's a Mother that plays a relevant and fundamental role to the balance of life in the ecosystem. And as a Mother, she's honored and consecrated. Conceived as the Mother Earth that feeds and sustains us, the caboclos consider her as a guide who conducts them. This state of surrounding itself already provides a connection with the forces of nature, which makes possible to experience deep interactive trances with the sacred, being auxiliated by the songs, the power of "toré" and a great Faith. The way we exist is immersed in nature. We have a logic of living and perceiving life in a different way of the urban centers. It means no doubt the connection with nature is already a connection with the divine... And Jurema (the drink made only from the root of the plant) is sufficient to your connection with the Sacred. For this relationship with nature keeps us connected daily, we are naturally nature.

An Amazonian Indian, Nilma reports that she had her first encounter with Jurema outside of her place of origin.

My meeting with Jurema was a meeting with myself, an indigenous person, because until then I did not evaluate myself as an indigenous person nor did I recognize myself as an indigenous person because of the terrible process, which as in the Northeast happened with the indigenous people in relation to the culture, suffering until today a lot of prejudice. It was at the Masters in Human Ecology that I had contact with this Sacred Force.

Nilma attended the Masters in Human Ecology and Socio-Environmental Management at the University of the State of Bahia (UNEB). In this course, Dr. Juracy Marques, Professor of the Program, besides developing research on the traditional uses of power plants, created opportunities outside the academic space, so that interested students could have contact with spaces where this tea was consecrated: in indigenous villages, or therapeutic spaces.

It was on one of these occasions that Nilma had contact with the Sacred Jurema, in a lecture and experience given by the head of the Eclectic Center of Umbanda Itassussé de Aracaju-SE, in the city of Paulo Afonso/Bahia. As she describes, this experience changed his life forever.

About her interaction with Jurema, Nilma reported that the plant opened its way into a world previously unknown to her. From this recognition, she began to transform into someone who wanted to help her neighbour.

She reports that he heard a call from her ancestry, began to receive some hymns that reminded him of her childhood memories, including dreams and personal

conflicts. Asked about her own self-assessment of being able to help others, she answered that by helping herself and transforming herself, help arrives for others in a very subjective and profound way.

Objectively, however, Nilma reported that she noticed a change in the behaviour of the people she helps. She informed that people come to her lost, sad, and that, by the evaluation of their behaviour during the use of the plant, they begin to find themselves again.

But she stresses that, first of all, people need to want this change. Nilma points out that nowadays people are very sad, with an empty soul, living in superficiality, and that from the moment they come into contact with the divine essence and the sacred, they start to improve. Talking about the power of the Sacred Jurema, she affirms:

I believe that indigenous people, people of terreiros, quilombolas, fishermen and all those who establish a relationship of integration with nature and with the whole, practising faith, love and respect with the sacred and its ancestry, are already in the strength of Jurema, which has been teaching and rescuing souls, both in the villages and in large urban centres. I also believe that this more concentrated Jurema, consecrated in urban centres, can become a powerful healing tool for the villages, helping to treat the deepest wound of the Indians' souls: the disconnection with nature, which has been generating pain, sadness and hopelessness. This sacred medicine can be a tool to help to heal these pains, which come from the capitalist logic of relating with nature. This form of relationship has harsh consequences for the balance of life, causing diseases such as alcoholism (very common in villages), depression, anxiety and other illnesses, which also manifests itself with high rates in indigenous villages.

We can see in Nilma's speech that the people who seek her in search of a dialogue with her spirituality, most of the time, are also in a process of pain and sadness. These characteristics are also present in religions, as Mota, Trad and Boas (2012) state. The authors point out that the experience with the sacred aims at a transformation in the individual, being the corporified dimension of the religious experience something of great value.

On how to reconcile the context of the power plant with family members, Nilma said the following:

The power plant gives us change. In the beginning, it caused me many conflicts, separation from my partner until then... Nowadays I walk along with my brothers and I learn more and more, singing the hymns and receiving all the guidance I need.

In the songs that I receive, come many teachings. I myself already had a great interaction with nature, but now I have much more, although it may sound crazy, I can hear the birds, find myself as a human being and develop my works. It was all very natural and I never pressured myself about anything. I continue for the resistance in this group we have here: "United of the Forest", which has been a path of a lot of perseverance that made me question a few times about having entered this situation, but right after, the answer would come to me. Nowadays I am being worked on, together with my brothers, learning with them, being someone who walks on this earth, seeking alignment with my spirit and my matter.

Through Nilma's words, one can see that she is always stressing the importance of Jurema in her life. About this truth, whose power is present in her speech, comes the movement for her to become the leader of this neoxamanic group in the city of Paulo Afonso, who works with the formula of the Jurema tea associated with the Syrian Rue produced by Garrone. About the nature of this drink, she explains:

The Syrian Rue acts as a potentiator of DMT present in the Jurema. Its biochemical composition inhibits enzymes responsible for the breakdown of active DMT in Jurema. This formula transforms the beverage into a faster and more powerful vehicle to access the sacred, helping to break our rationality, thus enabling the connection with the invisible and access to divine consciousness. With the detachment from the higher self, humanity began to live in a constant exterior search, following a logic that emphasizes materiality over Spirit. This Sacred Wine integrates the magic of opposing complementary forces. The mystery of Jurema merges with the mystery of Syrian Rue, bringing in itself the energy of the Mother Creator Moon (intuition) and Father Sun (the force of the universe), Jurema and Syrian Rue respectively. Added to the water and taken to the fire, this divine drink becomes a powerful wine of the soul, integrating in this way these divine forces. This wine appears as a tool in urban centers. It rescues souls trapped in a daily life of individualism, consumerism, of the illusory compensation of an accelerated and competitive rhythm of life, far from nature. Which fills us with emptiness, giving space to diseases that corrode the soul and the mind like depression or anxiety.

When asked where her position on the teachings to guide her Jurema fellowship came from, she says that she simply feels, "I feel it and she's shown it to me, so she's a teaching plant and she's been talking and calling everyone for a long time, all I talk about is really feeling it". We know and, as she brings, there are many layers that compose Nilma's speech about her relationship with Sacred Jurema.

Foucault (1995) states that, initially, the subject will delineate himself in a certain field of enunciation, with status and place, presented to him, and that he will refer to possible relations with his past, opening to him a usual future. That is, there is no enunciate that is free, neutral and independent, so that each and every enunciate plays its role in front of other enunciates, participating actively in the construction of a subject. In Nilma's case, she defends a speech based on contexts that she has acquired with her experience with Jurema and, concomitantly, with what she is as a subject since her childhood.

Nilma said that in her work in the Fellowship, she only uses Jurema. She said at first she was opening for snuff, but it didn't work out. She also said that the Syrian rue leads to the awakening of DMT present in Jurema and that this integration relationship is perfect, even in thought integration. About the hymns she received in the rituals with Jurema, she replied that she conducted a very extensive study on them, describing them as sources of healing, praise and gratitude.

In explaining details of what healing would be, Nilma responded that healing occurs from the moment there is an understanding about enlightenment, that it is nothing more than the knowledge that comes and demands a change. This change would be healing, emphasizing that this knowledge is divine and comes from God. The healing would be that of the soul, which according to the interviewee is to free yourself from sorrows and burdens of the past.

Nilma carries out the works in the backyard of her residence, a wooded place with a bonfire in the center. She explains that this space belongs to the caboclos and, as she described, it has the strength of the forest and the waters, for being close to the São Francisco River. She also said that forces manifest in and through her in order to empty all misfortunes, exercising the practice of forgiveness and always moving forward in a positive way. Regarding the participants in her shamanic space, Nilma reported that they are very sincere and that there has never been a disintegration in the work carried out.

The hymnbook "Light of the Forest" which is worked by Nilma, is composed of praises to nature, thanks to God "father", God "mother" and all beings who accompany life.

For Nilma, Jurema brought a strong integration with nature, besides a significant improvement in the life of each member. She does not see her group as religious, but as a path without indoctrination, even though there is a relationship with the divine.

She affirms that her journey with Jurema took place before the sacred. She says that she also knows about the chemical reactions that exist in her body and her thoughts. Regarding the disintegrating and integrating process in each individual, she elucidated that the human being, by harmonizing internally, also awakens his exterior, feeling peace and well being. About the disintegration, Nilma states that:

When I speak of disintegration I am speaking of separation, since we are systemic, we are all united in wires, all interconnected. Once a little thread goes out of place, there is a separation, a disintegration. More violent reactions arise in some way or thoughts without connection, I don't know, there is a conflict. With that, there is a loss of this integrity.

Nilma reported that after the works with Jurema, still on the effect of the plant, she received messages and hymns, some even with lyrics and melody. She confirmed that she does not compose the songs, but she hears them sung by beings who do not identify themselves. They bring the songs to her mind, making her feel a very strong vibration. She affirms that, firstly, she goes through a process of deep cleaning of her matter to receive the hymns.

He also stated that he has received messages from Ayahuasca, and that he is also a member of the church of Santo Daime "Céu de São Francisco", in Paulo Afonso-BA. However, Nilma said that in her house she only consecrates the Jurema, being the Daime consecrated only in the church. Although she feels the need to consecrate the Ayahuasca and believes that she could also develop her work with it, she affirms that her preference is to work in her house with the Jurema.

I believe that Jurema is like a being, like a plant or a spirit that moves nature, that it is here calling its children and everyone to transformation. The need came here, I think, from every soul and being who sought Jurema, do you understand? The need is not mine. Jurema does not have that dimension of doctrine or religion. One of the things I have observed in some brothers and sisters who come here is that: they think because Santo Daime has a whole doctrine, all well defined, the ritual of Jurema would be the same. It even has, but as it does not have the uniform, people end up thinking

that Jurema is "all free". It is free, but within a discipline that is different from the Daime. That's our way of living shamanism.

Finally, Nilma continues to talk about her conception of what Jurema is to her and what makes people look for her work more and more each day:

I see it as an energy, a vibration of nature. I wanted to explain to you in what way I feel this spirit, this vibration of love that takes care of our work, our hearts, of everyone. She is in front of our works. I think I could say that I have great faith in Jurema. I really believe that everyone who comes to do our work is brought by her, comes by her.

The study also reveals the evolution of the ritual itself from the experiences of each one of the interviewees. This evolution at the same time adapts its practices to each one's living environment and also includes the personal history of both.

Garrone was guided by his autonomy through the improvement and mastery of a technique and formula proper to the preparation of the sacrament, being motivated, among others, by the influence of European academic developments and his formation as a shaman acquired in several countries. This search directed a profound change in his life culminating in a messianic attitude of humanitarian aid, which brought him to live in the northeast of Brazil, identified with his sacrament, "Mamma Jurema".

Nilma accepts the praxis received from Garrone and develops a work more linked to the liturgy of Santo Daime. Her indigenous ancestry also brings the caboclo riverine form characterized by the reception of the hymns, thus demonstrating to take a different path of her own, despite having experienced her first works of Jurema with Garrone.

IV. CONCLUDING REMARKS

In the face of the interviews, one perceives a parallel as to what Jurema represents for both, that is, a vehicle of self-knowledge, a means of connection with health, with the healing of the soul, the body and the spirit; with a greater consciousness of oneself, where the question of integral health is worked out, encompassing a planetary consciousness, as well as its connection with the sacred, be it the sacred life itself, or the divinity itself.

The plasticity of neoxamanism brings the possibility of cure to urban beings through the use of traditional peoples medicines, such as Jurema. In the bulge of this adapted ritualistic practice fits the enchantment, the renewal obtained by the deep respect inspired by the gift of a

divine being intimately present in a new conception of social existence.

The strength of an ancestry as a plant, divinity and identity, immersed in a collective unconscious, is updated, reinvented, penetrating urban environments. Manifesting itself to new subjects, Jurema gives birth to a circuit of a neoxamanic network in Brazil and in the world.

For having been used for millennia exclusively by people from traditional communities in the northeast of Brazil as a sacrament of openness and communication with this magical world present in our collective unconscious, there has always been the belief on the part of these peoples that the mysteries of the Jurema plant would not present itself to people of another culture. We noticed from the speeches of those interviewed that the plant responds to a mixed identity.

It is also clear that this new way of living spirituality, devoided of the precepts of its rituals, common to traditional religions, is an opportunity to address urban health and existential issues through a reconnection with the natural and the sacred.

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Interactions about Pneumatic Conveying Systems on the characteristics of Calcitic Limestone

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Abstract— *Pneumatic conveying is one of the most important techniques for the manipulation of particulate or powdered materials in the industry. This method has many advantages such as greater flexibility, simplicity of operation and lower cost if compared to other techniques of particulate handling. The objective of this work is to check the modification of the characteristics (particle size, angle of repose and apparent density) of calcitic limestone in an industrial scale pneumatic conveying system. It was verified by means of standard tests that the characteristics such as apparent density and effective diameter decreased by 22% and 7%, respectively, from the cycles with the material through the line of the pneumatic conveying system, and the angle of repose, even after abrasion of the material in the system, there were no significant changes.*

Keywords— *pneumatic conveying, material characterization, calcitic limestone.*

I. INTRODUCTION

Pneumatic conveyance is the term used for moving different types of materials from the suspension and mixing in a gas flow through a pipe. Because it presents advantages such as flexibility and low maintenance cost, it is one of the most important materials transfer techniques in a huge variety of industries (LOPES, 2007).

The design of a pneumatic conveying system for a solid material is strongly dependent on its physical properties, in particular, those ones involving interaction with air and with the pipeline. Typically, these interactions are a function of basic particles properties such as size, density, and shape.

The study of these properties and its correlation with their macroscopic characteristics is what defines the material for its proper application. If there is any change in these properties, the material may lose its applicability.

In a pneumatic transfer, intense friction can occur due to the interactions of the material with the air, the pipe and between particles, entailing changes in the characteristics of the material transported such as granulometry, apparent density, and angle of repose, which can lead to losses for industries.

In the mineral industry pneumatic convey is highly used, one of the materials widely used is the limestone. The limestone presents a wide variety of uses, from material for construction, material for aggregates, material for the manufacture of lime (calcium oxide), source of

hydraulic binder in the manufacture of cement, and even as ornamental stones (MINISTÉRIO DE MINAS E ENERGIA, 2008). The applicability is associated with the size of the limestone granule, size grains of 40 to 100 mm are used in cement kilns and steel kilns, as small grains of about 100 µm are used in animal feed (FEECO, 2008). For each industrial branch, the size of the limestone affects its application.

The present work deals with the analysis of calcitic limestone characteristics by sieving granulometry, apparent density through a known volume and angle of repose by the funnel method, before and after being transported in a pneumatic system by means of pressurized feeders, in order to compare the changes in their characteristics, validating or invalidating its applications.

II. THEORETICAL FRAMEWORK

This work presents and discusses the results of calcitic limestone characterization in terms of its angle of repose, bulk density, and granulometry. The angle of repose, among other applications, is relevant to determine the amount of volume loss in collecting equipment, such as a silo or hopper, due to the angle formed on the surface. This test gives directions for deciding the best solution for the material handling required in the company and to make

coherent projects for the installation of this chosen solution (ANDRADE, 2016).

Apparent density is the bulk density of the powder. It provides the mass per unit volume of loose-packed powders. This value is a first, low-cost evaluation of

powder to determine consistency from lot to lot. A low apparent density can be an indication of fine particles and a high apparent density can be an indication of large particles. A change in apparent density can also indicate a change in the surface roughness of the powder.

The granulometry is important to predict characteristics of the material transport, depending on the granulometry the material may have a greater facility to be transported, the granulometry also influences the fluidization capacity of this particular material, besides its applicability. Some definitions (VARELA, 2017) should be presented for a better analysis of the material:

- Fineness module: The sum of the percentages accumulated in all the sieves of the series used, divided by 100. The larger the modulus of fineness, the thicker the soil will be;
- Maximum diameter: Corresponds to the number of the sieve of the series used in which the cumulative percentage is less than or equal to 5%, provided that this percentage is greater than 5% in the sieve immediately below;
- Effective diameter: the opening of the sieve for which we have 10% in the total mass of all particles smaller than it (10% of the particles are thinner than the effective diameter) and presented by equation 1; this parameter provides an indication of the permeability of the sand;

$$d_{ef} = d_{10} \quad (1)$$

- Coefficient of non-uniformity: is the ratio between the diameters corresponding to 60% and 10%, taken in the particle size curve and presented by equation 2. This relation indicates the lack of uniformity since its value decreases when the material is more uniform;

$$c_{nu} = \frac{d_{60}}{d_{ef}} \quad (2)$$

$c_{nu} < 5$ uniform

$5 < c_{nu} < 15$ partially uniformity

$c_{nu} > 15$ not uniform

For the comparison between the limestone before and after transports, the first characterizations were carried out on samples of virgin calcitic limestone. After this data collection, the material was submitted to pneumatic transport in a cyclic system and then the same characterization procedures were performed. The pneumatic conveying system used is described in the next section.

III. MATERIAL AND METHODS

The mentioned material characterization, as well as the pneumatic conveying process, were performed at the facilities of the Zeppelin Systems Latin America Test Center, located in São Bernardo do Campo.

The system in question consists of two hoppers MG-02 and MG-04, two pneumatic guillotine valves (VGP-01 and VGP-02), one manual guillotine valve VGM-01, two butterfly valves for dosing -35) and a butterfly valve for air control (V-28), the blow tank (VP0100), a standard 3" pipe of about 130m, having a 5m height difference between the hoppers, an RT conveyor -01 and flexible for interconnection.

In order to control this system a flow meter (FL-01) and two pressure transmitters (PT-01 and PT-09) were used. The transport cycle consists of dosing material into the blow tank by means of butterfly valves, opening of valve V-28 and its subsequent closing.

Due to the limited availability of material to perform the tests, it was necessary to recirculate the material in batches through the system. It was defined that at a certain set mass value measured in the upper hopper the system would enter into the lower hopper feedback stage, preventing the opening of the air supply valve V-28, opening the pneumatic valve VGP-02 and RT-01 thread until a certain set value was reached, thus returning the system to its initial operation.

Each feedback loop was defined as "mass cycle". The system is shown in Figure 1.

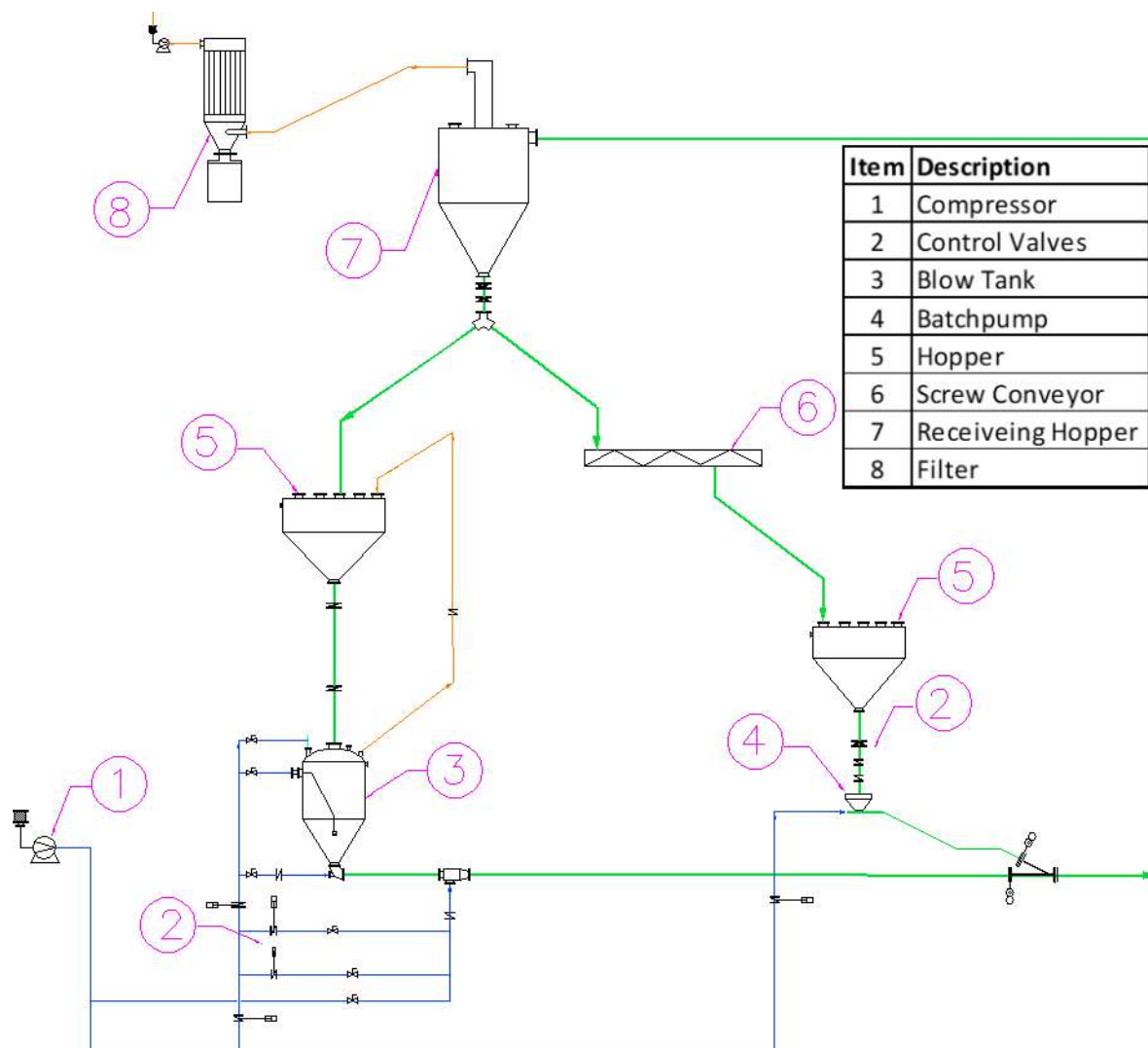


Fig.1: Schematic representation of the pneumatic conveying system.

The funnel method was used in the evaluation of the angle of repose. This method consists of filling a cylinder with a diameter at the exit of at least five times the diameter of the particle (GUZMAN, PELAEZ, 2008). The work makes use of a PVC tube filling up to approximately half its capacity, pouring the material contained in the container slowly and avoiding any vibrations in the cylinder and its bearing surface. The material is then deposited on the surface forming a cone as shown in figure 2, whose angle was measured by using a goniometer positioned at the straightest region of the cone and corresponds to the angle of repose.

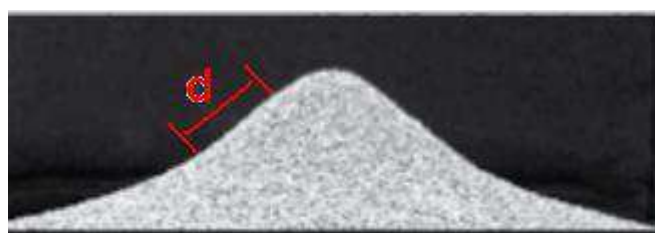


Fig.2: Material deposition and the region of the cone (d) that must be used to evaluate the angle of repose.

The method used in the work to determine the apparent density followed the experimental procedure: the material was added in a cylinder of known volume (152 cm³) until it was completely filled slowly so that there was compaction of the material, so as not to leave empty spaces which interfered in the density calculation, and then the mass of that material was measured by repeating this procedure ten times for the minimization of instrumental uncertainties. After these measurements, the obtained

value of mass was recorded, and thus the density was calculated dividing the mass contained into the recipient by its volume. The mean value of the bulk density was considered.

The granulometric test carried out in this work was done through the sieving method (SAMPAIO, 2007), where a series of sieves with different openings and previously known masses are stacked and the material is deposited into the top sieve. After submitting the ensemble to ten minutes of vibration, using for this purpose a sieves agitator, the sieve masses were evaluated again. The mass difference corresponds to the amount of material retained at each sieve.

IV. RESULTS AND DISCUSSION

Before the passage in the pneumatic transport, the sampled material showed an average apparent density of 970 kg/m³. In terms of the angle of repose, it was obtained a mean value of 44 °. Through the granulometric test it was possible to obtain the values of fineness module, maximum diameter, effective diameter and coefficient of non-uniformity, for future comparison with the limestone that passed through pneumatic transport. After characterization of the blank sample, the material was inserted into the transport line presented in figure 1 and then a sample was drawn for characterization. Its apparent density was 757 kg/m³. The mean value of the angle of repose at this stage resulted in 45 °.

From the granulometric test after the transport, it was possible to analyze the fineness module, maximum diameter, effective diameter and the coefficient of non-uniformity. These results are presented in table 1 comparing the limestone characterization before and after the pneumatic transport. The coefficient of non-uniformity revealed that limestone before the transport process did vary significantly, with an increase of 43%, but remained lower than 5, which corresponds to a considerably uniform material. The maximum diameter increased as well, which means that there was a greater mass accumulation in the sieves of greater aperture if compared to the test gauged out before the conveyance.

Table 1. Comparison of the material properties after and before the pneumatic conveyance process.

Property	Before transport	After transport
Angle of repose (°)	44	45
Bulk density (kg/m ³)	970	757

Effective diameter (um)	42	39
Maximum diameter (um)	180	300
Coefficient of non-uniformity	2,14	3,07
Fineness module	0,05147	0,03500

When comparing the obtained values of the tests with the applicability of the limestone (FEECO, 2018), one can verify that, considering only the particle size, the material continues in the same range of application even being submitted to cycles of pneumatic conveyance which are not common in industries, that is, the material is usually transported from a storage device to a destination only once. The influence of the pneumatic transport, by the system used, was that of degradation of the calcareous limestone grain. What can be concluded is that the material conveyance can change the analyzed characteristics of materials and, depending on the particularities of the system and number of cycles, can influence the application.

V. CONCLUSION

It can be concluded from FEECO, 2018, that limestone after passage through the pneumatic conveying systems did not show a change in its angle of repose. Already analyzing the densities and the fineness modulus we can see that there was a significant decrease. In the apparent density, there was a decrease of 22% after transport and in the fineness module a decrease of 32%. The effective diameter decreased by 7%. This shows that the limestone has become thinner because of the intense particle-particle, particle-air and particle-pipe interaction that occurs in a pneumatic convey. These interactions cause wear on the material and can cause a decrease in grain diameter.

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Innovation in the electricity sector in the age of Disruptive Technologies and renewable Energy Sources: A Bibliometric study from 1991 to 2019

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Abstract — This article aims to elaborate a bibliometric study about innovation in the electricity sector, in the era of disruptive technologies and renewable energy sources, to describe, quantify and analyze the studied themes, including their evolution, from 1991 to 2019. The following methodological procedures were used: a) definition of keywords and research in the Scopus and Web of Science databases; b) analysis of 159 selected texts, using Iramuteq with the R software statistical interface, for qualitative, quantitative and statistical data processing. As a result, it was possible to observe that innovation in the electricity sector in the world is incipient. In the USA, UK, Australia, China and 31 OECD countries including Brazil, renewable energy sources and technological innovation have found difficulties to make progress. In tightly regulated markets, regulation has yet to find the point and balance that can foster an enabling environment for sectoral technological innovation. The Brazilian electricity sector (SEB) also finds difficulty to innovate, as indicated in the studied literature. It was found that the research gap, which was the absence of bibliometric studies on innovation in the electricity sector in the world and in Brazil, was satisfactorily met.

Keywords — electricity sector; innovation; disruptive technologies.

I. INTRODUCTION

The study of innovation in the electricity sector began to draw attention in the last decade of the twentieth century, when a study on the technological reconversion of the oil refining industry was published, by gasification of heavy refinery waste with electricity generation, generating product and process innovation for both the oil and electricity sectors (Gulli, 1995).

From 1991 to 2010, the publication of literature on the subject remained relatively low, but from 2011 to 2019, scientific production accelerated and advanced rapidly.

In the same period (1991-2019), sector innovation shifted from product and process to companies, institutions, regulation and, more recently, to disruptive technologies, renewable energy sources such as solar photovoltaics, and Distributed Energy Resources (DER). (GVces, 2015; MME/SPE/EPE, 2018).

The type of innovation adopted, albeit incrementally, has shown that investing in new technologies has generated a combination of useful results or directed to both business and the environment. Business has been accounting for economic and financial gains and image

improvement with the consumer (Wiersma, 1991; Gulli, 1995; Fischer & Newell, 2008; Jusoh, 2017; Zhu *et al.*, 2018).

When a product and process innovation occurs in the electric sector, which implies a reduction in the use of fossil fuels for electricity generation, the environment receives a certain relief due to the reduction of greenhouse gas (GHG) emissions, since that GHG is one of the villains of global warming, which is one of the greatest challenges facing humanity today. However, this GHG reduction is still far from the ideal level (Gulli, 1995; Fischer & Newell, 2008; Jusoh, 2017; Zhu *et al.*, 2018).

Faced with the challenge of writing a thesis, whose theme is innovation in the Brazilian electricity sector in the era of disruptive technologies and renewable sources of energy, arose the need for a study that would understand the evolution of the theme in the world over time. After readings and discussions, the convenience of a systematic literature review through a bibliometric research was identified.

The bibliometric study is a quantitative and statistical technique used to measure the production and

dissemination of scientific knowledge that can also be a way of measuring the written communication patterns of the authors of these works. This type of study is recommended when the researcher is facing a large amount of bibliographic material published about the object of his research, as is the case shown (Araújo, 2006; Quevedo-Silva et al., 2016).

Thus, the aim of this paper is to elaborate a bibliometric study about innovation in the electricity sector in the age of disruptive technologies, to describe, quantify and analyze the studied themes, including their evolution from 1991 to 2019.

The justification for the application of bibliometric research in this article is the fact that this method is the most appropriate to present the vast published scientific production, in a summarized and systematized way, over a long period (Quevedo-Silva et al., 2016). The databases defined for this research were: Scopus and Web of Science, from 1991 to 2019, more specifically until June 2019. The choice of these two databases is due to their privileged position in the rankings of scientific publications in the world. The motivation for choosing the period is based on the fact that the 1990s (20th century) was a milestone in the study of business innovation in the world, and in 1991 the first publication (identified by this research) about innovation in the electricity sector occurred.

The contribution of this study is to structure the academic-scientific knowledge, on a global scale, on innovation in the electricity sector in the age of disruptive technologies, published in the Scopus and Web of Science databases, from 1991 to June 2019.

This article is structured in five parts, the first being this brief introduction. The second section presents a literature review involving the main concepts of the study. The third section describes the methodological procedures step by step. The fourth shows the results and the discussion of the bibliometric study. The fifth and last one describes the final considerations about the study accomplished.

II. LITERATURE REVIEW

The literature review presents the concepts of innovation, business model innovation, disruptive technologies (DT) of industry 4.0 (I4.0), Brazilian electricity sector (BES) and technological innovation.

2.1 Concepts

The main concepts that guided this study are presented.

2.1.1 Innovation

The concept of innovation for the purpose of this study followed the Oslo Manual, which is a proposal for guidelines for the collection and interpretation of data on

technological innovation in the scope of countries that are part of the 1997 Organization for Economic Cooperation and Development (OECD). In 2004, the innovation standard advocated by the Oslo Manual was adopted by Brazil as the benchmark for evaluating the technological innovation model at the national level, through an initiative of the Ministry of Science, Technology, Innovation and Communications (MCTIC) and the Financier of Studies and Projects (FINEP) (BRASIL, 2004; OCDE, 2004).

Currently, innovation is divided into three types: a) incremental innovation; b) creative destruction; and c) disruptive innovation.

The first two types were developed by Schumpeter in 1934 and are in the Oslo Manual. In it, incremental innovations are described as those that continually fill the process of change, while radical innovations bring about major changes in the world, the latter being responsible for the concept of creative destruction, coined by the same author (BRASIL, 2004; OCDE, 2004).

The third type of innovation is disruptive innovation, inspired by the concept of creative destruction, disruptive innovation means the transformation of a technology, product or service into something new, simpler, more convenient and affordable, that is, easily accessible and inexpensive (Christensen, 1997).

While disruptive innovation has emerged more than 20 years ago, it has started to build on the literature and the marketplace over the past 10 years, with the advent of start-up businesses in Silicon Valley, California, and within a new conception of business models, companies such as UBER, Netflix and others won over the world.

2.1.2 Innovation in business models

As there is no uniqueness as to the concept of business model, a broader search was necessary, since defining a business model implies on meeting complex organizational structures, that include internal (organizational) and external aspects. External aspects include the sector competitive environment, with potential for value creation for stakeholders, which can be translated into competitive advantage (Chesbrough, 2010; Gambardella & McGahan, 2010; Ostenwalder & Pigneur, 2009; Teece, 2010; Zott, Amit, & Massa, 2011).

Faced with a tangle of concepts that use similar terms, a concept for the theme arrived when Vils *et al.* (2008, p. 315) defined that Business Model “is an instrument by which companies make resources available, using internal and external structures and processes, aiming to create value propositions that solve their clients' existing problems or work”.

From the concept of Business Model, the search for what would be New Business Models began. It was concluded that it was the enterprises that were born using TD from the I.4.0's, some of them based on the sharing of goods and services supported by Information and Communications Technology (ICTs), but that fundamentally alter the traditional business configuration (Prause, 2015; Rifkin, 2012).

2.1.3 Disruptive Technologies (DT) and Industry 4.0 (I.4.0)

Industry 4.0 (I.4.0) is the combination of intelligent machines, production, processes, and systems that form a sophisticated interconnected network that emphasizes the idea of coherence, digitalization, and connection of all productive units in an economy, creating the virtualization of the real world in a large information system (Palma et al., 2017; Prause, 2015).

The first three industrial revolutions (IR) were responsible for mass production, assembly lines, electricity and ICTs, providing economic development never before seen in human history, increasing incomes and technological competition (Rifkin, 2012).

The fourth industrial revolution (FIR) is expected to have an even greater impact on an exponential scale, as it is supported by a set of technologies that allow the fusion of the physical, digital and biological world (ABDI, 2018; Schwab, 2018).

The combination of these technologies led to the transformation of existing products, services and even businesses into something newer, simpler and more affordable, modified by disruptive innovation, which required new business models. This change has reached the electricity sector in various places around the world and now it arrives at the Brazilian electricity sector (SEB).

2.1.4 Structure of the Brazilian Electricity Sector (SEB) and technological innovation

The strategic management of the Brazilian electricity sector is the responsibility of the National Energy Policy Council (CNPE). The Ministry of Mines and Energy (MME) is responsible for implementing the public policies of the sector. The Brazilian Energy Research Office (EPE) elaborates the system expansion planning, while the Electricity Sector Monitoring Committee (CMSE) takes care of the safety of the segment (BRASIL.MME, 2018).

The sector is regulated by the Brazilian Electricity Regulatory Agency (ANEEL), with the participation of the National Water Agency (ANA) and National Agency for Petroleum, Natural Gas and Biofuels (ANP), due to the

overlap caused by the resources involved (BRASIL.MME, 2018).

The technical operation of the electric system, as well as the coordination and control of the electricity generation and transmission facilities in the National Interconnected System (SIN), along with the planning of the operation of the isolated systems in the country, is performed by the Electric System National Operator (ONS), under the supervision and regulation of ANEEL (ONS, 2018).

The actors, agents in the electric system, are those involved in the generation, transmission, distribution, commercialization of energy, free consumers, importers or exporters of energy.

For several decades, the Brazilian electricity sector was dominated by power generation from water sources and maintained a traditional modeling, which highlighted the generation, transmission, distribution and commercialization (ANEEL, 2018).

However, there are signs that the current model has been changing configuration, as shown in the 2027 Ten-Year Energy Expansion Plan (PDE 2027). It predicts that technological advances are impacting the current market structure, which is beginning to change as new players or agents are included in this market segment, which are the independent producers or the energy prosumers¹, through Distributed Generation (DG), focusing on renewable energy sources, mainly solar photovoltaic (MME/EPE, 2018; MME/SPE/EPE, 2018).

The ramifications of these technological advances, together with the prospects for investment in SEB, show a change in the profile of the evolution of each source of electricity from 2018 to 2027, according to PDE 2027, Figure 1.

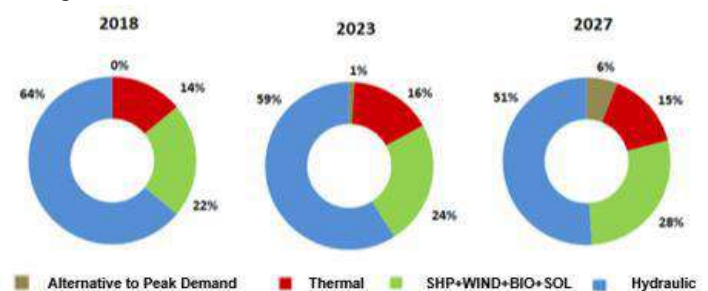


Fig.1: Evolution of the share of electricity sources PDE 2027

Source: Made by the author, based on data from MME/EPE, 2018.

It is noteworthy that, even with the significant drop in the share of water source, the forecast for the participation

¹ Prosumer is a neologism that comes from the combination of producer + consumer or professional + consumer (Rifkin, 2012).

of 80% of clean energy sources in the national electricity matrix is maintained, which is in line with the commitment of the Nationally Determined Contribution (NDC) signed by Brazil for 2030, under the Paris Agreement (MME/EPE, 2018).

Technological innovation in SEB is guided by the Energy Research, Development & Deployment, regulated by ANEEL, which determines that Generation, Transmission and Distribution (GTD) companies should invest at least 1.0% of their Net Operating Revenue (NOR) in the two programs: the R&D Program (R&D) and the Energy Efficiency Program (PEE) (ANEEL, 2018; De Castro *et al.*, 2015).

The R&D program aims to allocate appropriately human and financial resources to projects that demonstrate the originality, applicability, relevance and economic viability of products and services in the processes and end uses of energy. The aim of the PEE is to promote the efficient use of electricity in all sectors of the economy through projects that demonstrate the importance and economic viability of improving the energy efficiency of machines, processes and energy end uses (ANEEL, 2016, 2017).

The implementation of R&D, instituted by Law No. 9.991/2000, is divided into two phases. The first phase was based on Normative Resolutions 502/2001, 219/2006, which regulated the project cycles from 1999 to 2007. In this phase, R\$ 1.536 billion were invested in 4,555 projects, the main results of which were products (model/methodology and software/system), i.e. incremental process innovations accounted for 71% of what was generated, product/prototypes 9% and only 2% of the projects generated patents (Guedes, 2012).

Also in the first phase, these R&D projects also resulted in academic degrees of specialization, master and doctorate, in relation to the projects, in the order of 7%, 33% and 24%, respectively (Guedes, 2012).

The second phase of R&D, which covers the 2008-2017 cycle, regulated by Normative Resolutions 316/2008, 504/2012 and 754/2016, invested R\$ 4.070 billion in 1,643 projects. The PEE regulated by Normative Resolutions 556/2013 and 830/2018, generated 891 projects, with investments of R\$ 4.588 billion, according to ANEEL's project audit report (ANEEL, 2016, 2017). Therefore, the investment values of the two programs in this cycle amount to R\$ 8.658 billion.

III. METHODOLOGICAL PROCEDURES

To achieve the proposed objective, the following methodological procedures were established: definition of the research strategy and download of articles, according

to items “i” to “vii” (described below); qualitative, quantitative and statistical treatment of data using “R” and Iramuteq software, as recommended for bibliometric studies (Quevedo-Silva *et al.*, 2016; Camargo & Justo, 2013).

3.1 Database research, download and data processing

The research in the databases, including search, download and process of the articles obtained, used the following steps:

- i) search arguments: the definition of the keywords for the research was in line with the doctoral thesis project presented to the qualification board, at UnB's CDS: “electricity sector”; “innovation” and “disruptive technologies”;
- ii) database search strategy: the words were translated into English for query purposes: {[(“electricity sector”) AND (“innovation”)] OR (“disruptive technolog?”)};
- iii) refining search adjustment: a) Scopus = “TITLE-ABS-KEY” and Web of Science = “TOPIC”; v) export of the research results of the two databases in extension “.csv”; “.ris” and “.doc”;
- iv) handling of files in Excel sheets, according to the research interest: 242 articles downloaded;
- v) selection of articles to exclude duplicates (71 articles) and those outside the research scope (12 articles): 83 articles excluded;
- vi) research and download of articles defined as research interest: 159 articles;
- vii) inclusion of 159 articles in the Mendeley software;
- viii) reading of the abstracts of all articles.

3.2 Data processing: qualitative, quantitative and statistical

To analyze the 159 selected texts, Iramuteq (*Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires* – in french), a specific software that enables the identification of the context in which the words occur, was used, applying the R software statistical platform. In recent years, Iramuteq has been used as a data processing tool in scientific works and textual materials obtained in various ways, including articles published in journals, because it is free and effective in its results (Camargo & Justo, 2013; Salviati, 2017).

Initially, a database was prepared in Word, called “Corpus Geral”, with 159 texts, originated from the abstract of each article under analysis. In accordance with the Iramuteq method, each article abstract was identified with a title beginning with four asterisks, one space,

another asterisk. Then, the letter A (initial of the word Article) was placed, underline, AUTHOR'S NAME, underline, year of publication of the article. Example: **** *A_MOORE_2004 (Camargo & Justo, 2013; Salviati, 2017).

The article abstracts were copied and pasted into a Notepad, and all blank lines between the title and abstract or between paragraphs of the abstract were deleted, leaving only one space line separating one abstract from the other. A folder named "Corpus_teste" was created and the file was saved in *.txt format with the encoding: UTF-8 (Salviati, 2017; Camargo & Justo, 2018).

Next, the Iramuteq application was used, which processed the data and presented the description of the corpus². From it, we proceeded to Text Analysis, involving the following parts: Statistics; Specifics and AFC; Classification - Reinert Method; Similarity Analysis; and Word Cloud (Salviati, 2017; Camargo & Justo, 2018).

It was requested a generation of a statistic by selecting definitions "lemmatization", the key properties "1 – active", for adjectives and nouns; "2 – supplementary" for supplementary adjectives and supplementary nouns; and "0 – eliminate" for the other word classes; and "indexing". Based on this statistic, only active forms (nouns and adjectives) were analyzed and 40 forms were selected, with at least 42 occurrences (Camargo & Justo, 2018).

The next moment, the word cloud was made, the similarity analysis was performed, and the text was categorized into three classes by the Reinert method and the study of the Specificities and Correspondence Factor Analysis (CFA) in Iramuteq.

The word cloud analysis shows a set of words that are grouped, organized, and structured in a cloud form. These words are presented in different sizes, and the larger words are those that are most important and appear most frequently in the textual corpus. Although it is a simple lexical analysis, it is quite interesting because it allows quick identification of the keywords of a corpus (Salviati, 2017).

The Similarity analysis is based on the theory of graphs whose results help in studying the relationships between objects of a mathematical model. It shows a graph representing the link between words in the textual corpus. From this analysis, it is possible to infer the structure of text construction and the themes of relative importance, from the co-occurrence between the words (Salviati, 2017).

Reinert's method proposes a descending hierarchical classification and aims to obtain classes of Text Segments

(TS) that, at the same time, present similar vocabulary and different vocabulary from other classes. Its analysis is based on lexical proximity and the idea that words used in similar context are associated with the same lexical world and are part of specific mental worlds or systems of representation (Salviati, 2017).

The Specificity analysis associates texts with variables and enables the analysis of textual production as a function of characterization variables. The corpus is associated with variables that the researcher wants to analyze, so that the database is divided according to the selected variable (Salviati, 2017).

The use of Iramuteq made it possible to obtain the number of texts in the corpus, number of text segments, total number of words occurrence, number of different words, and number of words that appeared only once in the corpus. It was also possible to elaborate a relation with the active words, to understand the specificities, associating the texts with the variables used, calculating their frequencies and the chi-square relation of each corpus word.

This tool showed the words in different sizes, according to the frequency with which they occur in the textual corpus, grouped in a cloud format and facilitated the presentation of the link between the words in the textual corpus, making the similarity analysis.

In addition, it made it possible to perform descending hierarchical classification (DHC) with Reinert's method for grouping words into thematic classes. In DHC, Iramuteq performed the chi-square test (X^2) to measure the association between words and their respective class. According to Souza *et al.* (2008), the association will be confirmed when the value of X^2 is greater than 3.84 and the value of p, which identifies the lowest level of significance in which the null hypothesis of the association of the word with the grammatical class would be rejected, is less than 5% ($p < 0.05$) and a minimum use of 70.00% of the ST. In the sequence, the correspondence factor analysis (CFA) was performed (Camargo & Justo, 2013; Camargo & Justo, 2018).

The results obtained with the support of Iramuteq were analyzed in order to establish the connection between the scientific production from 1991 to 2019 as a way of explaining to what extent published articles can contribute to the study of innovation in the electricity sector.

IV. RESULTS AND DISCUSSION

The analysis of the results was divided into quantitative and qualitative with content analysis using Iramuteq/R. Class analysis from DHC and CFA results.

² Corpus is a set of texts constructed by the researcher that form the object of analysis (Salviati, 2017).

4.1 Quantitative analysis: publications and citations from 1991 to 2019.

In both databases, 242 articles were obtained, in which 127 were in Scopus and 115 in Web of Science. Of these 242, 83 were excluded (71 because they were in duplicate and 12 because they were outside the scope of the research). This left 159 works of the search that performed properly related in an Excel sheet, with the following data: Publishing base; author or authors; title; year; periodic; DOI; total of citations; average of citations per year, distribution of citations from 1991 to 2019³, as shown in Figure 2.

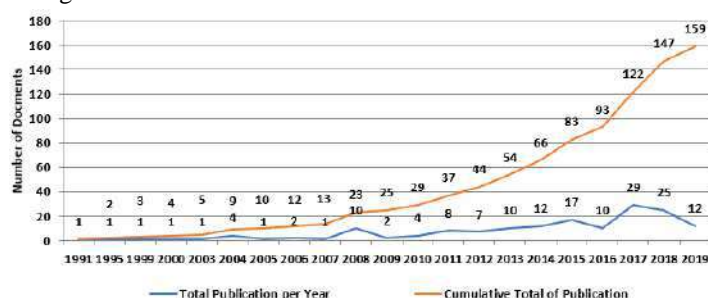


Fig.2: Number of articles published per year and accumulated in the period (1991-2019)

Source: Made by the authors.

The 159 articles generated 3,261 citations, whose annual and cumulative distribution can be analyzed in Figure 3. It should be clarified that the counting of citations started only in 2004, retroactive to 2002. Therefore, the period of citations registration ranges from 2002 to 2019 and the survey was conducted until June of this last year.

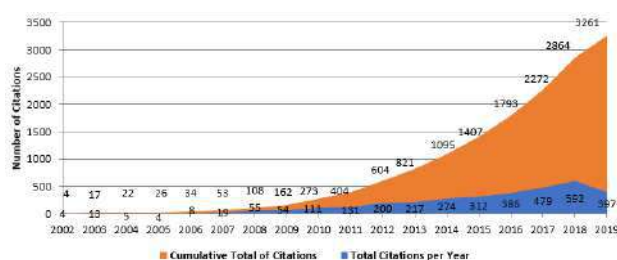


Fig.3: Number of citations of articles per year and accumulated in the period (2002-2019)

Source: Made by the authors.

Of these 3,261 citations, a single work contributed with 734 citations or 22.5% of identified citations. Another aspect verified is that there is a direct relationship between the growth of publications and citations in the analyzed period, which demonstrates the dissemination of

knowledge via publications in digital media, over the last two decades, enhanced by access via the Internet, as shown in Figures 2 and 3.

4.2 Content analysis of texts using “Iramuteq/R”

4.2.1 Statistical analysis of texts

The study was conducted through a General Corpus, consisting of 159 texts, separated into 861 text segments (TS). From it, 30,681 occurrences arose (words or forms), being 4,131 different words and 1,802 words with a single occurrence.

After defining the corpus, a statistic was generated, selecting as active properties only adjectives and nouns and using the lemmatization and indexation of these words. From this statistic, the following result was obtained: a) the number of forms that appeared only once was 1,303, which corresponds to 40.18% of the number of forms (3,243) and 4,25% of the number of occurrences (30,681); b) the 3,243 selected forms appeared on average 192.96 times per text, considering the number of 30,681 occurrences and the number of 159 texts.

Next, the 40 forms with more than 42 occurrences were selected, eliminating the forms “paper” and “study”, and a word cloud was formed on the theme under study, whose strongest word is “energy”, which appears highlighted in the central part. As can be seen in Figure 4, the twenty most frequently occurring words are: energy (298 occurrences), policy (186), innovation (177), technology (161), model (115), development (110), market (109), system (109), power (102), renewable (101), sector (98), transition (91), research (82), change (77), grid (76), project (74), carbon (71), process (69), emission (67) and business (61).

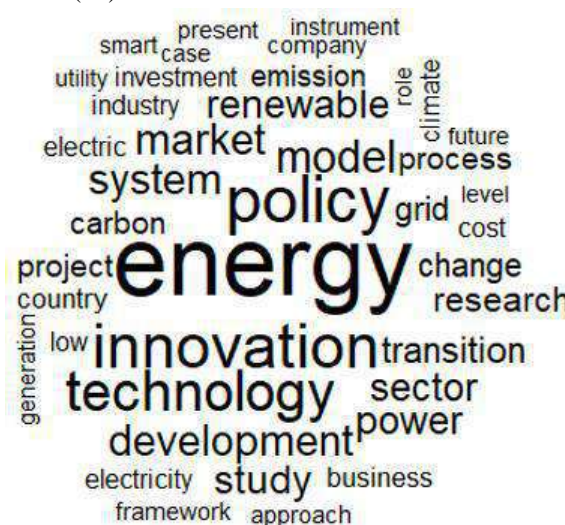


Fig.4: Word cloud of the general corpus of 159 texts

Source: Made by the authors, generated by Iramuteq.

³ Data extracted from the Scopus and Web Of Science databases refer to the period 1991 to June 2019.

4.2.2 Similarity Analysis

The Similarity analysis resulted in Figure 5, which resembles the roots of a tree, forming branches between the words that stand out as they appear closer to each other throughout the analyzed texts. From a central core formed by the word “energy”, it is possible to observe branches that form communities with “innovation”, “development”, “model”, “power” and “policy”. The stronger the root that connects the nucleus to communities, the greater and more frequent the relationship between them (Camargo & Justo, 2013; Camargo & Justo, 2018).

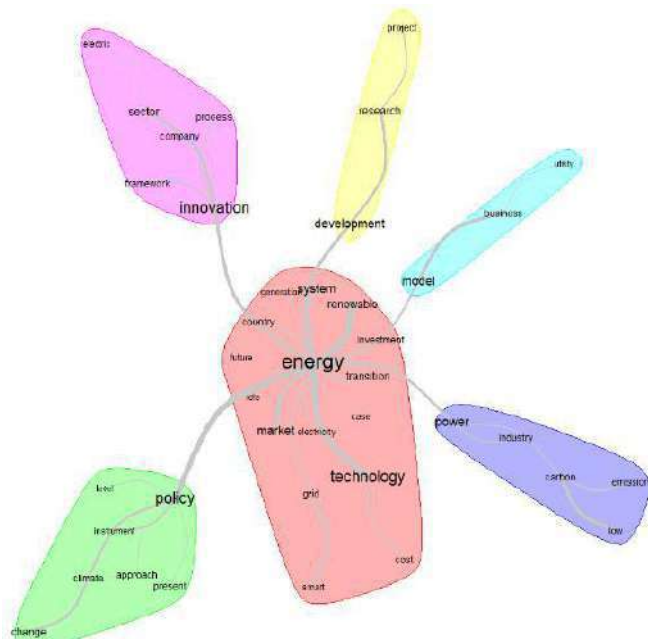


Fig.5: Keyword similarity and co-occurrence analysis - community and halo (1991-2019)

Source: Made by the authors, generated by “Iramuteq/R”.

Three of these communities form attention-grabbing nodes, such as: “policy”, with three branches, the most important being that consisting of “instrument”, “climate” and “change”; a second led by “power”, whose node is in “carbon”, distributing to “emission” and “low”; the last community is “innovation”, which has a node with “process”, “company”, “sector” and “electric”. This indicates that the analyzed literature addresses the relationship between these words in each community, by the proximity with which they appear in the texts, as well as by the frequency (Camargo & Justo, 2013; Camargo & Justo, 2018).

4.2.3 Descending Hierarchical Analysis (DHC)

The DHC is the most important analysis of texts or discourses performed by Iramuteq, because in it the TS are correlated, forming the hierarchical scheme of vocabulary classes (Camargo & Justo, 2018).

The analysis used the Reinert Method, where of the 861 TS found, 685 were classified, which means that 79.56% of the existing TS were classified, thus above the established minimum for the model to be validated, which is 70% (Camargo & Justo, 2013; Camargo & Justo, 2018).

Figure 6 shows the content analyzed and categorized into three classes: Class 1 with 255 TS (37.23%); Class 2 with 142 TS (20.73%) and Class 3 with 288 TS (42.04%).

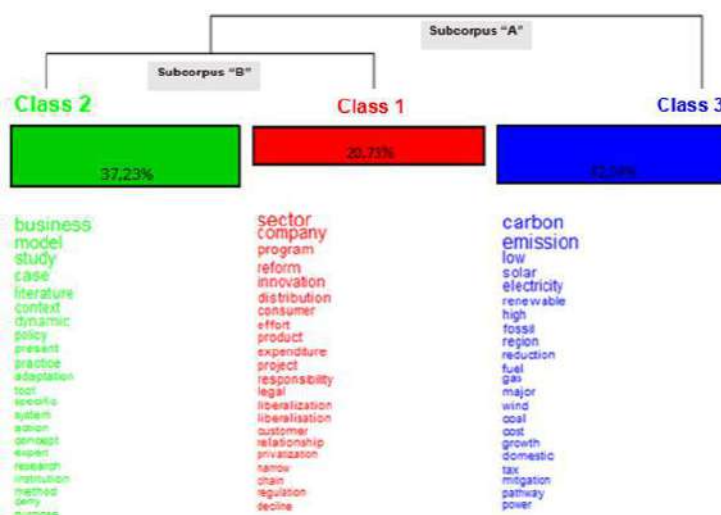


Fig.6: DHC classification of TS by Reinert's method categorized into classes (1991-2019)

Source: Made by the authors, generated by “Iramuteq/R”.

These three word classes are divided into two branches: A and B of the total corpus under analysis.

Subcorpus “A” has formed class 3 (“emission, carbon, low, solar and electricity”), called “Carbon”, which includes studies on CO₂ emissions from electrical power generation from fossil fuel, mitigation or emission reduction of CO₂ in the electricity sector, renewable sources of energy, with emphasis on solar energy as a source of low carbon electricity generation.

Subcorpus “B” has been divided into two classes: The first, “Sector”, contains the class 1 discourses (“innovation, sector, distribution and company”), that addresses innovation in the electricity sector, both in generation and distribution companies, and that demonstrates a new chain that focuses on the customer. The second, “Business”, composed by the words of class 2 (“business, model, policy and adaptation”), refers to the conception of new business models in the electricity sector, as well as the need for companies and institutions to adapt to this new market trend, with impacts on planning, management and regulation.

4.2.4 Specificity Study and Correspondence Factor Analysis (CFA)

To perform the study of specificities and CFA, 40 forms were selected and the variables chosen were: a) used forms: active; b) selected by: modalities (all modalities were selected); and c) minimum frequency: 42, according to the DHC analysis standard, Figure 6.

Figure 7 presented graphically the result of the analysis and formed three clusters in green, blue and red, which associates the words with the studied theme. The colors green and blue have groupings of terms closer than red, and red is well dispersed.

It should be noted that in the interpretation of clusters, font size is related to the frequency of the term, and the proximity between terms is a measure of how much they appear together. The results of the chi-square test (χ^2) and the value of "p" indicate that there was an association of each word with the respective class, since X^2 presented a result higher than 3.84, a "p" value of $< 0, 05$ and of the 861 TS, 685 were used, that is, 79.56% of the total, when the minimum acceptable is 70%, therefore, within the parameters indicated by Camargo & Justo (2018).

The groupings formed in the study of specificities and CFA are shown graphically in Figure 7, indicating to which class each group belongs, as defined by the DHC analysis.

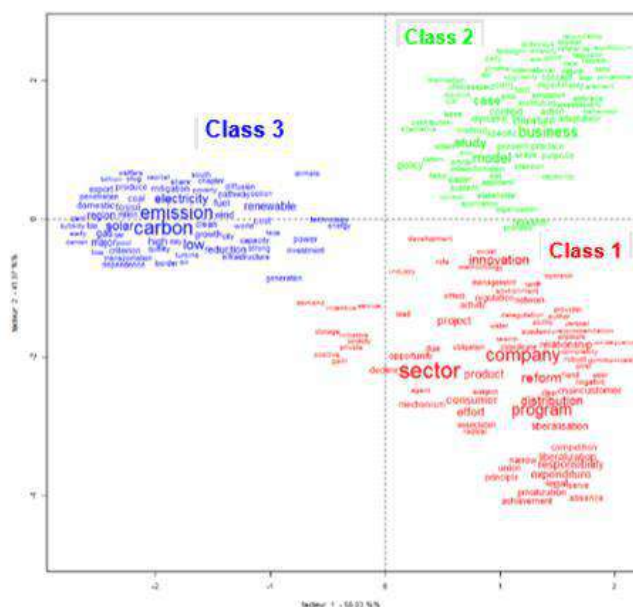


Fig.7: Study of Specificities and Correspondence Factor Analysis (CFA) (1991-2019)

Source: Made by the authors, generated by "Iramuteq/R".

The green grouping has an intermediate density level when compared to the blue and red ones. The highlighted terms are: "business", "model", "case" and "study", and a little further from the core of the grouping "policy",

"adaptation" and "system" appear. Thus, the terms of the green grouping indicate the relevance of the study on innovation and disruptive technologies in the electricity sector on business models in the sector.

The blue color grouping has a greater density of the terms "emission" and "carbon", followed by "electricity", "low" and "solar", around this core are "reduction", "renewable", "power", "fossil", "mitigation", and more on the periphery "technology", "energy" and "climate" appear. This demonstrates that these studies focus on carbon emissions, electricity and solar energy.

The content analysis of the texts showed that the thickening of terms in green and blue colors indicates that there is a high correlation, both in frequency and in proximity to them, with the keywords used in the search for articles on innovation, electricity sector and disruptive technologies.

The terms grouped in red, whose densification has a higher degree of dispersion, show that "sector, company, program and distribution" appear in the same frequency and proximity, while "innovation" appears more in the periphery of the group, which indicates a low correlation. However, they are well aligned with the study of innovation and disruptive technologies in the electricity sector, staying between class 1 "sector" and class 2 "business".

4.3 DHC and CFA analysis by classes: 1 - innovation, 2 - business and 3 - carbon

Next, an analysis of the results of DHC and CFA was performed, divided into three classes: class 1 - innovation, class 2 - business and class 3 - carbon.

4.3.1 Class 1 - Innovation

By analyzing the effect of public policies and market mechanisms for class 1, from the DHC and specificity analysis and CFA, "innovation", on the electricity sector, including companies and institutions, Jamasb & Pollitt (2015), updated previous studies on the UK electricity sector, admitting that the effects of both liberalization and privatization time are not known.

In recent years, it has re-evaluated the sector and realized that energy innovation efforts were not performing as expected, but acknowledged that there is a new effort to create a sectoral technology and innovation policy that could properly calibrate the institutional structure and promote long term progress in the UK (Jamasb & Pollitt, 2008a, 2008b, 2011, 2015).

Other studies looked at the effect of deregulation on innovation in the electricity sector, but one in particular, one that used a sample of 31 OECD countries or countries

that adopt international regulation standards in the electricity sector, like Brazil, and their findings suggest that a decrease in regulatory intensity after significant reform has a negative impact on innovation. The main factor of this force seems to be the degree of contestability of the market. This shows that there is an inverted U-relationship between regulation and innovation, as represented by Figure 8 (Marino, Parrotta & Valletta, 2019).

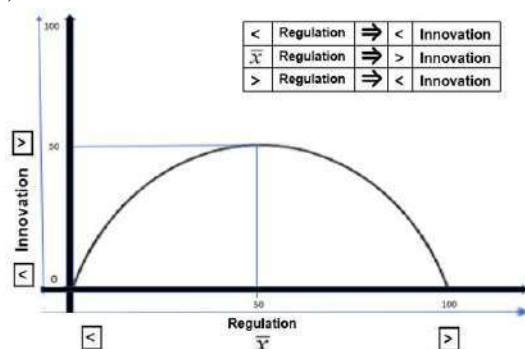


Fig.8: Graphical representation of the inverted U-shape of the regulation and innovation relationship

Source: Prepared by the authors.

The studies by Jamasb & Pollitt (2008b, 2015), conducted in the United Kingdom in 2008 and revisited in 2015, have shown that technological innovation has found difficulty to advance even in ultra-liberal markets such as the United Kingdom, where market mechanisms have failed to solve the problem. According to Marino, Parrotta & Valletta (2019), who studied 31 OECD countries or who use the OECD regulatory standard, where markets are regulated following international standards, regulation also could not find a break-even point that could account for advances in technology development and innovation in the electricity sector.

4.3.2 Class 2 - business

Regarding the studies done in DHC analysis and CFA classifications as class 2, renamed to “business”, with emphasis on the words (“model and policy”), there was a convergence of the authors as the possible impacts that disruptive technologies and renewable sources of energy will trigger in business models and public policies in the electricity sector on a global level (Fischer & Newell, 2008; Newell, Marsh & Sharma, 2011; Pereira & Soule, 2018; Pereira *et al.*, 2018).

It is noted that there is a growing concern with integrated resource management and a close look at the climate-energy-water nexus in countries such as Brazil and Australia, which increasingly requires a systemic and

multidisciplinary view on the subject (Fischer, Newell & Preonas, 2014; Nascimento *et al.*, 2017).

Smart grids can dramatically change the electricity sector by stimulating customer participation and allowing new players to enter as well as the admission of ICT companies. A critical analysis of existing smart grid studies assesses the consequences on the elements of the business model: value creation, value delivery and value capture, on which many uncertainties weigh, although there is reason to believe that electricity companies can innovate its business model and create the adequate conditions to operate with energy in a sustainable way (Shomali & Pinkse, 2016; Ausrød, Sinha & Widding, 2017).

As the same doubts also arise about the involvement of consumers and the support of governments and new players in this technological evolution, work must be done to reduce uncertainties so that innovation in business models in the electricity sector happens faster, since harnessing disruptive potential depends on quick decision-making for targeted and safe adaptation (Shomali & Pinkse, 2016; Pereira *et al.*, 2018; Pereira *et al.*, 2018).

4.3.3 Class 3 - Carbon

The scientific production submitted to DHC and specificity analysis and CFA, classified in Class 3, titled carbon (emission, electricity, renewable, solar), shows a very uniform positioning of the different authors, when considering that the generation of electricity is one of the most important sources when it comes to total CO₂ emissions, which is directly related to global warming. They also agree that large-scale implementation of innovative renewable energy technologies is key to reducing carbon emissions (Fuss & Szolgayová, 2010; Zhang, 2014).

China and the countries from the Association of Southeast Asian Nations (ASEAN) have a great potential for growth in renewable energy supply while at the same time holding even greater potential for reducing emissions by opting for a cleaner electricity matrix (Jusoh, 2017; Zhu *et al.*, 2018).

Published studies show that innovation in the electricity sector can deliver benefits to society by reducing CO₂ emissions, but all will depend on new business models in the sector, the increased use of renewable energy sources and the evolution on regulatory standards.

V. CONCLUSION

This bibliometric study on innovation in the electricity sector in the age of disruptive technologies and renewable energy sources, conducted with 159 articles published in

journals in the Scopus and Web of Science databases, covering the period from 1991 to July 2019, demonstrated that there are advances in innovation in the sector worldwide and especially in Brazil.

In the USA, studies analyzed the reduction of carbon dioxide emissions, the inclusion of renewable energy sources in the electric matrix, as well as the technological evolution in the electricity sector. These studies concluded that new technologies are impactful as they affect the desirability of ongoing sectoral policies (Fischer & Newell, 2008).

In Europe, innovation in ITGCC plants (“integrated tar gasification combined cycle plants”) was a milestone in the competitiveness of the oil industry in terms of cost and environmental impact reduction in electricity generation (Gulli, 1995).

These cases followed the same line as an empirical study carried out in the Netherlands on electricity-producing coal plants, which simulated for the period 1985-2000 and showed that in an evolving technological environment there would be a reduction in costs by reducing sulfur dioxide (SO₂) emissions per unit of electricity produced by these plants (Wiersma, 1991).

In Asia, notably China, there is a great potential for reducing CO₂ emissions by increasing the use of renewable energy sources, making the continent's electricity matrix cleaner (Jusoh, 2017; Zhu *et al.*, 2018).

In Brazil, the authors Bin *et al.* (2015) and Pereira *et al.* (2018) recognize the advances, but point out problems in the PD&I model adopted by SEB, especially regarding the results of the program regulated by ANEEL. Regarding the problems, the authors Bin and Pereira, can be aligned with Jamasb & Pollitt (2008b; 2015) and Marino, Parrotta & Valletta (2019) who identified that the difficulties faced by innovation models in the electricity sector are inherent in tightly regulated sectors.

Given the results of the studies analyzed, it can be concluded that for the society to reap the benefits of these new technologies, innovation must be able of generating new business models, capable of absorbing disruptive technologies and involve the new actors who will work in the electricity sector.

The study shows that new research should focus on new business models based on renewable energy sources, smart grids and consumer behavior, since these are the trends that will dominate the industry in the coming years.

Another barrier to be broken is the U-inverted effect, because the literature indicates that there is a knot to be untied in the regulation and innovation relationship. If regulations are not adequate to encourage innovation, countries that fail to advance in innovation may lose the

opportunity to have a more efficient electricity market and also lose the chance to benefit from the potential gains from innovation in three respects: economic, social and environmental.

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The more education program as a gate for Capoeira in School

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Abstract— This work presents capoeira as a pedagogical tool for contextualizing school education. Observing how the teaching of capoeira and the historical process of the African and Afro-Brazilian people, thinking of them as identities intrinsic to it, appear in the school context. In this sense, proposing the breaking of the invisibilization in the pedagogical works that provoke constructions and stereotypes about the cultural and religious manifestations of this people. It is worth mentioning that the bibliographic walk of one of the authors, based on the report of experiences lived in capoeira, inside and outside the school, envisions showing examples of profiles of professionals who develop work with capoeira at school. In this case, the locus of research will be the Educational Center Luis Eduardo Magalhães, in Sobradinho-Ba, an entity that has already developed works in two Federal Government programs, mainly the Mais Educação program, indicating the possibilities and contributions of capoeira as a tool for contextualizing the school education. The activities developed in such a context were what made it possible to know the divergences between what is proposed in Laws 10.639 / 03, as amended by Law 11.645 / 08 which deal with the teaching of Afro-Brazilian and indigenous culture and what is experienced in the programs. The contradictions that, even in chaos, fill the absence of playfulness at school very well, with actions that enable students to learn while moving, talking among themselves and with others. Boiling point to be corrected, in order to advance in pointing out the possibility of the school becoming a space for the preservation of capoeira as a Cultural and Immaterial Heritage of Humanity.

Keywords— Capoeira. School. Culture. Contextualization.

I. INTRODUCTION

This work observed the presence of capoeira in the school and its connection as a possibility of contextualizing teaching. In this north, seeking to emphasize the importance of activities with capoeira in Elementary School from the 1st to the 6th year, mainly, from the experiences at the Municipal school, Centro Educacional Luis Eduardo Magalhães, in the City of Sobradinho, north of Bahia, northeast of Brazil, in the year 2013. This work made it possible to break with the paradigm of capoeira thought merely as an activity devoid of a pedagogical structure, folklore, even neglecting the historical aspects intrinsic to it, a contributing act for stereotyped constructions for the African and Afro-Brazilian people.

The initial description of the previous paragraph is complemented by the timid way in which teachers talk about African and indigenous contributions in Schools, often using only the fragments described in textbooks, worked by teachers in the classroom in a simplifying way, without discussion or conversation .

This work is based on bibliographic research, plus the feasibility possible due to the spaces built and occupied from the creation of the Federal More Education

Program, which enabled the activities that permeate the autobiographical experience report for this work, as proposed by Souza (2007), an experiential approach, with life stories or educational biographies.

Regarding the concept of school, I understand it as an institution that should teach the diverse knowledge present in society and not just the scientific knowledge determined by the curriculum matrix, I used the perspective of decontextualization by Marques (2016) and contextualization by Martins (2006), which look at deconstructing the school and the other at reformulation. However, I prefer to walk, taking advantage of the influence of both, as they highlight the importance of including other knowledge in the training of children and adolescents who attend school, stressing the importance of cultural plurality, and the school no longer has to deny the issues surrounding the diversity, decontextualizing or contextualizing are names that propose paths - not taking into account the margins, the ones without reflections in the social mirror, as Eduardo Galeano says (2015)

Therefore, I justify the desire to carry out this work by the concerns arising from personal experiences in teaching capoeira, as well as the indifference of the professionals who worked at the school during the work I did, causing

the absence of links between the students' learning from the beginning. curricular matrix imposed on the school environment and the teaching of capoeira.

Finally, I present the possibilities of reaching this work, a perspective that awaits, follow a path that, over time, allows greater involvement of capoeira with school education. Contributory dimensions for breaking paradigms of the relationship of strength and hierarchy of knowledge - whether due to the formative dialogicity of capoeirista actors or the attitudinal changes of school professionals. Capoeiristas, focusing on the development of better quality works, with the participation of Masters, Teachers and capoeira practitioners in school activities. Of school professionals, having a collaborative instrument that will walk together in solving problems of discipline and playfulness, positively influencing learning.

II. METHOD: THE CONTEXTUALIZATION OF SCHOOL WORK

The work was carried out from a bibliographic review and analysis of the reports of experiences exposed by one of the authors of this text for the production of a course conclusion work, presented to UNIVASF- Federal University of Vale do São Francisco, located in the State of Bahia, Brazil. A production that presents itself as an essay format, envisioning the continuity of capoeira studies, thinking as an important tool for contextualizing school education.

In the sense of walking that seeks the social legitimation of capoeira, the individual produces knowledge based on the history of himself and the community he represents, thinking about the knowledge necessary for the development of the human being. In this sense, the professionals who enter schools ethically, incorporate other studies into their work with capoeira: on the development of the child and the pedagogical knowledge necessary to be there, in that formative space. Thus, looking at the school space through the lens of contextualization, as an institution of society that should not only teach elements relevant to the specific contents of curricular subjects. Thus, capoeira becomes part of the works, a space that requires unlimited and sufficient knowledge for those who aspire to carry out activities with quality.

The previous paragraph reflects the notes of Martins (2006) when he says that, at the time the school understood the great contribution of traditional knowledge from society, it would perceive itself as part of the reality where it is inserted, aiming to propose "an education with their feet on the ground they step on", reaching the widest educational dimension of the social actors involved. The

author emphasizes the importance of school in the game, in relation to human educational development. A development that should enhance the capacities of the subjects, aiming to improve the way they produce their existence, encouraging creativity, awakening the responsibilities for collective living. In the words of the author himself

In this sense, even though the notion of "education for living with the semi-arid", enjoys this enormous lack of definition or this plurality of meanings, it is already inserted in a language recognized among many collective actors who recognize that education cannot afford to ignore the ground you walk on. In fact, both the notion and the practices that it animates and inspires, come from the criticism made of this "decontextualization" of school education, of its practices and knowledge. (Op. Cit. P. 37)

Martins (2006) also points out the importance of including other knowledge in the training of children and adolescents who attend school, valuing Cultural plurality, therefore, it is no longer up to the school to deny issues involving diversity, such as those presented in the questions raised by Marques (2015) called for the meaning of a broader place, which he called decontextualization? A vision that presents itself, reflecting the lack of context experienced by the refugees, without a place, cannot remain and cannot fully return to impermanence, the movement of those who often leave their homes and flee from the chaos caused by the war, whether in the Middle East or in Africa. A fluidity that launched towards education does not only hurt the school, because it causes us to think about collective responsibility, which according to BRASIL (1988) says in "Art. 205. Education, the right of all and the duty of the State and the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, their preparation for the exercise of citizenship and their qualification for work". In this case, society is called upon to commit itself to school work, because, in the face of so much complexity in the world, pedagogical work no longer fits activities based on xeroxed texts in crowded rooms, only, or even, activities without reflection and neither the necessary discussion.

As stated by Freire (2000), it could be said that there is a lack of political education, which would provide students, teachers and the community with an understanding of their presence in the world. Training that would enable understanding and empowerment, for the

commitment to demand the proper use of participation mechanisms, laws, so that they work as they are set, to build an education based on school reality, emphasizing the need of dialogicity between man's knowledge of the reality that surrounds him.

There is an urgent need to expand the discussions on the social function of the school, in a collective, democratic, inclusive construction, in an attempt to reduce the number of students from the less favored classes who are in the middle of the road and consequently devalue the cultural manifestations of their community. , for not realizing their presence in the school context. They are the invisibles, who find no sense in learning such knowledge and despise them. I emphasize that this is not about saying that one culture is better than another. The most rational proposal would be to guarantee participation with greater equality, where students could recognize themselves in the educational process, seeing or feeling the presence of the culture (s) considered to be of family or community experience at school.

The aforementioned proposal consists in advocating for school work that surpasses the form of work punctuated in the unique condition of content transmission, organized for the benefit of the perspective of social domination. Appropriating the conditions arising from the Mais Educação Program, where, after solving the bureaucratic difficulties posed to popular knowledge, we can together build a comprehensive training for children and adolescents who attend school, a point discussed in this study and which will follow in the next session.

III. RESULTS AND DISCUSSION: ENTERING THE CAPOEIRA ACTION FIELD

In view of the diversity of possibilities for working with capoeira, it becomes pertinent to use the memories of our ancestry, which added to the experiences and literature, serve to punctuate the type of capoeira and capoeirística arrived at school. Furthermore, may the experiences serve as an example to present a characterization of the training of professionals who appear daily in this type of work. Capoeiristas who have an academic background are not superior or replace ancestry, the old masters, knowledge built from training carried out in the academy, in the streets and in vagrancy, however, when they arrive at school, they are lacking specific knowledge and necessary to work with children and adolescents.

Thus, experiences should cooperate for a better quality of work, making it possible to show the built conditions and find the best capoeiristic training for those who want to work at school.

The narratives about the experiences of capoeira teachers who work at the school narrate the ways of acting, making it possible to show that many experiences lived while walking, outside the school, arrive at the school stripped of pedagogical constructions and require an intervention by the school management.

The school is an important space of legitimation available to capoeira knowledge, even if unevenly distributed, however, it requires having a well-formed training or work proposal, with strategies or actions for a proposal for quality work, which contributes to a paradigmatic change, thinking about the view that school education professionals have on capoeira. In this sense, guaranteeing the transmission and preservation of historically constructed knowledge, thinking as Marques (2016) that “we are also, permanently, inventing ourselves from the way they invented us. This is our best way to exist”(P.121).

CAPOEIRA: THE PEDAGOGICAL TOOL FOR THE CONTEXTUALIZATION OF TEACHING AND SCHOOL AS A SPACE FOR SOCIAL LEGITIMATION.

The main experiences to teach capoeira at school took place in Brazil from two government programs: the first called Programa Segundo Tempo in 2008 and the other Mais Educação Program in 2013, all carried out at the same school. In 2013, they were developed in the evening, that is, students who study in the morning (morning) participate in the program in the afternoon (afternoon) and vice versa, the program was the responsibility of the principal. In this work, the organization was related to the construction of government measures that sought to extend the school day. In this sense, the program had as its main prerogative, to lay the foundations for the promotion of a full-time education, in the state and municipal networks of basic education.

The implementation of the Federal More Education Program created spaces for the development of activities composed of other knowledge from the community. In this perspective, the program was able to soften the emphasis given to the traditional model of education, enabling oriented recreational activities that guaranteed the broad participation of students from different communities, however, caused the professionals traditionally established in the school, strangeness and distance from activities. Thus, the school walked in the perspective of what Freire (1995) called the field of struggle of the legitimizing instances of power, and, of Bourdieu (1983), it supports the power relations between agents (individuals and groups), mainly, within the institutions that have the power to dictate the rules.

The main criticisms of the professionals who traditionally worked in schools and the disagreements with the Program, in addition to the distances from the activities performed at the school, were based on the justification that the plans were carried out by the Department of Education, without the participation of parents, teachers and technicians. About these aspects questioned by the teachers, Marques (2016) affirms that it is essential to seek to understand “[...] if knowledge, knowledge, can be a monopoly of a system, a house, a discourse and what are its consequences for the equality or inequality of human intelligences ”(121), in this case, we could ask, if knowledge can be a group's monopoly? If collective work is not important for the construction of school work.

Unfortunately, this praxis of school spaces in Brazil is something that is commonly carried out. This form of organization creates a structure that even limits other knowledge of working at school. The form of school administration is increasingly distancing itself from the laws that govern it, allowing itself to be guided by a management centered only on the Department of Education, excluding teachers, students and the community from the process of constructing the knowledge to be work in the school. This management model makes a distorted reading of the LDB (Law of Guidelines and Bases), which governs curricula and obliges schools to have a base that is common throughout the national territory, however, to be complemented with other areas of knowledge, called diversified base. In this diversification, the inclusion of teaching African and Afro-Brazilian history would be appropriate, where capoeira and other knowledge of the community would have their spaces guaranteed.

In this perspective, capoeira would appear as a proposal to complement the school's Pedagogical Political Project, contemplating possibilities of adaptation to the school curriculum, dialoguing with the disciplines of arts, religion, history, geography, physical education. Including as a resource to the themes on the fulfillment of what determines Brazil (1996) of the laws 10.639 / 03, nº 11.645 / 08 that speak about the mandatory teaching of Afro history and the law 11.769 / 2008 that deals with the mandatory teaching of music.

Regarding the justifications about the possibility of capoeira helping to adapt the law 11.769, we can bring some justifications:

a) Introduce the student to the general notions and basic structural principles of music, such as harmony (analysis of simultaneous sounds, superimposed as that of two or more instruments using - berimbau, tambourine, atabaque, agogô passing to the melody, rhythm and composition

stimulating the creation of music emphasizing the history that involves capoeira.

b) Introduce the student to basic notions of singing, since every capoeira song is written and accompanies the melody put on by the berimbau: The gunga or berra boi (more serious), the middle in reverse and the viola itself. Not to mention that the basic touch of the palms is in pity.

In the field of discussion about law 10,639 / 03, which completed more than ten years of its promulgation, modified in 2008, becoming law nº 11,645 / 08 including the Indigenous theme, without being put into practice. It is worth mentioning that the Afro-Brazilian, African and indigenous historical aspects that the laws highlight when they appear at school, have tiny notes in textbooks, a factor that I consider dangerous, because they have situations that need a dense description to avoid prejudiced constructions. The highlight is that these laws are changing the LDB - Law of Directives and Bases of Education, representing changes in the normativity of national Education with immeasurable significance, however, in practice little has changed - including the possibility of becoming a combat mechanism intolerance (racial, social, religious) in the school environment.

Regarding work with capoeira performed outside, however, cooperating with the school proposal, I highlight the activities carried out in the Community Action Project of Sobradinho, a place that I could show the students' enthusiasm during activities with everyday situations, causing them to actively interact in a way intellectual and affective. In this place, the dynamics of the games had elements of the history of slavery, zombie, captain of Mato, slave, little man, sinhá or with the names of the instruments berimbau, tambourine, atabaque, in addition to tours, taking students to the interior of Sobradinho-Ba. Promoting contact with nature and problematizing the escapes of slaves, with capoeira wheel among native plants, inside the river with water up to knee height, causing them to think about the slaves' difficulty in defending themselves.

With these affirmations, I propose managerial adjustments so that the school becomes, even with the Mais Educação Program, an “open” and organized space for carrying out teaching and learning activities based on the diversity of sabers placed in the community, which can advance, so , create more concrete situations of preservation of the knowledge inherent to capoeira, which, like other popular culture knowledge, experienced a history of transformations in search of respect and social valorization, since the slavery period, when its practitioners in search of freedom acquired knowledge about their culture, religion and rituals, therefore,

understood that preserving them would guarantee their survival against the system of repression.

RESULTS

As reflexões apresentadas no contexto histórico da capoeira mostraram os avanços importantes que a capoeira conquistou, inclusive pontuando, as transformações e as lutas de resistência que contribuíram para torná-la uma excelente ferramenta pedagógica. Nesta perspectiva o trabalho com a capoeira apresentado neste texto, apropriou-se dos espaços construídos pelos programas governamentais para resgatar conectar a sua gênese histórica, intrínseca as identidades do povo afrobrasileiro e indígena, como parte indissociável as atividades da escola.

Nesta perspectiva a capoeira mostra sua viabilidade como ferramenta pedagógica de contextualização do ensino escolar, contemplando inclusive as temáticas sobre o cumprimento do que determina Brasil (1996) da lei 10.639/03 sobre a obrigatoriedade do ensino de história Afro. Contudo, a proposta de trabalho requer um compromisso com a historicidade e o respeito à diversidade de conhecimentos, na perspectiva de articulação com conteúdos de geografia e história, intimamente ligadas a capoeira, situando o praticante no tempo e no espaço que ocupa.

Em fim, são diversas questões que acompanham o trabalho com capoeira nos espaços disponíveis na escola, principalmente, a partir de 2008 com o surgimento dos programas governamentais destacados no corpo do texto. Assim, o debate segue perpassando o problema da ausência de diálogo entre o trabalho de capoeira e as ações pedagógicas desenvolvidas em sala de aula, pois, não só a capoeira, mas a escola configura-se como um espaço cultural dinâmico que, tanto influencia como são influenciadas, e merecem estudos que apontem sugestões relevantes aos dois espaços.

Vale ressaltar que a aceitação ou as influências possuem significados de formas diversas, inclusive a partir de quem administra o sistema educacional, fora da escola, que não estabelecendo vínculo com a realidade, portanto, não somente com a capoeira. Sendo assim, o embate é caracterizado pelo distanciamento entre o planejado, ou seja, o escrito e o desejado pela escola.

Portanto, espero que as reflexões apresentadas neste estudo tenham continuidade em outros trabalhos de acadêmicos. Com uso dos aspectos sócio-culturais, da religião, do físico ou no contexto escolar. Visando avançar no entender e possibilidades da relação da capoeira com o espaço escolar, assim como do espaço escolar com a capoeira e suas possibilidades de relação multidisciplinar.

Portanto, vislumbro que este trabalho não se encerra aqui, trata-se apenas de considerações finais que servem como aporte para outros estudos, com outra temporalidade, um final para o momento, mas que insurge novas perspectivas.

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Descriptive analysis of the physiotherapist's health risk factors in ICU

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Abstract—Introduction: The ICU intensive care unit is a place where there is exposure to risks of various natures, such as biological, physical, chemical and organizational. The physiotherapist in the ICU is a fundamental component of the interdisciplinary team for patient care. It is up to practitioners who practice physiotherapy to work on patient functionality. Method: This is a literary review of exploratory research, of a descriptive nature, based on original articles and review published in databases. The inclusion criteria used were books, online journals, in Portuguese, English, and Spanish, published between 1998 and 2016. Objective: To describe the practical actions of physiotherapists in the face of the health risks faced in an ICU. **Results:** A total of 220 publications were found, with 18 publications that met the established criteria. We found information about the complexities of the ICU and the practice of the intensivist Physiotherapist, the risks and vulnerability of the physiotherapist in the ICU, standard precautions and the use of PPE. **Final Thoughts:** In the multidisciplinary team of the ICU the physiotherapist is an essential component to the aid to the seriously ill patient. Mobilization of the patient, removal of secretions and pulmonary reexpansion are the main methods used by these professionals in the ICU, as well as the performance in the adaptations and organization of mechanical ventilation, ventilatory weaning, and extubation in the unit. Thus, these professionals are constantly exposed to several risks in their care activities to patients ill in the ICU, both biological risks and physical risks and chemical risks.

Keywords—Physiotherapy, ICU, Occupational Risks.

I. INTRODUCTION

Hospitals are environments that pose considerable risks to workers' health because they present conditions that increase the vulnerability of health workers such as the complexity of care provided to the patient, the accelerated pace of work, procedures adopted, the risk in contact with blood and secretions and other bodily fluids, equipment and materials, measures of individual and collective protection among others [1].

According to Bolick et al. (2000) [2], Health professionals suffer accidents almost as often as industry workers, and their risk of acquiring diseases is about 1.5 times higher than the risk of all other workers. Nowadays, there is increasing pressure on the intention of performing more activities in less time and with less

help. This contributes to the risks faced by health professionals, including the physiotherapist. The stress generated in this environment can increase the chances and frequencies of accidents. The safety of these professionals even comprises the prophylaxis of infections. Hospitals are identified as naturally unhealthy sites as it provides the exposure of health professionals to numerous risks by harboring patients with contagious diseases, and requiring often invasive procedures. Sometimes with overcrowding of beds, they present inadequate working conditions, putting their professionals in situations of occupational risk and health threat [3].

In this context, intensive care units ICU's have special significance because they are environments

within the hospital that are most often intended for critically ill patients, usually with a high degree of dependence on direct care of the health team. The ICU can be considered one of the areas with the highest risk to workers' health. It is a place where the insertion of new technologies and work processes increases the vulnerability of professionals. [4]. In a study conducted by Silva et al. (2008) [5], in a university hospital, it was found that physiotherapists are 4.57 times more likely to be colonized by multidrug-resistant microorganisms in the performance of their activities when compared to other professionals in the same sector. Among the techniques performed by physiotherapists in the ICU that can increase the health risks of these professionals, the mobilization and positioning of potentially infected or colonized patients, manual hyperinflation maneuvers of the coughing exercises, aspirations of pulmonary secretions, among others.

The complexities of these organizational environments together with occupational risks have manifested itself as a professional socio-partner problem that leads to the adoption of initiatives by institutions together with professionals considering that there is a greater understanding of the forms of intervention and prevention.

For Rocha (2010) [6] the application of norms and laws does not always provide the best results and it is known that there is a great difference between the work processes prescribed in the rules, manuals, and work in real events. Thus, Moraes (2005) [7], Grevink and Pinsky (2009) [8] suggest that in risk management, real work situations should be considered not only theoretical information but also real situations experienced by professionals in their routine. Risk control in the ICU is based on the elaboration of rules and functional manuals for various situations, which aim to protect professionals in the execution of their work; however, these rules sometimes do not take into account actual work activities and, thus, all their variability. This study raises the need to know the health risk factors of the physiotherapist in the ICU, the importance of being

informed about the prevention and precautionary standards of risks, as well as understanding, how they perform their functions in the face of risks, and insufficient means, in order to meet the requirements of the work.

II. MATERIALS AND METHODS

This is a bibliographic category study, exploratory research of descriptive nature, based on original articles and reviews published in databases such as Scielo, Lilacs, Bireme, and others. Books, journals, and monographs relevant to the theme were also examined. For the search for material, the following isolated or combined descriptors were used: Physiotherapy; ICU; Occupational Risks. Information on the complexities of the ICU and the practice of the intensive physiotherapist, the risks and vulnerability of the physiotherapist in the ICU, standard precautions and use of PPE were removed books, online periodicals, in Portuguese, English, published between 1992 and 2016. Articles that did not correspond for the purpose of the work were discarded.

III. RESULTS AND DISCUSSION

Initially found two hundred and twenty publications, but only twenty-eight met the established criteria. The selection of studies was carried out through the careful reading of the title and abstract, in order to verify the questions that would guide the research. After this reading, information was found about the complexities of the ICU and the practice of the intensive therapist, the risks and vulnerability in its performance, precautions and pattern of use of PPE's and then selected five articles as main, to be exposed in Table 1, presented in relation to the health risk factors of the physiotherapist and the entire multidisciplinary team in the ICU. Table 1: Characteristics of the studies analyzed addressing the risk factors to the physiotherapist's health and the multidisciplinary team that composes the ICU, standard precautions and use of PPE.

AUTHORS	YEAR	TYPE OF STUDY	GOAL	RISK FACTORS
Silva et al.[14]	2016	A cross-sectional study with a descriptive and analytical approach	Evaluate health damage related to the work of physiotherapists working in ICU.	Excessive workload, double or triple working hours, biological risk, direct contact with limit situations, high level of tension and low wages.

Rocha.[6]	2010	Ethnographic approach	Describe the practical actions of physiotherapists in view of the limitations of material conditions and biological risks in an ICU.	Biological risks, highlighting the complexity of care provided to patients, the requirement of accelerated production rhythms, procedures with the possibility of contact with blood and other body fluids.
Amaral et al.[9]	2011	Qualitative research developed in an ICU	To characterize the profile of professionals working in the Intensive Care Unit (ICU) of adults and identify the risks inherent to the multidisciplinary team that provides assistance in the ADULT ICU, through the perception of the professional himself.	Mechanical Risks/Accidents, Biological Hazards, and Psychological Risks.
Metzker et al.[10]	2012	The descriptive and explanatory study, with quantitative and qualitative approaches.	Investigate aspects related to stress in the work of physiotherapists of a philanthropic hospital	Frequent emergency situations, circumstances that provide the constant need for the settlement, chemical and physical risks.
Silva et al.[5]	2008	Cross-sectional study.	Evaluate the epidemiological profile and sensitivity of <i>S. aureus</i> lineage, isolated in health professionals (SBP) of a university hospital in the state of Pernambuco, Brazil.	Biological and chemical risks

The findings of this research reveal several health risk factors of physiotherapists working in ICU.

Silva et al. (2008) [5] in his study concluded that the intensive care unit (ICU) presents a specific context that exposes the professional to the risk of illness, characterized by excessive workload, double or triple working hours, biological risk direct contact with limit situations, high level of tension and low wages. The high number of emergency swells in the ICU, either by the specificity of work or the environment exposes professionals who work there at various risks. The same author above pointed out that in a university hospital it was confirmed that physiotherapists professionals have 4.57 times greater possibility of being colonized by multidrug-resistant microorganisms in performing their tasks such as mobilization and positionings of colonized or possibly infected patients, cough exercises, manual hyperinflation maneuvers of the lungs, aspirations of

pulmonary secretions when compared to other professionals in the same sector.

Like Silva et al. (2008) [5], Rocha (2010) [6] in his study addresses biological risks. Through the use of ethnomethodology elements, the variability of the physiotherapist's work in the ICU was identified, evidencing how extraordinary demands are generated and how professionals act in the face of the inadequacies of the means of work associated with the biological risks present in their daily lives. He stressed as one of the main health risk factors of the physiotherapist, biological risks, highlighting the complexity of care provided to patients, the requirement of accelerated production rhythms, procedures with the possibility of contact with blood and other body fluids. Amaral et al. (2011) [9], developed his study in an adult

intensive care unit of a federal university hospital, where 37.50% of health professionals working in the ICU participated in the research and concluded that this work environment is by occupational risk excellence and exposes its workers to various situations of illness, either by their organizational structure of work or by the risks of diseases and forms of treatment used for them, and the applicability of both high technologies and basic techniques, using physical agents, chemical, in a therapeutic nature, in their most varied forms.

Meltzker et al. (2012) [10] interviewed 38 physical therapists from a philanthropic hospital in which 76.3% had occupational stress, 60.5% had mild to moderate stress and six 15.8% had the diagnosis of intense stress. Regarding the risk factors in the work of the physiotherapists evaluated, he concluded that the constant need for success, the performance of several activities performed simultaneously, as well as the division of autonomy with another health professional. The main symptoms of stress caused by these factors were: fatigue, pain in the neck and shoulders muscles, loss and/or mood oscillation, easy irritability, sharp nervousness, and insomnia. Silva et al. (2016) [14] addressing other risk factors, it found in his study that more than half of physiotherapists working in ICU experienced, at some point, some kind of osteomuscular disorder related to work, this result is credited to the work context of the ICU, in which the physiotherapists with work. Returning to the study by Amaral et al. (2011) [9] they affirm that the risks in ICU are mainly related to patient care procedures and also to occupational risks existing in the work environment. Therefore, all possible measures to be adopted to minimize the risks of accidents should be considered.

Leite and Vila (2005) [11] conducted a descriptive study that aimed to identify the difficulties experienced by the multidisciplinary ICU team. They observed that the multidisciplinary team faces difficulties related to dealing with death and information to family members, as well as difficulties related to the absence of teamwork and the lack of material resources, and the psychological risk to which these professionals are exposed due to the difficulties they experience in the work environment.

Considering not only the identification of risk factors but also forms of prevention of health damage of the physiotherapist, Tomaz and Oliveira (2001) [12] and Hinrichsen (2009) [13] suggest in their study the need to implement guidelines and conducts for control of infection and thus implement the health protection of the physiotherapist by preventing various diseases that

can affect him in the exercise of his profession in the ICU.

The National Technical Committee on Biosafety suggests that the professional must comply with safety standards and carry out individual protection measures, wear (PPE) gloves (wash hands before and after handling), apron, mask and goggles (safety liquids and projection in the eyes), that is, all individual equipment necessary at the time of assistance and also collective protection equipment (EPC). Make use of own disinfectants to inactivate a specific agent and always report risk situations and accident cases to the responsible safety sector.

Standard precautions integrate hand washing standards, use of barriers such as gloves, shoes, beanie, glasses, apron, and masks. Attention with equipment, articles, and clothing used in the care, handling of health service remnants, correct disposal of drill-cutting materials and accommodation of the infected patient according to the required level, and immunization control of the as it is a precaution of defense for immunodepressible diseases. These instructions for the exercise and practice of physical therapist action are important to protect these professionals from the eventuality of infectious or psychological pathologies by exposure to the work environment in the ICU.

IV. CONCLUSION

In the multidisciplinary ICU team, the physiotherapist is an essential component for the aid to the seriously ill patient. Patient mobilization, removal of secretions and pulmonary reexpansion, are the main methods used by these professionals in the ICU, as well as the performance in adaptations and organization of mechanical ventilation, ventilatory weaning, and extubations in the unit. Thus, these professionals are constantly exposed to various risks in their patient care activities sick in the ICU, both biological risks and physical risks and chemical risks. Information, continuing education and adherence to correct precautionary measures by physiotherapists in the ICU are important for maintaining their health and occupational safety in the exercise of their profession.

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Yield parameters of two maize hybrids submitted to different spacing in Paraibano Semiarid, Brazil

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Abstract— One of the most important crop practices to obtain high grain and forage yields in maize is the correct management of the seeding density, because the plant stand can influence growth components, production and partitioning of photoassimilates. The objective of this study was to evaluate the growth and yield of corn cultivation at five spacings, using two hybrids. The experiment was installed at the experimental farm of the Federal University of Campina Grande, CCTA/UFCG, Campus de Pombal, located in the city of Santo Domingo—PB. The experimental design was a randomised complete block, in a factorial scheme, with the factors being five spacings and two hybrids, with four replications. The spacings were 0.15, 0.30, 0.45, 0.60 and 0.75 m between plants, and the two hybrids were 'AG-1051' and 'BR-106'. The following yield components were evaluated: ear weight with straw and without straw; weight of 1000 seeds, ear length and diameter, grain yield and mass of corn. The spacings of 0.30 and 0.45 m had the best results, corresponding to the population densities of 30,000 and 40,000 plants ha⁻¹, and the 'AG-1051' cultivar had the best performance, with an average yield of 13 t ha⁻¹, largely due to its better genetic load.

Keywords— Productivity, sowing densities, *Zea mays* (L).

I. INTRODUCTION

Corn (*Zea mays* L.) is a monocot the Poaceae family, native to Central America, and it is among the most cultivated cereals consumed in the world, due to production potential, chemical composition, nutritional value, multiplicity of applications and high adaptability, which facilitate cultivation beyond the broad market [12].

Among the various factors that may interfere with the productivity of the corn, seeding density and arrangement appear to be the main factors responsible for the low yield of corn in Brazil [13]. This is because the plant stand can affect the growth of the culture components due to increased competition in assimilate partitioning [2]. The ideal population to maximise the yield of corn grain ranges from 30 to 90 thousand ha⁻¹ plants, depending on the availability of water, soil fertility, sowing and spacing adopted among rows and among plants in the cultivation line in addition to cultivating characteristics, which are crucial to plan the density of plants [8].

According to [14], studies indicate that modern hybrids have had a reduction in spacing from 0.9 to 0.4–0.6 m, and an increase in the population of plants 60 to 75 ha⁻¹ plants.

[17] showed that plant populations between 60 and 80 thousand plants ha⁻¹ showed increases in productivity of approximately 12.5 to 13.6%, corresponding to spacing between plants in the row of 0.6 and 0.8 m. The use of higher plant densities in smaller spacing allows greater interception of photosynthetically active radiation, promoting higher grain yields per plant [15].

According [19] the management of plant density is one of the cultural practices that most interferes with the productivity of maize. This response is associated with the fact that maize does not have an efficient space compensation mechanism, since it tends little and has low prolificacy and limited expansion capacity. The effects of density are also reflected in genotype hybrids with smaller numbers of leaves that are upright, with lower biomass production, which reduces the interference of one plant with another [9].

Considering the importance of obtaining high yields and knowledge about the double spacing recommendations between rows of commercial hybrids, this work was to evaluate the influence of five spacings cultivation, growth and productivity of two hybrids of commercial corn.

II. METHODOLOGY

The experiment was conducted at the experimental farm Federal University of Campina Grande - CCTA/UFCG, Campus de Pombal, located in Santo Domingo, in the middle region of the Paraíba backwoods and de Sousa microregion, with an altitude of 190 m.

Soil preparation was done by cross harrowing five days before sowing, favouring the initial weed control as well as providing conditions for a good germination and root growth of commercial culture.

Before sowing, soil sampling data was collected at a depth of 0–0.20 m and sent to the Soil and Plant Nutrition Laboratory, LSNP, at the Centre for Science and Agrifood Technology at the Federal University of Campina Grande, to determine its physicochemical characteristics and preparation of fertiliser recommendations (Table 1 and 2).

Table 1. Physical attributes of soil.

Physical characteristics	Collection depth 0-0.20 m
Sand (g kg ⁻¹)	536.8
Silt (g kg ⁻¹)	332.4
Clay (g kg ⁻¹)	130.8
Apparent density (g cm ⁻³)	1.22
Real Density (g cm ⁻³)	2.56
Total Porosity%	52.3
textural classification	sandy loam
Particle size by decimetre (Boyucos); Bulk density by 100-mL beaker method and flask method for determination of true density. Laboratory Soil Science and Plant Nutrition of UAGRA/CCTA/UFCG.	

Table 2. Chemical properties of soil.

chemical characteristics	Collection depth 0-20 cm
pH H ₂ O	5.47
N (g kg ⁻¹)	0.74
P (mg dm ⁻³)	8.29
K ⁺ (dm ⁻³ cmolc)	3.05
Na ⁺ (dm ⁻³ cmolc)	9.39
Ca ⁺⁺ (cmolc dm ⁻³)	1.88
Mg ⁺⁺ (cmolc dm ⁻³)	1.13
H ⁺ + Al ³⁺ (cmolc dm ⁻³)	0.1
MO (g kg ⁻¹)	12.79

Analysis carried out on Soil Science and Plant Nutrition Laboratory of UAGRA/CCTA/UFCG. P, K, Na extractor Mehlich 1; Al, Ca, Mg: 1 M KCl extractor L-1; H + Al: extractor calcium acetate 0.5 M L-1, pH 7.0. MO: wet digestion Walkley-Black.

The fertilisation was performed during the period of sowing, and 10, 60 and 20 kg ha⁻¹ of nitrogen, phosphorus

and potassium, respectively, were applied in the groove. After 30 days, 20 kg ha⁻¹ of nitrogen was applied to cover. The sources used were superphosphate, potassium chloride and urea fertilisers.

The seeding was performed manually in open grooves with the aid of spades; the spacing used was 0.8 m between the double rows and 0.30 m between the single rows. Each plot consisted of three double rows, with different plant densities in planting lines according to the treatments employed. Thinning was performed at the V3 stage, when the plants had three fully expanded leaves.

The treatments consisted of two corn hybrids ('AG-1051' and 'BR-106') and five approximate density values: 24, 30, 40, 60 and 121 thousand plants per hectare. These treatments were arranged in a randomised block in a 5 × 2 factorial design with four replications, totalling 40 experimental units with dimensions of 3.0 × 3.20 m (9.6 m²), which totals 384 m² plots, with 1 m between the rows. The calculation of the populations was performed from double spacing: 0.8 × 0.3 × 0.75 m, 0.8 × 0.3 × 0.6 m, 0.8 × 0.3 × 0.45 m, 0.8 × 0.3 × 0.3 m and 0.8 × 0.3 × 0.15 m (1).

$$D = \frac{10.000}{\left[\left(\frac{a}{2}\right) + \left(\frac{b}{2}\right)\right] \times c} \quad (1)$$

where:

D = estimated density (plants per hectare);

a = the spacing between the double rows (m);

b and c = the distance between the plants in rows (m).

The management of the weeds was conducted by means of chemical control associated with manual hoeing undertaken only as post-emergent application in the association of herbicides (Atrazine + Nicossulfurom) at a dosage of 1.5 to 5 L h⁻¹, respectively, which are recorded in the MAP (Ministry of Agriculture Livestock and Supply) and are selective for the corn crop.

Based on the water requirement of 800 mm culture during the cycle, irrigation was handled to provide a sheet of 6.7 mm/day/plot, since both hybrids have an average cycle of 120 days. The irrigation system was with 20 mm thick dripping tapes with self-compensating drippers, and the dripping tapes were coupled to spiders, which were arranged in 32 mm tubing, in a single line, in the experimental area.

Throughout the crop cycle data on precipitation and temperature were monitored. According to INMET (2017), one 206 mm rainfall during the experiment was observed as well as an average temperature of 28°C (Fig. 1).

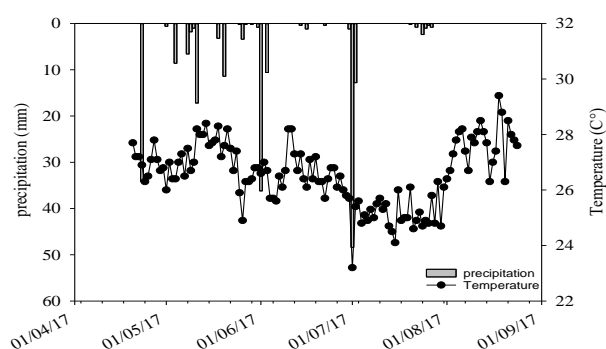


Fig.1: Meteorological parameters.

Source: INMET (National Institute of Meteorology).

Harvest was done manually at 127 OF before the physiological maturation stage R6, with the particular components of the production culture of ear weights with and without straw (kg ha^{-1}), number of grains per spike (kg ha^{-1}), diameter of shank (mm), ear length (cm), weight of 1000 seeds, seed yield (kg ha^{-1}) and cob weight.

Data were subjected to analysis of variance by F ($p \leq 0.05$) test, when significant effect was verified the treatment means were unfolded, and regression analysis was applied to the density factor, and for the hybrid factor. All statistical procedures were performed using the computer program for statistical analysis SISVAR [7].

III. RESULTS

The interaction between hybrids and different spacing did not influence all variables (Table 3). Evaluating the effect of different spacings, we observed a significant effect on the straw with ear weights (PES/P), the ear weights without straw (PES SP) and numbers of grains per spike (N° GR ESP). For hybrid sources of variation, there was no significant effect for the studied variables, except for PES/P.

Table 3. Analysis of variance.

FV	G L	mean squares			
		C PES / P ¹	PES SP ²	No. GR ESP ³	D ⁴
Hybrid s (H)	1	731,496.9**	19879,55 ^{ns}	3064,25 ^{ns}	11,84 ⁿ s
Spacin g (E)	4	581,129.42 **	595033.97 **	14897.99* *	11,5 ^{ns}
H x E	4	64468,64 ^{ns}	78511.29 ^{ns}	3370,63 ^{ns}	1,5 ^{ns}
Block	3	69640,49 ^{ns}	27049.12 ^{ns}	1831,45 ^{ns}	2,89 ^{ns}
CV (%)	-	14.2	18.96	6.29	4.77

¹Ear weight with straw; ²Weight of the shank without straw; ³Number of grains per spike; ⁴The shank diameter. (*) (**) (ns), significant at $p < 0.05$ and $p < 0.01$

respectively probability and not significant by F test. Spacing: 0.15, 0.30, 0.45, 0.60 and 0.75 m. Cultivars: 'AG-1051' and 'BR-106'.

The maximum observed values of the studied hybrids for the variables PES C/P, PES SP and N° GR ESP were 1.76, 1.46 and 0.533 Mg ha^{-1} , respectively, spaced 0.43, 0.47 and 0.48 m (Fig. 2A, 2B and 2C). The spacings above 0.45 m (0.60 and 0.75 m) did not promote significant increases for variables of these hybrids. The values of the straw with ear weight corroborate those obtained by [16] that when evaluating the hybrid 'AG-1051', aimed at producing corn, reached values of 14.39 Mg ha^{-1} .

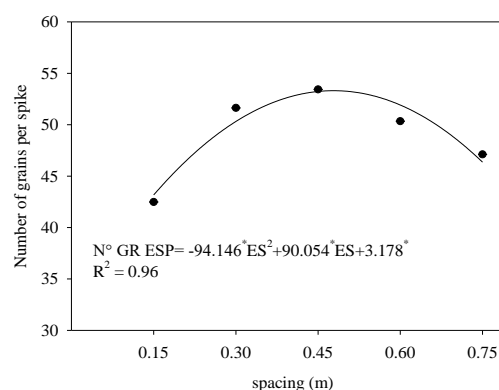
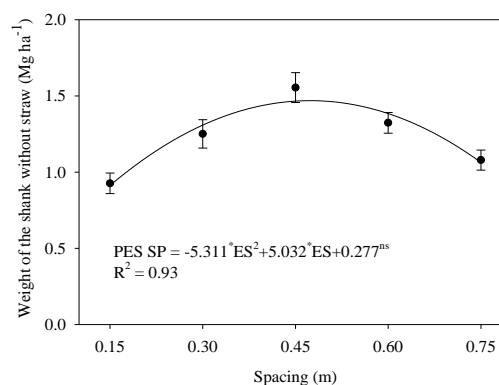
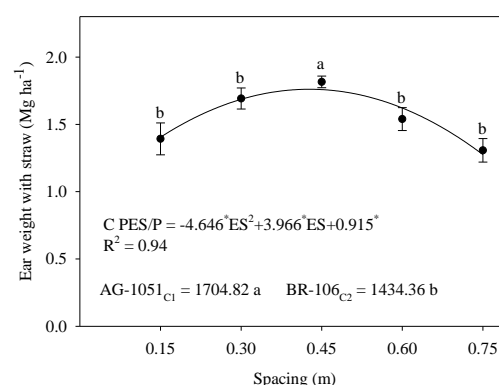


Fig.2. Straw ear weight (PES/P) without straw (PESP) and number of grains per ear (ESP GR°C), due to different spacing and two hybrids.

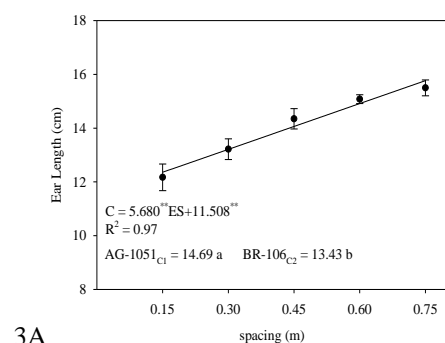
The interaction between hybrids and spacing influence ($p < 0.01$) the weight of 1000 seeds (P 1000). The length of the spike (C), grain yield (PG) and mass cob (MSAB) were affected ($p < 0.01$) by treatment alone (Table 4). Based on these results, we can infer that the seeding density was not a determining factor for there to be changes in the variables P 1000.

Table 4. Analysis of variance for ear length, 1000 seeds weight, grain yield and corn mass.

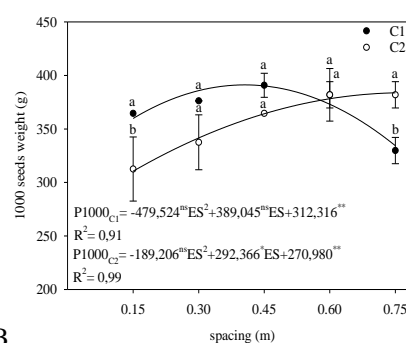
FV	G	Mean squares			
		C ¹	Q ² 1000	PG ³	MSAB ⁴
Hybrid (M)	1	16.05*	1686.75 ns	28358189.52 *	0.0013 ^{ns}
Spacing (e)	4	14.91*	2511.86 ns	14926884.48 *	0.013 ^{**}
HXE	4	0.79 ^{ns}	3382.24 *	12083927.09 ns	0.0065 ^{ns}
Block	3	0.21 ^{ns}	1495.72 ns	5251413.34 ^{ns}	0.0045 ^{ns}
CV (%)	-	5.58	8.96	21.69	20.55

ear length; 21000 seeds weight; 3grain yield; 4corn mass. (*) (**) (ns), significant at $p < 0.05$ and $p < 0.01$ respectively not significant probability and by test F. Spacing: 0.15, 0.30, 0.45, 0.60 and 0.75 m. Hybrids: 'AG-1051' and 'BR-106'.

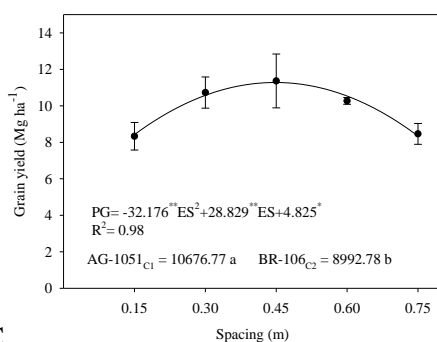
The length of the spike (C) increased linearly at the rate of 5.680 cm for each meter (m) increment, considering all studied spacings (Fig. 3A), with a maximum of 15.768 cm in spacing of 0.75 m.



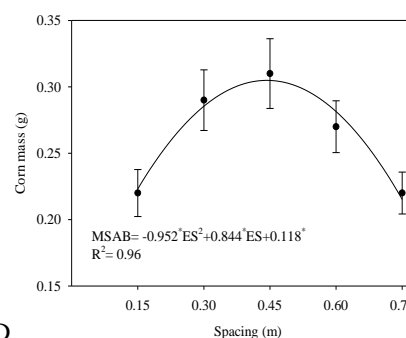
3A



3B



3C



3D

Fig.3: Spike length (C), Loss of 1000 seeds (P 1000), Grain yield (PG) and mass of the cob (MSAB) of the 'AG-1051' and 'BR-106' hybrids to 127 OF depending on the spacing.

The maximum values observed for the variable P1000 seeds was 391.23 g for the hybrid 'AG-1051', when the 0.41 m spacing was used and 383.92 g for the hybrid 'BR-

106', under the spacing of 0.77 m. Similar results were obtained by [1] evaluating the effect of spacing on growth and yield of corn, reaching higher 1000 grain weights in

largest spacing tested (0.90×0.30 m). Such results for the lowest population density of plants may be due to the greater availability of abiotic resources such as water, nutrients and solar radiation and thus greater efficiency of utilization of resources (Abubakar et al., 2019).

IV. DISCUSSION

[18] noted that dehusked ear weight and number of grains per spike showed higher average values when the corn was cultivated under larger spacings (0.83 and 1.00 m), assigning the highest weights to less competition for abiotic factors, such as water, sunlight and nutrients and hence the greater potential for expression of genetic potential. [6] to evaluate the performance of corn cultivars for the production of corn found significant differences among cultivars, for ear weight variables and dehusked ears, with an average of 253.12 and 190.29 g, respectively. on the importance of the work or suggest applications and extensions.

As the spacing is an alternative to increase the interception of solar radiation, as well as a better photosynthetic activity and proper allocation of assimilates, depending on other management factors such as irrigation, the plant can not only reduce the average ear weight values, but also other factors such as the number of grains per spike [18], [5].

[20], who studied the performance of corn hybrids in different spacings, had higher mean values for the variables of the shank length and number of grains per spike, as it increased the spacing between plants.

The delay in processing the lateral branches of spike early observed in cultures denser, can affect the final number of grains per spike and the morphological and physiological changes imposed on the female inflorescence before flowering, during fertilisation and early grain filling. The number of grains per spike at high densities can also be reduced by the abortion of newly fertilised eggs in the early part of grain filling, occurring more frequently in localised grains in the apex of the ear, which are the last to be fertilised [9].

[3], when evaluating the production potential of several hybrids in different spacings, observed that there was no significant difference for the weight of 1000 grains.

The maximum observed values of grain and cob weights in plots spaced at 0.45 m and 0.44 m, respectively, was 10.74 Mg ha^{-1} and 0.31 g. The results, possibly because there were larger gaps and therefore less plant population, potentiating the photosynthetic capacity of the plants, and the C4 metabolism that makes them highly efficient in converting light energy into chemical energy, allowing more significant yields and better utilisation of

the available radiant energy, as a result of the equidistant distribution of plants. [4] found that the grain yield was influenced by the double line spacing (0.20×0.70 m).

[11] studied different populations of plants (40, 53, 71, 84 and 97 thousand ha^{-1} plants) observed linear productivity, as the plant density increased, for some hybrids. The authors concluded that the increase in grain yield, with increase in plant density, depends on the hybrid being worked.

V. CONCLUSION

The combination of 0.8 m spacing between the double rows, and spacing of 0.45 m between plants in the row corresponding to a population of approximately 40.000 h^{-1} plants showed promise for achieving high productivity. We analysed two different hybrids, and for most of the observed variables, the results obtained increased with increased spacing and decreased from 0.45 m spacing between plants.

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Determinants of Portuguese Iberian Capitalism

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Abstract— *The purpose of this work is to explore varieties of capitalism (Hall & Soskice, 2009) by considering the existence of an Iberian capitalism in which the State plays a preponderant role in the economic activities of society. Our analysis aims at understanding the elements that shaped capitalism in Brazil. To meet this objective, it is necessary to understand the working logic of the economic system, in this case, capitalism, that built the institutional relationships in the country. The studied time period is the fifteenth century to the early nineteenth century. For this study, we utilized the capitalism variety (Hall & Soskice, 2009) and historical institutionalism approaches (Hamilton, 2018; Commons, 2018; North, 2018). The findings reveal the central role of the State as a catalyst for economic dynamics, characterizing what Oliveira (2015; 2018) called “State-centered” dynamics, as opposed to the “firm-centered” approach existing in western economies, especially those of Anglo-Saxon origin.*

Keywords— *capitalism, institutions, Brazil.*

I. VARIETIES OF CAPITALISM AND INSTITUTIONALISM

The discussion around varieties of capitalism gained important momentum from the works of Hall and Soskice (2009). The authors observed, in their analysis, that capitalism varieties follow distinct paths from their institutional framework. Clearly, the concept is very close to works developed by authors with an institutionalist approach, especially North (2018). Moreover, from the intersection of the works of Hall and Soskice (2009) and North (2018), the historical institutionalist approach becomes more pertinent to our analysis.

It becomes evident that countries' socioeconomic logic is determined by their institution building. Meanwhile, this institution building takes place throughout the history of countries and involves the institutional instruments created by countries during this period. Obviously, the path dependency concept must be considered. Thus, the resulting institutionalism is a summation (to some extent, selective) of the preceding institutions.

In this sense, it is assumed that countries and, of course, the institutions that shape them are distinct. From a historical perspective, these differences can become quite significant, leading to distinct capitalist constructions among countries and regions. In this work, we examine the institutional dynamics that shaped what we call Iberian Capitalism, in its Portuguese variety, and its influence on Latin American economies, especially Brazil.

II. THE IBERIAN PENINSULA AND THE CAPITALIST EXPANSION

A characteristic of the Iberian States, since their establishment, is the relative distinction between the powers of the central State (denoted in the figure of the king) and the other institutional players comprising the Iberian societies (Yun-Casalilla, 2019).

This characterization, in which royal power had a central role, was important for establishing a favorable environment for the maritime expansion process¹. Among the actions enabling this process, in the Portuguese case, we must highlight the School of Sagres, established in 1443, and the synergy of Portuguese commercial capitalism, especially the city of Lisbon and Genoese financial capitalism, both under the coordination of royal power.

This arrangement between bourgeois capital (commercial and State), financial capital, and State power is the basis for the first major institutional pact that created favorable conditions for overseas expansion of the Portuguese domain.

As stated by Yun-Casalilla (2019) and Garcia and De Sousa (2015), this expansion significantly modified the reality of the Iberian and, in general, Western societies. The new routes allowed a gradual change in Mediterranean trade flows toward routes through the Indian Ocean, along the African Coast, and, later, across the South Atlantic. A

¹ The financing of navigations began in the fourteenth century by D. Afonso IV, and an important landmark of this maritime expansion process was the incorporation of the Canary Islands in 1341.

continuous rise in Western consumption patterns is observed from this overseas expansion; patterns already existing in the fourteenth and fifteenth centuries became more dynamic from the sixteenth century onward, which promoted a new institutional arrangement linked to modernity.

The economic growth and development model and the institutional design of the Iberian countries, built over the centuries, prevented them from taking advantage

of the first manufacturing wave preceding the First Industrial Revolution. The early sixteenth century was economically weak in Portugal. The country only experienced vigorous economic growth from 1550 onward, driven by the economic results of its overseas expansion and accompanied by demographic growth until the mid-eighteenth century (see Figure 1). This process started to decline from 1755 onward (Palma, Rosés & Santiago-Caballero, 2016).

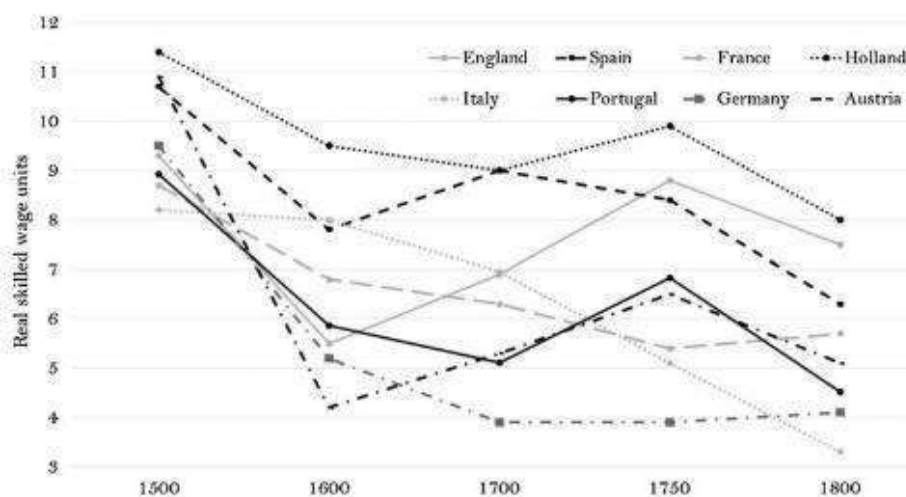


Fig.1 – Real skilled wage in Europe, 1500-1800

Source: Costa, Palma & Reis (2015)

Traditionally, there are several explanations for Portugal's relative backwardness, which began as early as the sixteenth century. This is initially attributed to its semi-peripheral role in the international division of labor after 1500, with implications arising from the overdependence on foreign capital and trade services, maritime transport, manufacturing imports, and the technically stagnant archaic agricultural sector (Wallerstein, 1974, 1980; Mauro, 1983, 1990; Rau, 1954; Sideri, 1970; Justino, 1981; Magalhães, 2010; Oliveira, 1980).

However, new interpretations, based on another data set, lead us to four different factors that may partly explain the Portuguese case: 1) limitation of entrepreneurship and internal diversification; 2) loss of agriculture's participation in the economy due to the attraction of opportunities in the empire and in port cities; 3) progressive accessibility of foreign foods, eliminating domestic production; and 4) a tertiary sector swelling due to colonial wealth, discouraging the national bourgeoisie from development (Costa, Palma & Reis, 2015).

According to Costa, Palma, and Reis (2015), Portugal slowly became a leader among the colonial powers of the modern age, which can be seen in the per capita value of trade with its colonies (see Figure 2). It is noteworthy that the growth of the Portuguese economy

was even more robust when considering the richness derived from mineral extraction.

Figure 2 also shows that the turning point was the commencement of the First Industrial Revolution, when the English and Dutch economic expansions surpass the Portuguese economy. This overcoming arose from the advent of economic expansion structured from industrialization, which becomes the technical-productive paradigm of industrial capitalism from the Anglo-Saxon perspective.

Overseas expansion also brought implications for socioeconomic factors related to the issue between capital and labor. Here, the Portuguese and Iberian institutional dynamics had a very different design from what developed later in most western countries, especially England. This forces consideration of an autochthonous interpretation of the institutional dynamics shaping the Iberian Capitalism, which were very different from the dynamics that shaped English industrial capitalism as described by Polanyi (2000). These differences between countries must be clear. After all, as stated by Wood (1991), the English capitalist system displays unique internal features, comprising variables related to agrarian, urban, and industrial issues and their respective consequences for the consolidation of an internal consumer market.

Ordinances and Portuguese institutionalism

Another important point in the construction of Iberian Capitalism institutionalism in its Portuguese variety, concerns the creation of Ordinances; norms that start to organize Portuguese society, which by the early sixteenth century had a global reach. The basic idea was to standardize and regulate the socioeconomic relations within a continuously expanding kingdom, which had been growing since the fourteenth century. The first of these rules was the 1446 Afonsine Ordinances; later, in 1521, the Manueline Ordinances were created; and finally, in 1603, the Philippine Ordinances were enacted.

As a whole, the Ordinances institutionalized a *modus operandi* of what characterized the Iberian Portuguese Capitalism, whose State-centric characteristic (Oliveira, 2015) is strongly present. Thus, we see the presence of the State in varied social and economic relations, from the rule of what is acceptable in the relations between Portuguese and native, both in the metropolis and in the new areas of the empire, to the monitoring of agriculture production, extractivism, and commercialization of economic activities.

The most complex and influential Ordinances are the Manueline Ordinances. Initially divided into five books, these Ordinances aim at standardizing the socioeconomic relationships from the centrality of royal power. According to Azevedo (2000), “the first book takes care of the regiments, positions and responsibilities...or of the whole administrative and bureaucratic machine of the State” while the second book “deals with the privileges of the Church and ecclesiastical persons, rights and goods of the Crown, as well as their fundraising methods.” The

third book encompasses civil procedure, including the economic relationships between individuals and the State. The fourth book primarily covers civil law and succession law. Last, the fifth book deals with criminal law.

The fact that the first book deals with the regiments, and the positions and responsibilities of the administrative machine cannot go unnoticed. Here, the importance of the public machine and State centrality is emphasized in the operation of the Portuguese capitalist enterprise and, consequently, in the Brazilian capitalist enterprise.

Although several authors, especially Faoro (1984), have emphasized the importance of the strata for the functioning of the Brazilian State, our argument considers this State, and of course this stratum, an integral part of the accumulation and replication logic of the Portuguese capitalist enterprise, to the point of being the main characteristic of what we call Iberian Capitalism, in its Portuguese version (Oliveira, 2018). Therefore, the State is not neutral in capitalist action and induction; on the contrary, it is the main inducing agent, as pointed out by Yun-Casalilla (2019).

In fact, if advanced capitalism economies are characterized by a State that regulates market competition, then early modern ones were shaped by political ‘competition’ among social agents for the control and expansion of their economic, political, military, and (even) religious resources....the king was not an impartial referee but rather an agent who had to defend his interests and present himself as a third party at the same time. (p. 146)

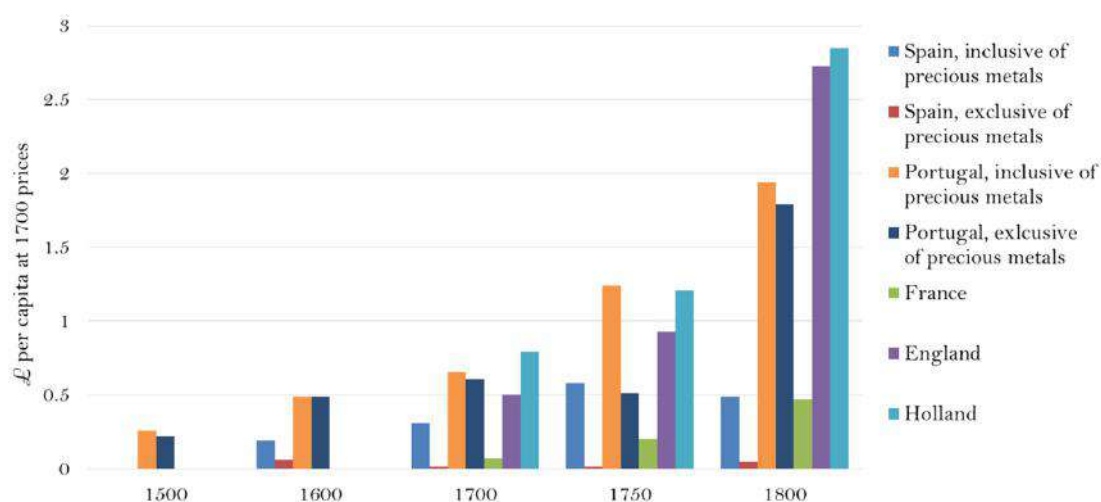


Fig.2 – Per capita Intercontinental Trade²

Source: Costa, Palma & Reis (2015)

² France 1800 commercial values correspond to 1788 and the values of Holland to 1780 (COSTA, PALMA & REIS, 2015).

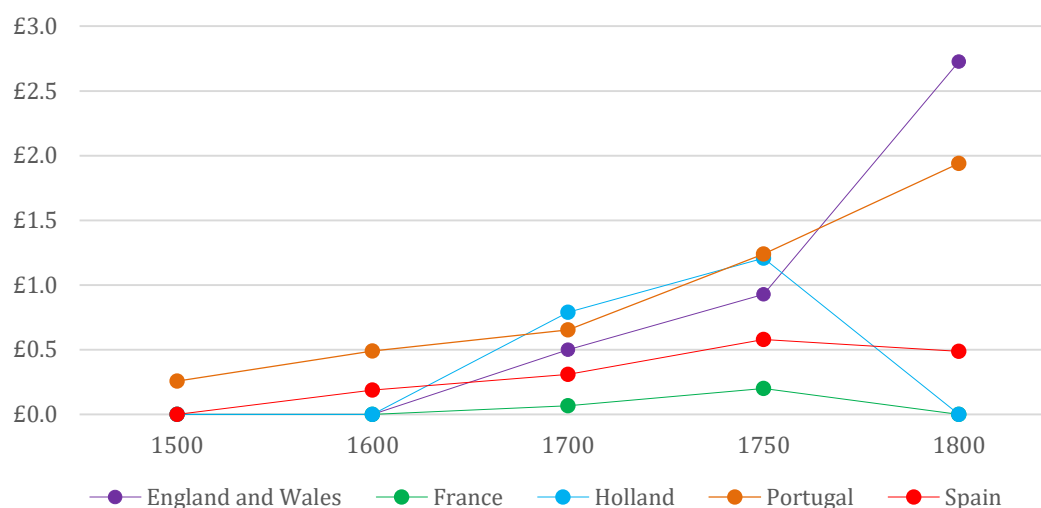


Fig.3 - Intercontinental trade, in pounds per capita, at constant 1700 prices, selected countries

Source: Costa, Palma & Reis (2015)

It is important to highlight the efficiency of this model, which is consolidated throughout the fifteenth and sixteenth centuries, and remained a paradigm until the early eighteenth century. This Iberian Capitalism, characterized by State-centered trade, expanded rapidly during the fifteenth century toward the Far East, taking advantage of existing trade channels between Africa, India, and China, through the Indian Ocean (Garcia & De Sousa, 2017). Conversely, in the early sixteenth century, this Iberian Capitalism (of Portuguese origin) expanded beyond purely commercial relations and became responsible for the means of production when sugarcane plantation in Brazil began (Junior, 1942) as a spin-off of sugar production in the African islands.

The elements that made this process viable are known: land elasticity, abundance of labor (made possible by the exploitation model of African slave labor, already developed in the African islands), and a large consumer market. Added to this is the large financing capacity of Genoese financial capitalism, combined with a guarantor of last instance, the Portuguese State. Regarding the spatial occupation, we noticed a change in enterprise that replaced extractivism with large-scale agriculture. This agriculture, in turn, plays a central role in the Portuguese capitalist dynamics (see Figure 3, 1500-1800). The commerce was

submitted exclusively to the metropolitan trade, which is essentially controlled by the State. This is the institutional arrangement that made possible the production model of Iberian Capitalism (of Portuguese origin).

Figure 3 displays the strong expansion trend of Portugal exports compared to other European countries, even when considering Spain. This growth remains consistent and high until the beginning of the nineteenth century, being surpassed by England only in the mid-eighteenth century, which resulted from the change in the capitalist paradigm that occurred in England with the advent of the First Industrial Revolution, as noted earlier.

To renounce or resume industrialization and its induction by the State

The successful effort of Portuguese Iberian Capitalist growth led the State to choose trade and territorial expansion. Since Portugal, in the European context, is a country of small territory and population, the option for expansion brought an economic component to the Portuguese reality. The demographic data presented in Table 1 demonstrate the increase in Portuguese and Spanish population growth throughout the sixteenth century.

Table 1 - Demographic growth, in the sixteenth century, in Europe, expressed in million inhabitants, selected countries

	(Million Inhabitants)					% annual growth
	1500	1530	1550	1590	1600	
Scandinavia	1.5		1.7		2	0.28
England	2.3		3.1		4.2	0.86
Scotland	0.8		0.9		1	0.22
Ireland	0.8		0.9		1	0.22
Holland	0.95		1.25		1.5	0.45
Belgium	1.25		1.65		1.3	0.04
Germany	12		14		16	0.28
France	16.4		19		20	0.19
Switzerland	0.6		0.75		0.9	0.4
Italy	10.5		11.4		13.1	0.22
Spain		4.69		6.63		0.7
Portugal		1.2		1.5		0.6
Austria-Bohemia	3.5		3.6		4.3	0.2
Poland	2.5		3		3.4	0.3

Source: Yun-Casalilla (2019)

Note that the Portuguese population's expansion was significantly higher than the population expansion in other European countries during the same period. Notably, this demographic expansion occurred primarily in the Portuguese colonies (particularly Brazil). This expansion illustrates a new variable in the Portuguese circumstantial reality during this period. Portugal now has, like other European countries, an important consumer market, demanding increasingly sophisticated and transformed products.

On the contrary, during the seventeenth and eighteenth centuries, a process of industrialization, similar to that which had occurred in the rest of the western world, begins. Regions like Lisbon (in Portugal) and Segovia (in Spain) had a strong textile industry. However, in the case of Lisbon, some factors led to the decline of these activities; among them was an institutional resistance related to the lock in of the process of colonial exploitation, highlighting Brazil and the Treaty of Methuen in 1703³ between Portugal and England.

Several economists of the seventeenth and eighteenth centuries questioned the Portuguese State system, choosing to maintain the working logic of its capitalist process based on the model of colonial exploitation. Among them, the works of Duarte Ribeiro de

Macedo in 1675 and Joze Joaquim da Cunha de Azevedo Coutinho in 1794 must be highlighted.

Duarte Ribeiro de Macedo, in his "*Discurso sobre a Introdução das Artes no Reino*" - *Speech on the Introduction of Arts in the Kingdom* in 1675, highlights the importance, and necessity, of Portugal paying more attention to the industrialization process that was already occurring in other western countries, including in the Segovia region of Spain. In his work, the author highlights the aspects of industrialization regarding the balance of trade between countries. For him, the balance of trade between industrialized products, imported by Portugal, and agricultural products, exported by the country, is quite uneven and detrimental to the crown's accounts. The author also addresses the issue of maintaining the worker in the land and in the city, a problem that industrialization and urbanization could alleviate. Undoubtedly, it is curious that, in his speech, Duarte de Macedo already anticipated, by several centuries, important topics appearing in the discussion of Latin American Economic Structuralism.

Nevertheless, in the context of industrialization, Duarte de Macedo argues that the Portuguese colonies played an important role as a market for an eventual industrialization in the metropolis. It was a responsibility of the Portuguese State to coordinate this process, which, at that time, was a common practice.

Later, in 1794, José Joaquim da Cunha de Azevedo Coutinho published his "*Ensaio Econômico sobre o Comércio de Portugal e suas Colônias*" - *Economic Essay on Portugal Trade with its Colonies*. In his work, Coutinho takes up arguments raised by Duarte de

³ Novais (1981) describes some conditioning factors, emphasizing the European geopolitical aspects, which made the que Methuen Treaty possible, in 1703.

Macedo, presenting chronic problems such as the high consumption pattern of Portuguese society and its lack of dynamism in the arts of manufacturing and highlighting the importance of the colonies, especially Brazil, as a large and captive consumer market for an eventual Portuguese industrialization.

It is interesting to note the period when these papers were published, 1675 and 1794. During this time interval, in 1703, the Methuen Treaty⁴ is signed, significantly inhibiting any industrialization effort in Portugal as well as the colonies.

Nevertheless, there are important points between the two authors. Both Duarte de Macedo and José Azevedo Coutinho highlight the importance of diversifying production with a focus on the industrialization process. In both cases, the process is induced by the State.

It is surprising that the appeals of both economists sensitized neither the State nor the Portuguese commercial or State bourgeoisie. On the contrary, the exclusivity of the metropolis strongly inhibited any industrializing effort that may occur in the colonies. Such consideration becomes evident from works such as Cantarino's (2012). The author details the metropolis point of view regarding a possible industrialization process in Brazil. From there on, Cantarino highlights the statement of Rodrigo Sousa Coutinho:

which arts can Brazil desire for many centuries, when its gold and diamonds mines, etc., its woods and groves for building timber, cocoa, coffee, indigo, rice, hemp, salted meats, etc., and the new cultures of cinnamon, cloves, nutmeg, bread tree, together with the extent of its navigation, promise a much higher income than it could ever expect from manufactures and arts, that could be taken from the metropolis at lower costs, based on a well-defined policy? In this way, the interests of the Empire are usefully and wisely combined, and what at first glance would look like a sacrifice becomes a reciprocal advantage and the one that seems to gain less is the one that benefits the most.”⁵

Other Portuguese economists of this period, like Joaquim José Rodrigues de Brito (1803), also sought to defend the presence of the State, claiming that its actuation is justified from the moment the local bourgeoisie does not meet society's needs.

Nevertheless, a common aspect materializes: the presence, or search for justification, of State action as inducer and controller of the production means. This weight of the State ends up permeating the socioeconomic relations of the Portuguese Empire.

III. CONCLUSIONS

The expansion of the Iberian economy, from the late fifteenth century and early sixteenth century, introduces a new reality of capital expansion, here called Iberian Capitalism. From the Iberian States, Spain and Portugal, this capitalism occurs by means of a tacit pact between the international capital (of Italian origin, especially Genoese), the commercial bourgeoisie, and, in the Portuguese case, the central power of the State (in the figure of the king).

Considering the case of Iberian Capitalism, in its Portuguese aspect, the governance of this capitalist expansion process, which occurs through overseas expansion and imparts a strongly internationalized character, materializes within the Portuguese Ordinances. These Ordinances create a pattern of behavior and operating logic for the economy, with State centrality being the primary characteristic. Here appears the State-centered concept, that is, the idea that the capitalist process necessarily goes through the State.

This Iberian Capitalism proves successful in its ambition and economic performance, placing the Portuguese State at the forefront of Western capitalism to establish a way of thinking and to influence other European States.

While proving successful in its application throughout the sixteenth, seventeenth, and eighteenth centuries, the insistence, or lock-in, that prevails in this model eventually leads it to lose the window of opportunity of the First Industrial Revolution by insisting on a model based on agriculture for exportation, mineral extraction, and utilization of slave labor. Notably, this insistence on remaining in a historically successful model is justified due to the institutional relations agreed upon in the Ordinances since the rules that regulate the market materialize in the institutions created from them (Ordinances).

The consequences of this variety of capitalism for the Brazilian economy are remarkable since the creation of Brazilian economic relations is based on the submission of the colonial economy to the metropolitan economy. Thus, a possible industrializing drive, led by an eventual entrepreneur, is incompatible with the model structured from the rules imposed by the Portuguese Ordinances. The

⁴ Authors, such as Reinert (2008), developed an interesting reflection on the Treaty of Methuen (1703) and the Ricardian Advantages introduced by David Ricardo in 1817, asserting that the Ricardian logic was already present in the construction of the treaty between Portugal and England formulated by the English Ambassador in Lisbon, John Methuen.

⁵ Apud Cantarino 2012, page 201.

venture, when it happens, is due to a public action coordinated by the State.

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A Sustainable analysis of Comparative Genomics to study of Antioxidant Compound

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Abstract— Neurodegenerative disorders, including Alzheimer's disease, Parkinson's disease and Huntington's disease, present in a major health issue and the financial load for the health care systems and around the world. The impact of these the diseases will be further increase and decrease over the next decades caused by the increasing life expectancies of the health. No cure is currently available for the treatments of the these conditions; only drugs, which are merely alleviate the symptoms. Oxidative stress has been lengthy been associated with a neuro degeneration, whether as a cause or as part of the downstream and upstream results caused by the other factors and other effects. Thus, the use of the antioxidants to the counter cellulars and a oxidative stress and antioxidant within the nervous system has been suggested as a potential treatments option for the neurological disorders. Over the last decade, it has to be significant research has to be the found to be most and focused on the potential use of natural antioxidants to be target oxidative stress. However, clinical trial results have been lacked success for the treatment of the patients with neurological disorders. The knowledge that natural extracts shows other positive molecular activities in addition to the antioxidant activity, however, has led to further research of natural extracts for their potential use as well as prevention or treatment/management of the neurodegenerative diseases. The diversity of the wild mushrooms was a investigated from two protected forest areas in India and 232 mushroom specimens were morphologically identified. Among them, 77 isolates were screened for the antimicrobial potential against seven and bacterial and fungal pathogens. Out of the 77 isolates, 46 isolates which displayed significant antimicrobial activities were identified using ITS rRNA gene amplification and subsequently phylogenetically characterized using a random amplified polymorphic DNA (RAPD) and inter-simple sequences repeat (ISSR) markers. Sequencing of the ITS rRNA regions classified the isolates into 16 genera belonging to the 11 families. In total, 11 RAPD and 10 ISSR primers were selected to be the evaluate genetic diversity based on the their banding profile produced. In total 337 RAPD and 312 ISSR bands were to be detected, among which is percentage of the polymorphism ranges from 35.2% to 77.8% and 37.6% to 93.4% by using RAPD and ISSR primers respectively. The report has to be also demonstrated that both RAPD and ISSR could be efficiently differentiate wild mushrooms and it could thus be the considered as the efficient markers for the surveying genetic diversity. Additionally, selected six or more then six wild edible mushroom strains (*Schizophyllum commune* BPSM01, *Panusgiganteus* BPSM27, *Pleurotus* sp. BPSM34, *Lentinus* sp. BPSM37, *Pleurotus* sp. BPSM41 and *Lentinula* sp. BPSM45) were a analyzed for the their nutritional (proteins, carbohydrates, fat and ash content), antioxidant potential.

Keywords— antioxidants, natural products, in vitro, in vivo, clinical trials, plant extracts, photochemical, phenolics, *Ginkgo balboa*, secondary metabolites.

I. INTRODUCTION

This review aims to give a refinement on the importance of the oxidative stress and its relevance in the neurodegenerative disease. One or more option for the counteracting of the oxidative stress in the application of the natural and artificial products get from plant extracts. And These have been thoroughly tested in vitro (chemical antioxidant activity and cell systems) and in vivo (animal disease models) and have been visible in promising results. However, results from clinical trials studies have been less than successful and other successful. Here, recent research on the natural and artificial extracts, and their a potential pitfalls in the clinical trials, are discussed in the review. Clinical trials have been demonstrated that a herb consumption is to be inversely related to the incidence of the cardiovascular diseases (Afshin, Michal, Khatibzadeh, & Mozaffarian, 2014; Belski et al., 2011; Hermsdorff, Zulet, Abate, & Martínez, 2010). These health benefits are partially attributed to the attenuation of the oxidative stress by the antioxidant components, and then the which exert an array of the cellular pursuit (Wang, Melnyk, Tsao, & Marcone, 2011). Oxidative stress has been established as the major factors in the development of a wide range of the cardiovascular diseases including hypertension (Siti, Kamisah, & Kamsiah, 2015). Dietary antioxidants are able to attenuate the oxidative stress and counteract to the onset and progression of the cardiovascular diseases. With a human and rat cardiomyocytes, we have proven that crude lentil phenol extract is able to attenuate angiotensin II-induced cardiomyocyte hypertrophy and to reduce intracellular reactive oxygen species (ROS) levels (Yao, Sun, & Chang, 2010). In animal studies, we have demonstrated that administration of the crude lentil phenol extract could substantially reduce aorta ROS level and increase and decrease total phenol content (TPC) and oxygen radical absorbance capacity (ORAC) in artery serums. Meanwhile, significant alleviation of the angiotensin II-induced hypertension, peripheral vascular remodeling and perivascular fibrosis have also been observed (Xuan et al., 2013; Yao, Sun, & Chang, 2012). Amenorrhea is a predominant factor in the development of various cardiovascular diseases and other diseases including atherosclerosis, heart attack and coronary disease and others. With a spontaneously hypertensive rats (SHRs), other researchers also have been proven that phenol extracts from the herb could reduce blood pressure and suppress inflammatory responses, such as intracellular ROS level, over expression of the proinflammatory enzymes including

iROS, COX-1, generation of O_2^- , as well as NADPH oxidizes (Mukai & Sato, 2009, 2011).

Lentil (*Lens culinaris*), black soybean (*Glycine max*), and black turtle bean (*Phaseolus vulgaris*) are dry legumes or moist legumes, and belong to the three different scientific genera, which are widely used to be cultured in the world, and preferred by the different groups of the consumers in different parts of the world. Numerous studies have been done proven that lentil, black soybean and black turtle bean have high concentrations of phenolics and potent antioxidants capacity to do (Tan, Chang, & Zhang, 2016; Wang et al., 2016; Xu, Yuan, & Chang, 2007; Zhang, Chang, & Liu, 2015). However, a direct and indirect comparison of the compositions and relative health promotion potential of these phenol-rich legume varieties, and then the particularly when they are cooked, it is not available in the literature. Cooking (thermal treatment) is to be the essential for the human consumption since raw and legumes and other contain anti-nutritional factors that it will cause illness without heating. In addition, dry legumes are not texturally palatable unless they are to be soaked and cooked to the softness of the antioxidant.

In addition to the suppression of the oxidative stress, one or more commonly used in the therapeutic approach to treat hypertension is the inhibition of the angiotensin-converting enzyme (ACE), which mediates the formation of the angiotensin II, a vasoconstrictor and the ROS initiator. Various plant extracts and pure phenolics possess ACE inhibitor activity and the ACE inhibition varies greatly according to their chemical structures (Afonso, Passos, Coimbra, Silva, & Soares-da-Silva, 2013; Al Shukor et al., 2013; Guerrero et al., 2012; Ojeda et al., 2010). However, the ACE inhibition capability of the cooked legumes extract has not been received little study (Xuan et al., 2013). In addition, phenolics compositions and antioxidant activity of the legumes are to be largely affected by the processing conditions (Haileslassie, Henry, & Tyler, 2016; Xu & Chang, 2009; Zhang & Chang, 2016). It is logical to assume that the processing-induced change in the phenol compositions might affect ACE inhibitor activity, but information regarding the effect of the thermal processing on the ACE inhibition is not available in the antioxidant. Our previous animal study (Xuan et al., 2013) with rats revealed that the phenol extracts of the cooked lentil showed lower and higher effectiveness than the raw extracts in the attenuation of the angiotensin II-induced blood pressure elevation, peripheral vascular remodeling and perivascular fibrosis disease.

High phenolics content and compositions in the three legume varieties have been reported in the literature. However, results are to be inconsistent or even opposed due to the differences in the extraction methods and equipment employed for the analysis of the antioxidant. Therefore, the objectives of this study were to investigate and compare to

the effects of thermal treatments, purification, and fractionation on the phenolics substances, antioxidant activity, and ACE inhibitions of the three or more legume varieties, and to identify phenolics compounds using UV spectroscopy and LC-MSⁿ analysis.

Fig.1: Summary of compounds identified in three legume varieties via LC-MSⁿ analysis.

	Compounds	Monoisotopic mass	Lentil	Black soybean	Black turtle bean
Phenolic acids	Gallic acid	170.0215			X
	Protocatechuic acid	154.0266	x	x	
	<i>p</i> -Hydroxybenzoic acid	138.0316	x	x	
	<i>p</i> -Coumaric acid	164.0473	x	x	
	2-Hydroxycinnamic acid	164.0473	#	#	
	3-Hydroxycinnamic acid	164.0473	#	#	
	Vanillic acid	168.0422	x	x	
	Caffeic acid	180.0422	x	x	
	Ferulic acid	194.0579	x	x	X
	Syringaldehyde	182.0579	x		X
	Trans-cinnamic acid	148.0524			X
	Sinapic acid	224.0684	x	x	X
Flavonoids	Kaempferol	286.0477	x	*	X
	Epicatechin	290.0790	x	x	X
	Cyanidin	287.0550	*	*	
	Kaempferol 3-rhamnoside	432.1056	*	*	
	Kaempferol-3-O-rutinoside	594.1585	x	x	X
	Luteolin 7-glucoside	448.1006	*	*	*
	Kaempferol-3-O-glucoside	448.1005	x	x	X
	Kaempferol 3-(6-malonylglucoside)	534.1010	x	x	
	Quercetin-3-O-glucopyranoside	464.0950		x	X
	Myricetin	464.0950			X
	Apigenin	270.0528	x	x	
	Pelargonidin	270.0528		*	
	Genistein	270.0528		x	
	Glycitein	284.0685		x	
	Genistin	432.1057		x	
Condensed tannins	Procyanidin B ₁	578.1425			X
	Procyanidin B ₂	578.1425		x	
	Procyanidin C ₁	866.2058	x	x	

	Compounds	Monoisotopic mass	Lentil	Black soybean	Black turtle bean
Other compounds	Riboflavin	376.1383	x		
	Indole-3-acrylic acid	187.0633			X
	Carvone	150.1045		x	
	Indole-3-acrylic acid	187.0633		x	
	N,N'-Dicyclohexylurea	224.1886	x	x	
	Adenosine	267.0968		x	
	3-Nitro-2-6-dipiperidinopyridine	290.1743			X
	Dioctyl phthalate	390.2770	x		

X indicates confident identification via matching mass spectra of the analyses to the spectra of standards in the in-house, or on-line database (see text for details).

- Indicates compounds that they are identical via mass-spectra matching.
- Indicates tentative identification based only on of the matching of the monoisotopic masses.

Fig.2: Identification of antagonistic wild mushrooms based on ITS rRNA gene sequences.

Isolate No.	Accession number	Closest species with accession number	Similarity	Identification
BPSM01	KJ865831	<i>Schizophyllum</i> sp. (KR155096)	99%	<i>Schizophyllum commune</i>
BPSM02	KJ865832	<i>Trametes hirsuta</i> (KP216914)	99%	<i>Trametes hirsute</i>
BPSM03	KJ865833	<i>Marasmiellus palmivorus</i> (JQ653438)	99%	<i>Marasmiellus palmivorus</i>
BPSM04	KJ865834	<i>Trametes</i> sp. (KP686448)	99%	<i>Trametes elegans</i>
BPSM05	KJ865835	<i>Schizophyllum commune</i> (AB470852)	99%	<i>Schizophyllum commune</i>
BPSM06	KJ865836	<i>Trametes hirsuta</i> (JN048768)	99%	<i>Trametes hirsute</i>
BPSM07	KJ865837	<i>Trametes hirsuta</i> (KC461301)	99%	<i>Trametes hirsute</i>
BPSM08	KJ865838	<i>Trametes hirsuta</i> (KP216887)	99%	<i>Trametes hirsute</i>
BPSM09	KJ865839	<i>Phliotalimonella</i> (KM496470)	98%	<i>Phliotaadiposa</i>
BPSM10	KJ865840	<i>Pleurotus</i> sp. (KJ670292)	99%	<i>Pleurotus pulmonarius</i>
BPSM11	KJ865841	<i>Fomitopsis</i> sp. (KC595913)	99%	<i>Fomitopsis</i> sp.
BPSM13	KJ865843	<i>Marasmiellus palmivorus</i> (JQ653437)	99%	<i>Marasmiellus palmivorus</i>
BPSM14	KM985651	<i>Auriculariapolytricha</i> (FJ617294)	100%	<i>Auriculariapolytricha</i>
BPSM16	KM985653	<i>Bjerkandera</i> sp. (KM099498)	100%	<i>Bjerkanderaadusta</i>
BPSM17	KM985654	<i>Hymenopellischiangmaiae</i> (GU980131)	100%	<i>Hymenopellischiangmaiae</i>
BPSM18	KM985655	<i>Xylaria</i> sp. (JQ862668)	100%	<i>Xylaria</i> sp.
BPSM19	KM985656	<i>Bjerkanderaadusta</i> (KJ831843)	100%	<i>Bjerkanderaadusta</i>
BPSM20	KM985657	<i>Polyporus</i> sp. (AJ542518)	100%	<i>Polyporus</i> sp.
BPSM21	KM985658	<i>Xylaria</i> sp. (KP263113)	99%	<i>Xylaria</i> sp.
BPSM22	KM985659	<i>Auriculariapolytricha</i> (FJ617295)	99%	<i>Auriculariapolytricha</i>
BPSM23	KM985660	<i>Xylaria</i> sp. (KM066560)	97%	<i>Xylaria</i> sp.
BPSM24	KM985661	<i>Trametes elegans</i> (JN048766)	100%	<i>Trametes elegans</i>

Isolate No.	Accession number	Closest species with accession number	Similarity	Identification
BPSM25	KM985662	<i>Trametes</i> sp. (FJ372692)	99%	<i>Trametes elegans</i>
BPSM26	KM985663	<i>Trametes elegans</i> (JN164936)	99%	<i>Trametes elegans</i>
BPSM27	KM985664	<i>Pleurotus</i> sp. (HQ668461)	99%	<i>Panusgiganteus</i>
BPSM29	KM985666	<i>Xylariafeejensis</i> (KF619557)	100%	<i>Xylariafeejensis</i>
BPSM30	KM985667	<i>Microporusxanthopus</i> (JX290074)	99%	<i>Microporusxanthopus</i>
BPSM31	KM985668	<i>Auriculariapolytricha</i> (FJ617294)	100%	<i>Auriculariapolytricha</i>
BPSM32	KM985669	<i>Gymnopusmenehune</i> (AY263426)	99%	<i>Gymnopusmenehune</i>
BPSM33	KM985670	<i>Microporusvernicipes</i> (KP715551)	100%	<i>Microporus</i> sp.
BPSM34	KM985671	<i>Pleurotus pulmonarius</i> (KF932728)	99%	<i>Pleurotus</i> sp.
BPSM35	KM985672	<i>Lentinussajor-caju</i> (KP283493)	99%	<i>Lentinussajor-caju</i>
BPSM36	KM985673	<i>Pleurotus pulmonarius</i> (FJ379269)	100%	<i>Pleurotus pulmonarius</i>
BPSM37	KM985674	<i>Lentinussp.</i> (KC507237)	99%	<i>Lentinussp.</i>
BPSM38	KM985675	<i>Marasmiellus palmivorus</i> (JQ653433)	99%	<i>Marasmiellus palmivorus</i>
BPSM39	KM985676	<i>Trameteselegans</i> (KF573029)	99%	<i>Trametes elegans</i>
BPSM40	KM985677	<i>Polyporusarcularius</i> (KP050637)	100%	<i>Polyporusarcularius</i>
BPSM41	KM985678	<i>Pleurotusdjamor</i> (FJ040176)	100%	<i>Pleurotusdjamor</i>
BPSM42	KM985679	<i>Trametes elegans</i> (JN164921)	99%	<i>Trametes elegans</i>
BPSM43	KM985680	<i>Xylariasp.</i> (JN615250)	97%	<i>Xylariasp.</i>
BPSM44	KM985681	<i>Xylariasp.</i> (JX082389)	97%	<i>Xylariasp.</i>
BPSM45	KM985682	<i>Lentinula</i> sp. (KF757012)	99%	<i>Lentinula</i> sp.
BPSM46	KM985683	<i>Schizophyllum commune</i> (AB369910)	100%	<i>Schizophyllum commune</i>
BPSM47	KM985684	<i>Schizophyllum commune</i> (KP326577)	99%	<i>Schizophyllum commune</i>
BPSM48	KM985685	<i>Schizophyllum commune</i> (JX848644)	99%	<i>Schizophyllum commune</i>

Fig.3: ITS rRNA gene analysis classified the isolates into 16 genera and 11 families.

Sl.No.	Genus	No. of individuals	%	Family
1	<i>Auricularia</i>	3	6.67	Auriculariaceae
2	<i>Fomitopsis</i>	1	2.22	Fomitopsidaceae
3	<i>Schizophyllum</i>	5	11.11	Schizophyllaceae
4	<i>Gymnopus</i>	1	2.22	
5	<i>Marasmiellus</i>	3	6.67	MarasmiaceaeMarasmiaceaeMarasmiaceae
6	<i>Lentinula</i>	1	2.22	
7	<i>Bjerkandera</i>	2	4.44	Meruliaceae
8	<i>Hymenopellis</i>	1	2.22	Physalacriaceae
9	<i>Pleurotus</i>	4	8.88	Pleurotaceae
10	<i>Panus</i>	1	2.22	PolyporaceaePolyporaceaePolyporaceaePolyporaceaePolyporaceae
11	<i>Trametes</i>	10	22.22	

Sl.No.	Genus	No. of individuals	%	Family
12	<i>Microporus</i>	2	4.44	
13	<i>Lentinus</i>	2	4.44	
14	<i>Polyporus</i>	2	4.44	
15	<i>Pholiota</i>	1	2.22	Strophariaceae
16	<i>Xylaria</i>	6	13.33	Xylariaceae

Plant material-

Two or more different varieties of the *C. pepo* belongings to the zucchini morph kind were evaluated in this work: "Light Green" (elongated in shape with light green skin) and the "Yellow" (elongated in shape with yellow skin). They are the spokesperson of the zucchini commercial cultivars currently offered in the markets. The seeds of these varieties were germinated on the wet filter papers in the Petri dishes at the room temperature for the 2 to 4 days in the dark and light, after and before which they were transplanted into rockwool cubes (Grodan BV, Redmond, The Netherlands) in the greenhouse effect. Plants were transferred to 1 m large rock-wool and glob slabs at the density of the two or more plants/slab when developed in three to four leaves. Plants were grown in the greenhouse in the Andalusia Institute of Agricultural Research and Training, Fisheries, Food and Ecological Production (IFAPA) Center in La Monera, Almería, Spain (36°47'19" N, 02°42'11" W, 142 m a.s.l.) from March to June 2011 backing standard local and global cultural practices for the both plant nutrition and insect pest and disease control. Six fruits of each variety were harvested at the immature stage, and processed preserving apocarps and monocarp of each fruit separately, packaged in the polypropylene plastic containers and stored at the -80 °C. Sample was lyophilized using freeze driers equipment (Telstar LyoQuest, Barcelona, Catalonia, Spain) at -55 °C under vacuum of length (134×10^{-3} mbar) for the 96 h per sample. Then, the samples were ground and frozen at the -81 °C for the further extractions and biological analyses of the antioxidant.

II. ANTIOXIDANT COMPOUNDS

The compounds used in the study were purchased from Fluka (lutein: Cat. Number 07168 and β -carotene: Cat. Number 22040, Milan, Italy), Extrasynthese (zeaxanthin: Cat. Number 0307S, Genay, France) and then the Sigma-Aldrich (ascorbic acid: Cat. Number 255564 and dehydroascorbic acid: Cat. Numbers 261556, St. Louis,

MO, USA). The carotenoids were dissolved in the ethanol prior to the addition to the corresponding culture of the media, i.e., in water for the fly treatment, or in the RPMI (Roswell Park Memorial Institute) 1640 medium for HL60 cell culture at the time of the experiment. The final concentration and last of the ethanol was 1% in the culture media.

2.1. Determination of the Carotenoid Content -

All things handling were performed in the ice and under subdued artificial light conditions with a headspace of the containers flushed with oxygen free nitrogen to assist prevents carotenoid humilium. Individual carotenoid concentrations were determined by the reverse phase high performance liquid chromatography (HPLC) after the saponification following the methods described by Martínez-Valdivieso et al. The carotenoids were extracted from the rehydrated sample with 5 mL ethanol containing 1 mg/mL butylated hydroxytoluene (BHT) using a Poltron homogenizer (Polytron Kinematica, Newark, NJ, USA). Samples were saponified in the order to determine esterified carotenoids that might complicate the chromatographic determinations. One milliliter of a 40% KOH metabolic solution (w/v) was added to each tube, and the samples were saponified for the 10 min at 85 °C. The samples were cooled in the ice bath, and 2 mL of ice-cold water was added. The suspensions were extracted twice with 2 mL of hexane by the vigorous vortexing followed by a 2000 rpm centrifugation for the 10 min at the room temperature. The upper hexane layers were pooled and evaporated to dryness in a Savant SpeedVac apparatus and resuspended (Waltham, MA, USA). Immediately before injection to the carotenoids were dissolved in 800 μ L of an acetonitrile/methanol/dichloromethane (45:20:35 v/v/v) solution, filtered through to a 0.22 μ m polytetrafluoroethylene (PTFE) syringe filter (Millipore, Billerica, MA, USA) directly to the sample vials, and 10 μ L were injected into the chromatograph. The initial and final mobile phase consisted of acetonitrile/methanol (97:3, v/v/v) containing 0.05% (v/v) triethylamine. We used a linear gradient of dichloromethane from 0 to 10% in 20 min at the

expense of acetonitrile, and then the dichloromethane was kept constant at 10% until the completion of the runs. The flow rate was 1.1 mL/min while the column temperature was 30 °C. The analyses were carried out on a HPLC apparatus equipped with a binary pump, in-line vacuum degasser, auto sampler injector, a Waters Symmetry C18 column (4.5 mm × 154 mm, 4 µm particle size), (Waters, Milford, MA, USA) and a 996 diode array detector (Waters, Milford, MA, USA) supported by the Empower chromatography manager computing system (Waters) was used to detect colored alytenoids at 450 nm. Compounds were recognized by the comparison of the retention times, co-injection with known standards, and then comparison of their ultraviolet (UV)-visible spectra with authentic standards. Quantification was carried out by external and internal standardization. Full standard curves were constructed with five different concentrations for each carotenoid in triplicate. The curves passed through or were very near the origin, were linear and bracketed to the concentrations expected in the samples. Results were communicated on a dry weight (DW) basis. Once the content of the selected antioxidant compounds was evaluated in the epicure and the monocarp of *C. pepo* fruit, the genotoxicity, cytotoxicity and apoptosis assays were performed.

2.2. Extraction and Analysis of Vitamin C-

The vitamin C analysis was carried out with freeze dried lyophilized samples stored at -80 °C. Five grams of the samples were homogenized in the 10 mL of MeOH/H₂O (5:95) plus citric acid (21 g/L) with a EDTA (0.5 g/L) and 4 mM NaF. Homogenates were then filtered through the cheese cloth and C18 Sep-Pak cartridges (Waters, Milford, MA, USA). Ascorbic acid (AA) and dehydroascorbic acid (DHA) contents were determined following the methods described by Zapata and Dufour. HPLC analyses were carried out after derivatization of the DHA into the fluorophore 3-(1,2-dihydroxyethyl) furol [3,4-b]quinoxaline-1-one (DFQ), with 1,2-phenylenediamine dihydrochloride (OPDA). Samples of the 20 µL were analyzed by using a Merck-Hitachi (Tokyo, Japan). The analyses were carried out on a HPLC apparatus equipped with binary pumps, in-line vacuum degassers, autosampler injectors, in a Waters and a 996 diode array detectors (Waters, Milford, MA, USA) supported by the Empower chromatography executive computing systems (Waters). Separations of the DFQ and AA were achieved on a Kromasil 100 C18 column (250 mm × 4 mm; 5 µm particle size; Tecnokroma, Barcelona, Spain). The mobile phase was a MeOH/H₂O (5:95, v/v) containing 5 mM cetrimide and 50 mM potassium dihydrogen phosphate

at pH 4.5. The flow rate was 0.9 mL/min. The detector wavelength was initially set at 348 nm and after elution of the DFQ, the wavelength was manually shifted to the 261 nm for the AA detections. Standard solutions, column conditioning and the derivatization procedures have been previously described by Gil et al.

III. GENOTOXICITY AND ANTI-GENOTOXICITY TESTS

The principles and the basic procedures for the *Drosophila* wing spot test have been described by Graf et al., and in previous works of our groups. Two or more strains of the flies carrying wing genetics markers on the left arm of the chromosome 3: *multiple wing hair* (*mwh*, 3-0.3) and *flare* (*flr*³, 3-38) are used. The transheterozygous larvae were obtained by the crossing *mwh/mwh* males and *flr*³/TM3 (*Third Multiple 3*), *Bd*^S(*Beaded serrate*) virgin females. Hybrid eggs derived from crossing optimally fertile flies were collected over a two to eight h period. Larvae emerged 72 ± 4 h later were cleaned from remaining feeding medium with distilled water, and subsequently transferred to the treatment vials. These are vials containing 0.85 g of *Drosophila* Instant Medium and other (Formula 4-24, Carolina Biological Supply in the, Burlington, NC, USA) wetted with 4 mL of the epicarps and mesocarp of the *C. pepo* and their antioxidant compounds solutions at the physiological concentrations for the *Drosophila melanogaster*: 0.25 and 8 mg/mL of the epicarps and mesocarp of each and every variety and the correspondent concentrations of the pure compounds based on the previously detailed resolution (0.039 and 0.615 µM for lutein, 0.0003 and 0.0689 µM for β-carotene, 0.0001 and 0.105 µM for zeaxanthin, and 0.003 and 0.107 mM for the dehydroascorbic acid). Concurrent negative and positive controls with the solvent alone (water) and positive controls with a hydrogen peroxide (120 mM) were also run. Anti-genotoxicity tests were carried out by blend to the mutagen (hydrogen peroxide, 120 mM) with the compounds solutions. After emergence, adult flies were collected from the treatment vials and stored in 70% ethanol. The wings of the flies were detached under a stereomicroscope using a pair of insect logy tweezers, similar number of the males and females-wings were mounted in the Faure's solution on the microscope slides and inspected, under 400× magnification, for the presence of the clones of the cells. The mutant clones were classified into three types: (1) small single spots, containing one or two cells; (2) large single spots, containing three or more cells; and (3) twin spots,

containing adjacent *mwh* and *flr*³ cells. The appearance of the twin spots indicated to the recombinogenic activity of the chemotherapeutic agent.

IV. CONCLUSIONS

C. pepo is an important crop and source of the human food around to the worlds. Our results confirmed to the food safety, anti-genotoxicity and chemo preventive potential of the zucchini and some of its compounds using the SMART test in the vivo model and the cytotoxicity HL60 cells in vitro model. Anti-genotoxicity assays indicated to be that all of the concentrations showed protective anti-genotoxic activity with different inhibitions percentages (ranging from 11% to 100% inhibition) in combined treatments with a hydrogen peroxide as a genotoxicant, except for the highest concentrations of the lateen. Technological evolutions, especially with respect to the “-omics” technologies, will be the revolutionize our the idea on end sphere microbiomes. At present, we are better able to the distinguish between properties specific to the phytopathogens, entophytes, and other microorganisms from soil and plant natural environment of the soil. This will allow us to be better understands mutualisms and pathogens, because from an a ecological perspective, to the boundaries between both groups are not to be always clear. Furthermore, microbial groups previously thought to the be distinctive of the other environments, such as human pathogens in the warm-blooded animals, have been demonstrated to the thrive in plants. Genomics will be the teach us how microbial groups from one and other environments adapt to the plant environments and i will reveal the minimal genetics requirements for the successful penetration and internal and external colonization of plants. Novel automation will be also allowing us to be investigating multiple orders between microbial groups associated with plants and the plants host it. Nowadays, we have a better capacity to the analyze impacts of the invading microorganisms on the whole entophytic group composition and functioning of the data.

V. DISCUSSION

Although pure natural products or plant extracts exhibit antioxidant activity have been shown in very good results in vitro and in vivo animal models, and to the their clinical trials of disease outcomes in the human patients are still inconclusive and reveal limited success in the antioxidant and other antioxidants. This could in person be due to the fact that in the clinical trials, mostly in the single and double compounds is the studied. In contrast, investigation of the plant extracts containing a variety of the secondary

metabolites is the more common in the studies prior to clinical studies. The amalgamation of the different active ingredients in the extracts can lead to be additive or synergistic effects, giving better antioxidant/disease-modifying activity. This may be one or more reason why, for example, the clinical trial with a Meganatural-Az Grape seed Extract inspect to be the done effect of the whole extracts compared to the single compounds, such as resveratrol found in the grape seed extracts, which had a shown positive result in the some AD trials. In general, clinical trials outcomes for photochemical have been highly variable, in the perhaps due to the way of these trials are control. Clinical trials look at a wide variety of the participants with a different environmental and genetic background and even different diseases symptoms and sometimes stages of the disease. It might to be worth taking a closer look, not at the general's significances of the whole participant population, but it is at single individuals, or smaller are larger groups of the individuals, which do not show significant improvement and determines why they might to be answer to the treatment when others are not. Although this is would be related with a extra cost in trial, it is the could lead to a better comprehension of the potential use of antioxidants in the curtains groups of the patients, either with a certain genetic or environmental background, in a which would also lead to be better understandings of the neurological disorders. In the general, most clinical trials on the natural antioxidants (i.e., natural products or plant extracts) have to been only the looked at the behavioral or cognitive improvements in the patients, very few trials were found that actually assessed molecular markers of the the disease or to be oxidative stress specifically.

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Evaluation of the Potentiality of Maniocresidues (*Manihot esculenta* Crantz) in animal feeding

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Abstract— Due to the successive increases in the prices of agricultural inputs is necessary to use alternative foods to ensure economic and environmental sustainability in animal production. In this paper, the nutritional composition of cassava and the various forms of its use in animal feed were studied in order to investigate the alternatives using these roots to reduce the production costs of the various animal species. Besides the nutritional characteristic, cassava has great economic and social importance, since it is cultivated in most of the Brazilian territory. Cassava residues can be used as substitutes for energy foods traditionally used in the diet of animals with similar performance to conventional energy concentrates and they can also reduce production costs. Cassava is cultivated in several regions of Brazil which is an important reason to become a biologically and economically viable alternative for animal feeding.

Keywords— By-products, Alternative Feed, Monogastric, Ruminant, Biotechnology, Agroindustrial Residues.

I. INTRODUCTION

Brazil is one of the largest producers of cassava in the world and according to the IBGE (Brazilian Institute of Geography and Statistics), in 2015, the national supply of cassava in Brazil increased by 7.5%, while the cassava's starch processing raised by 36%. The IBGE predicts a new production increase in 2016 to 24.2 million tons. 33.9% of this amount is used for human consumption, 50.2% for animal feed, 5.7% for other purposes, 0.2% were destined for export and 10% estimated as losses. In this case, one of the greatest challenges of contemporary society is the pursuit for an adequate management of solid waste, since population growth and modern patterns of consumption are becoming more common inducing agricultural and agroindustrial systems to increase their production. Agroindustry's income has been expanding in recent years due to the diversity of agricultural activities, technological advances, the development of new products and the improvement of quality in the various aspects of the sector. Due to the increase of productivity, large amounts of waste are generated and, when stored inadequately, can cause damage to the environment, creating problems of broad socioeconomic-environmental dimensions (Morales, 2012).

In the Brazilian's northeast, under normal climatic conditions, cassava production normally corresponds to 35% of national agroindustry production. This production is usually for human consumption, through flour and sour

sprinklesor gum that goes into the composition of several plates, such as cheese bread and tapioca. The main cassava producers in this region are three states, Bahia, Maranhão and Ceará, with production averaging 70% of the Northeastern Semi-arid Region (SEDAE, 2013).

The industrial units that process cassava produce high amounts of residues considered aggressive to the environment. Bagasse is the main solid waste produced in the cassava's production and, in general, is left in ditches that overflow with large organic load. However, the mass, or bagasse, of cassava is composed of the root fibrous material containing part of the starch which could not be extracted in the processing. The bagasse is generated in the stage of separation of the starch and is soaked in water and, under these conditions, presents a larger volume than the raw material itself, containing roughly 80% moisture (MIRANDA, 2014).

The literature review has the objective to investigate the food alternatives using cassava residues to add nutritional value and reduce the costs of feeding various species of animals.

II. PROCESSING FOR OBTAINING THE WASTE OF THE MANIOC

Population growth and modern patterns of consumption cause the increase of agricultural and agroindustrial systems' production. Agribusiness incomes have grown in recent years due to the diversity of

agricultural activities, technological advances, new product development and quality improvement in this sector. The productivity raise has increased the amount of waste generated that, when stored inadequately, can cause damages to the environment, creating social, economic and environmental problems (Morales et al., 2013).

According to the Ministry of Agriculture for Supply and Agrarian Reform (ORDINANCE No. 554, August 30, 1995), which defines the Identity, Quality, Conditioning, Storage and Transport Standard for cassava flour, the husk of cassava is the skin that surrounds the protective layer of the root. According to the same Ministry, the manioc rasp is defined as fragments of the central cylinder of the poorly ground cassava root. This poorly ground material is usable because it has some root pulp. The crust is a residue consisting of pieces of roots and bark, separated by sieves before the kiln, in the processing of cassava flour.

According to Araújo et al., (2014), one ton of manioc generates 15.4 kg of crustacea. This amount may vary with collection time, type of crop and process adjustments. In agribusiness, it is important to find some use for production residues and to develop processes that represent an alternative for a transformation of materials into products of higher added value. Therefore, the use of waste is essential as it contributes to a reduction of the accumulation of organic waste, reducing its environmental impact.

Silva et al., (2014) studied the process of protein enrichment of the manioc flour residues with *Saccharomyces cerevisiae* yeast. This process occurred in semi-solid fermentation, in the absence and presence of a non-nitrogenous protein source (urea) to speed up the growth of the microorganism. The article demonstrated that there was a high bioconversion efficiency of the processes, transforming the cassava residue (*crueira*) into bioproducts (pellets) with high added value similar to or greater than conventional concentrates, and could be used as a food alternative for ruminants in the time of scarcity in Brazil's Northeast which is a semi-arid region.

III. NUTRITIVE VALUE OF MANIOC RESIDUES

Silva et al., (2014), studied the nutritional capacity of manioc bagasse meal, table flour meal and bran meal, where crude protein contents were 1.6%, 3.7% and 3.0%, respectively. These results demonstrate the need to develop and adapt technologies to increase protein levels in cassava residues.

The same paper demonstrates that the greater capacity of cassava starch expansion in relation to cereal starch, especially corn, may be related to the lower amount of amylose. Moreover, the constitution of the cassava

starch differs from the grains because it does not present pericarp and endosperm, which are physical barriers to the digestion process. These characteristics of cassava starch facilitate digestion in comparison to maize starch and sorghum.

The results of the physico-chemical characterization of *crueira* present variations between different studies reported in the literature. However, these differences are due to the use of different varieties of cassava, climatic and soil conditions of the producing region, as well as the difference in methodology used to analyze the parameters used by each author. However, it is possible to verify that the *crueira* works as a residue with high content of starch and low content of ashes. This makes the *crueira* a high potential residue for use in bioconversion processes using microbial cultures (ROCHA, 2016).

According to Miranda (2014), the biotransformation process by the fungus *R. oligosporus* significantly decreases the content of hydrocyanic acid. This process can also be applied as a pre-treatment of cassava leaf meal before it is added to the MM to increase the allowed amount of the cassava leaf flour to be added in order to increase the amount and improve the quality of the protein available in this supplement.

The energy bioconversion of the leaf and cassava bagasse by the fungus *rhizopus oligosporus* to obtain functional food through solid state fermentation, promoted the protein enrichment of up to 8% in the substrate. It had higher digestibility obtaining values of up to 79.5%. This value is similar to animal proteins, it also increase the lipid, ash and crude fiber contents, and decrease the moisture content. The biotransformation process also indicated a decrease of up to 60.2% in substrate toxicity, due to the presence of hydrocyanic acid, promoting greater food safety (MIRANDA, 2014).

IV. USE OF MANIOC RESIDUES IN ANIMAL FEEDING

The dehydrated cassava starch residue (RDFM) promoted a decrease in the pigmentation of the skins and the meat of the birds without interfering in the other parameters of quality. There was a reduction in serum triglyceride and VLDL cholesterol at 79 days of age. The use of up to 2% of the cassava residue kept the productive indicators of the birds. However, the results showed that it is not economically feasible to include RDFM in the animals' diet (PICOLI, 2013).

Santos et al. (2013) evaluated the use of a mixture of cassava leaves and dehydrated roots as food for Japanese quails. They concluded that it is possible to add

up to 50% of the animal food to the diet in the breeding phase (8 to 21 days) without affecting the birds' diet.

Viana et al., (2012) studied shoot silage and cassava scrap and concluded that fractionation studies of carbohydrates in fraction B (potentially digestible carbohydrate) and fraction C (indigestible carbohydrate not degraded in the rumen) are important to promote better understanding of them. These studies are also important because they contribute for the balancing of diets according to the requirements of each animal category.

The cassava leaves silage with cassava scrap presents ideal pH and temperature values for better silage quality, good chemical composition, with high CP content, reduction of ADF, increase of crude protein fractions A and B, besides reduction of carbohydrate fractions and high in vitro digestibility. Therefore, it is recommended that cassava leaves for the manufacture of silage with addition of shavings at the 30% level, with potential for use in ruminant feeding (LIMA, 2013).

Ferreira (2013) states that the material composed of bark, peeled and manioc rasp presents high energetic value, but offers insignificant protein value. However, the results of the analyzes with vinasse showed that the residue has considerable values of protein and minerals. In this context, the enrichment of residues from cassava industrialization, with vinasse, resulting from the manufacture of alcohol, increases the protein and mineral content of the mixture. The bromatological results show that the feed can be considered as an energetic food, but it is considered as a protein and can be used in the treatment of ruminant animals.

Among the ingredients used in animal feed formulations, the bovine blood added to cassava meal presented as an excellent agglutinant of the pellets. When adding the blood to the cassava meal for pelletizing, there was an increase in the protein content of the control experiment (37.56%) to 44.14% in dry basis (SENA E NUNES, 2016).

Shinya (2017) cultivated four yeast strains in fermenter with sugarcane bagasse and manioc hydrolysed with amylases or not, in single or fed batch. A strain of *Saccharomyces cerevisiae* M26 was used as a comparative for the fermenter tests. Pre-treatment of sugarcane bagasse was not beneficial for cell growth. According to the highest cellular concentrations, four species were selected and identified as *Sporobolomyces japonicus* Sia 70a, *Sporidiobolus pararoseus* Sia 33.1, *Wickerhamomyces onychis* LABI2 and *Rhodotorula mucilaginosa* LABI1. All of them produced xylanase in culture with cane bagasse in fermenter (0.25 U / ml for *S. pararoseus* Sia 33.1, 0.31 U / ml of LABI1 *R. mucilaginosa*, 0.34 U / ml of *W. onychis* LABI2 Sia 70a, 0.52 U / ml *S. japonicus* Sia 70a), the

amylases were produced by *S. japonicus* Sia 70a (0.2 U / ml), *S. pararoseus* Sia 33.1 (0.26 U / ml) and *R. mucilaginosa* LABI1 (0.33 U / ml) in cassava bagasse culture. The highest concentrations of biomass were reached with cassava bagasse as substrate. The hydrolysed cassava bagasse resulted in the production of 5.2 g / L of *S. pararoseus* Sia 33.1, 8.5 g / L of *R. mucilaginosa* LABI1 and 10.9 g / L of *W. onychis* LABI2. This result is much higher than that obtained by *S. cerevisiae* M26 in the same medium (3.1 g / L). *S. japonicus* Sia 70a reached 8.1 g / L using untreated cassava, twice the value of *S. cerevisiae* M26 under the same conditions.

Araújo et al. (2017) analyzed the protein enrichment with microorganism in semi-solid fermentation. The study demonstrated the gradual increase of protein contents in the fermentations of the substrates (manioc peel) in the in natura form and processed with 2% of yeast and / or added to the different levels (0, 1, 2 and 3%) of urea a variation of this nutrient from 1.59% to 10.19%, respectively. They also observed that the protein content was inversely proportional to the non-fibrous carbohydrate contents, as well as the levels of neutral detergent fiber (NDF) and acid detergent fiber (FDA), because when the glucose metabolism decreases, sporulation is favored. It is worth mentioning that the spores present different biochemical constitution of the vegetative forms from which they are derived.

V. CONCLUSIONS

The success of livestock farming depends on adequate food planning, and it is necessary to use alternative food adapted to local conditions and agroindustrial co-products that can be used for animal feed, avoiding or mitigating the negative effects of lack of food at certain times of the year. In this context, cassava industry residues that have considerable nutritional value, presenting high carbohydrate fractions, consequently presenting a high energy value desirable for a better use in the animal feed, being necessary more studies on better forms of use of this residues in all the Brazilian regions. It is also concluded with this review that the residues of the cassava industry are products of wide versatility as to their possibilities of use as feed for both ruminant and monogastric animals and identify themselves as alternative sources that allow reducing the cost of animal feed and dependence on ingredients conventionally used for feed formulation.

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Regulation of Affective States: benefits of contact with the Nature

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Abstract— *It has long been known of the beneficial effects of nature on human health. However, more and more, the human being is disconnected from nature. Unfortunately, our routine takes us further and further away from nature and this can be harmful to our body and mind. What implications does the lack of such contact with nature have for society as a whole? This manuscript, which is a bibliographic review, based on the psychobiological perspective, covers this subject and proposes some solutions to this issue.*

Keywords— *emotional regulation, Psychobiology, nature.*

I. INTRODUCTION

Increasingly, the human being is disconnected from the nature. According to studies, such as Clements (2004); Frost (2010); Pergams and Zaradic (2008), activities such as visits to parks, hunting, fishing, camping in the nature and outdoor games have decreased substantially in recent decades. An American journalist, named Richard Louv, in his book “Last Child in the Woods: Saving Our Children From Nature-Deficit Disorder” coined the term “Nature's Deficit Disorder” to describe possible negative consequences for individual and psychological health, especially for children, they are increasingly moving away from physical contact with the natural world and contact with nature (Louv, 2005). This author who has already published other works such as: “The Nature Principle: Reconnecting with Life in a Virtual Age”, “The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder”, “Vitamin N: The Essential Guide to a Nature-Rich Life: 500 Ways to Enrich Your Family's Health & Happiness”. In his works, Louv (2005) cites researches that point to attention disorders, obesity, impaired creativity and depression as problems associated with a childhood with a deficiency in contact with nature. In this context, in recent years there has been a flourishing of scientific interest about the benefits of contact with nature for human health and well-being. Several recent reviews (e.g. Frumkin et al., 2017) have summarized and assessed the growing evidence base that supports the contributions of contact with nature to the general, physical and psychological well-being of humans. And, what are the implications that the lack of this contact with nature has for society as a whole?

According to many authors such as Gustavsson et al. (2012), Olesen et al. (2012), the economic costs of anxiety and mood disorders, such as depression, were estimated at 187.4 billion euros per year, just for Europe, just to

mention an example of psychiatric disorders that afflict humans. Health problems like these, at least in part, have been attributed to the growing disconnect between people and the natural world resulting from more urbanized and sedentary lifestyles (Miller, 2005; Soga & Gaston 2015). This is supported by research that shows that interactions with nature promotes psychological restoration (Kaplan, 1995), improves mood (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Barton & Pretty, 2010; Roe & Aspinall, 2011), enhances attention (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Ottosson, & Grahn, 2005) and reduces stress and anxiety (Ulrich, Simons, Losito, Fiorito, Miles, & Zelson 1991; Grahn & Stigsdottir, 2003; Hartig, Evans, Jamner, Davis, & Gärling 2003; Maas, Verheij, Groenewegen, Vries & Spreeuwenberg, 2006). And, all these factors are related to a construct contemplated by psychology called emotional regulation, or as more recently it is being disclosed, emotional self-regulation.

According to Franco and Santos (2015): self-regulation (emotional) or “The regulation of emotions refers to the ability to modulate the intensity or duration of emotional states” (p. 340), in such a way that they are properly managed our impulses and emotions.

In addition to other authors (e.g. Batista & Noronha 2018), emotional self-regulation can be understood, for many authors, as the dynamic process intrinsically linked to conscious efforts to control behaviors, feelings and emotions so that some goal is achieved. In other words, it is the act of managing your thoughts and feelings to get involved in actions aimed at goals, such as organizing behavior, controlling impulses and solving problems constructively. Being able to self-regulate helps us to succeed in many aspects of life, including creating satisfying relationships, tolerating difficulties, thriving in school and working, managing finances and maintaining

physical and mental health. Therefore, emotional self-regulation is a crucial skill for quality of life. Emotional self-regulation depends not only on the biology and individual actions of the child or adult, but also on the contributions of parents, teachers, other mentors, as well as neighborhood conditions to global environments. Although learning about emotional self-regulation is probably easier as children, humans can achieve it at any age, whether through healthy relationships or psychotherapy. A large part of psychotherapeutic work is helping individuals of all ages to learn to self-regulate emotionally.

All societies have their rules for regulating emotions, for example, which is acceptable in the way feelings are expressed. For example, this adequacy applies to aggressive behaviors, which need to be inhibited and channeled so that there is no damage to social life, however, this also applies to positive emotions, such as joy and pride. In some cultures, manifesting the expression of such feelings is also frowned upon and discouraged. Therefore, children must learn to dissociate internal feelings from their open expression and discover how to do it is an important part of their socialization process (Schaffer, 2004).

We certainly cannot generalize contact with nature as a panacea and manage the lack of contact with nature to justify all the issues that interfere with emotional self-regulation, even because the causal factors behind poor mental health are complex and diverse (Kinderman et al., 2015). What we want to demonstrate in this essay are the positive contributions of contact with nature, above all, for emotional self-regulation. That said, it follows for the discussion why being in contact with nature is so important? And what are the positive repercussions of the connection of contemporary man with nature?

II. THE CONCEPT OF SELF-REGULATION

The pioneering author who focused on the theme of emotional regulation in his research was the psychologist James J. Gross. In a chapter entitled: "Individual differences in emotion regulation", in the book "Handbook of emotion regulation", authors Oliver P. John and James Gross, conceptualize emotional regulation as the set of processes by which individuals influence which types of emotions people will have it, when they have it and how they experience and express it (John & Gross, 2007). The procedural model of emotional regulation, developed by these authors, distinguish different strategies of emotional regulation, the most studied being cognitive reevaluation and emotional suppression.

Cognitive reassessment involves modifying the meaning of the situation in a way that alters its emotional

impact. Empirical evidence (e.g. John & Gross, 2007) reveals that the use of this strategy allows the experience of more positive emotions and less negative emotions, better emotional and interpersonal functioning, less depressive symptoms, greater satisfaction with life, more optimism and greater self-esteem. In turn, according to these same authors, emotional suppression can inhibit expressive emotional behavior, but not the experience of negative emotion (John & Gross, 2007). In this sense, suppressing the expression of emotions seems to lead to less manifestation of positive emotions and greater experience of negative emotions, to psychological alienation, to social withdrawal, to higher levels of depressive symptoms and reduced levels of satisfaction with life, self-esteem and optimism.

In addition, Gratz and Roemer (2004) propose a multidimensional conceptualization of emotional regulation, which involves: (a) the awareness and understanding of emotions; (b) the acceptance of emotions; (c) the ability to, in moments of negative emotion, control impulsive behaviors and act in accordance with the desired goals; and (d) the ability to use emotional regulation appropriately by implementing strategies that flexibly modulate emotional responses, in order to achieve individual goals, at the same time, that the requirements of the situation are met.

Emotional self-regulation, for example, can be the ability to not do what we don't want to do. When we interact with each other, many times, we do not say directly or literally what we think and, for good reason: we are subject to the rules of our culture to interact in a way that can respect the feelings and personal space of those who are interacting with us. Emotions can sometimes start very quickly. In fact, so quickly that we don't even realize that our mind and body triggered a specific emotion at a moment. This speed can save our lives in an emergency, but it can also ruin our lives when we overreact and lose control of our actions. In other words, although there is not much control over emotional responses, in certain life situations, it is still possible, even if it is not easy to make some changes in what causes our emotions and how we behave when we are emotionally altered. Since the beginning of the new Millennium, some studies (e.g. Hoyle, 2010; Gallagher, Fleeson, & Hoyle, 2010) characterize emotional self-regulation, considering it as a personality trait and a skill. Personality traits are defined according to how the individual routinely interprets situations and self-regulates them (Hoyle, 2006).

People with high self-regulation capacity find it easier to control their impulses than people with low self-regulation capacity. However, the ability to self-regulate

can be trained: repeated acts of self-regulation enhance self-discipline and the ability to direct our energy towards what is most important for each person (Muraven & Baumeister, 2000). Twin studies confirm a genetic basis in the control effort (e.g. Willems, Boesen, Li, Finkenauer, & Bartels, 2019). However, parenting practices are also associated with individual differences related to the control effort. In general terms, the self-regulation of young children - including behaviors that reflect the control effort - has been positively associated with maternal support and, negatively, with the directive and controlling style of care. Likewise, a secure attachment, at 13 months of age, and maternal sensitivity, at 22 months of age, are predictive factors of the control effort in a future evaluation (Rothbart, Sheese, Rueda, & Posner, 2011).

Recent researches (e.g. Sosnowska, Kuppens, Fruyt, & Hofmans, 2020) consistently have shown that self-regulation is necessary to reinforce our emotional balance. From a behavioral perspective, self-regulation is the ability to act in your best interest in the long run, consistent with your deepest values. Violating your deepest values can lead to feelings of guilt, shame and anxiety, which undermine personal well-being. From an emotional perspective, self-regulation is the ability to calm down when you are upset, angry, frustrated or out of control and to motivate, energize and elevate yourself when people feel dismayed for these reasons. Self-regulation thus establishes a strong relationship with each person's ability to manage emotions.

III. CONTACT WITH NATURE FROM THE PERSPECTIVE OF PSYCHOBIOLOGY

In general, Psychobiology refers to the mind as a set of mechanisms for processing information, whose substrate is the nervous tissue, therefore susceptible to selective pressure like any other organ. This set of mechanisms is responsible for our conscious or unconscious mental activities, for the regulation of our body and for the expression of our behaviors, functions that reflect its phylogenetic origin and that were installed and developed, in a large part of our existence. Pioneeringly, the psychoanalyst Bowlby (1969/1984) called this ancestral environment, the acquisition of evolutionary strategies, as Evolutionary Adaptation Environment (SEA). The term Evolutionary Adaptation Environment, or, is used to denote the qualities of the ancestral environment in which human beings have become adapted to live. This term, which was adopted by Psychobiology, can be defined as a statistical combination of the relevant adaptive properties of environments found by members of ancestral populations (Crawford & Krebs, 1997; Irons, 1998; Tooby

& Cosmides, 1990). Thus, Psychobiology does not locate the SEA in time and space, for example, in the Pleistocene of the African savannahs, although it does not disregard that certain adaptations that we have today are inherited from the hominid ancestors of that time and region. However, the Evolutionary Adaptation Environment (SEA) is estimated to be more than two million years old (Izar, 2009). It is necessary to show that the current ways of life, entirely dependent on resources such as agriculture, livestock, organized societies and writing were not present in that period, having appeared only 10,000 years ago (Rodrigues, 2009). The structure of the human mind, in this way, was delineated with the survival conditions and ancestral problems faced before the appearance of these resources as a fulcrum, with a mismatch between the fixed mental modules and the current ways of life (Pinker, 2004). Human beings, like any other species, were shaped by the forces of evolution. Obviously, this environment comprised a presence closer to Nature compared to what most people experience today.

Plants were of crucial importance for survival during most of our evolutionary history, as a food resource, for shelter and as a water indicator. In a purely theoretical field, it would be expected that the presence of plants, as an integral part of the human evolutionary adaptation environment, has had an impact on the evolution of the brain. We are presumably adapted to live in a green environment. And, how do these data relate to the central theme of this essay, namely, the regulation of affective states: benefits of contact with nature?

Almost 99.9% of the entire evolutionary process was concentrated and tailored in a natural environment, in which men and women lived in direct contact with nature. Currently, and especially urban man, he is incipiently related to nature in relation to that primeval period. In other words, we are adapted to live in constant contact with nature. The routine of contemporary man, especially the city, does not take this importance into account. Based on these considerations, we will soon infer that contemporary man lives and lives in an environment in which he has not yet fully adapted, despite his great behavioral plasticity. And that is what several surveys reveal as we will see the follow.

Diverse researches strongly support the value of increasing contact with nature (Berman et al., 2012; Cervinka, Roderer, & Hefler, 2012; Hartig, Mang, & Evans, 1991; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Leather, Pyrgas, & Beale, 1998; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet, Zelenski, & Murphy, 2011; Ryan et al., 2010; Taylor, Kuo, & Sullivan, 2001; Townsend & Weerasuriya, 2010; Ulrich

1984). These researches originate from several different psychological approaches (evolutionary, cognitive-behavioral, psychodynamic, phenomenological and transpersonal psychology). A wide variety of research methods are used (analysis of narrative content, survey, quasi-experimental, experimental and qualitative methods). Experimental drawings that discuss nature's role in emotional regulation include a wide range of encounters with nature: images and videos of nature scenes, natural aromas, indoor plants, trees and fields seen from a window, practical gardening, interaction with animals, proximity to nature, visits to city parks or green spaces in housing development, forest walks and wild areas. Most of the research findings are based on time in contact with nature and images of nature, mainly because these settings are easier for researchers to work with. These findings are corroborated with highly controlled experimental configurations and more realistic and intensive nature encounters.

More specifically, the contact with Nature has been reported to have psychological benefits in reducing stress (Ulrich et al., 1991; Chang & Chen, 2005), improving attention (Kaplan & Kaplan, 1989), having a positive effect in mental restoration (Hartig, Evans, Jamner, Davis, & Gärling, 2003; Korpela & Ylén, 2007; Van den Berg, Hartig, & Staats, 2007) and to dealing with attention deficits (Taylor, Kuo, & Sullivan, 2001; Taylor & Kuo, 2009). In addition to mental benefits, there appear to be direct benefits to physical health (Pretty, Peacock, & Hine, 2006), such as increased longevity (Takano, Nakamura, & Watanabe, 2002) and self-reported health (Maas, Verheij, Groenewegen, De Vries, & Spreeuwenberg, 2006). As might be expected, the availability of Nature correlates positively with health (Mitchell & Popham, 2002). The benefits were associated with various types of nature experiences, including the real wilderness (Kaplan & Talbot, 1983; Hartig, Mang, & Evans, 1991), neighborhood parks (Grahn & Stigsdottir, 2003; Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007; Kuo, 2010), gardens (Lewis, 1973; Dunnett & Qasim, 2000; Loram, Tratalos, Warren, & Gaston, 2007) and natural features around the residences (Talbot & Kaplan 1991; Wells & Evans 2003).

It has long been known of the beneficial effects of nature on human health. Europe's first hospitals were wards in monastic communities where a garden was considered an essential part of the medium that supported the healing process (Gerlach-Spriggs, Kaufmann, & Warner, 1998). A tendency to add elements of Nature seems to be a universal human characteristic. From the hanging gardens of Babylon, to the cultivation of plants in

apartments or the creation of domestic pets, contact with nature is actively sought. Studies (e.g., Gomes, 2013) show that being involved in nature contributes to relaxation and increased sense of well-being, restoration of mental clarity, physical health and healing, decreased recovery time from surgery and decreased symptoms of Attention Deficit Hyperactivity Disorders in children. There are studies that also point out that walking with bare feet or sitting on the ground has benefits of very common disorders, including sleep disorders, pain and inflammation, chronic stress and cardiovascular diseases (Chevalier, Mori, & Oschman, 2006). Studies such as that of Chevalier, Mori and Oschman (2006) revealed a surprisingly positive and neglected environmental factor in health: direct physical contact with the vast supply of electrons on the Earth's surface.

Ulrich, Simons, & Miles (2003) also investigated the benefits of virtual nature. This study found that the stress levels of people who waited in a room to donate blood were lower when television showed images of natural environments than when city figures appeared.

IV. BIOPHILIA AND EMOTIONAL SELF-REGULATION FROM A PSYCHOBIOLOGICAL PERSPECTIVE

The hypothesis that human beings have an inherent inclination to affiliate with the Nature has been referred to as Biophilia (Wilson, 1984; Kellert & Wilson, 1993). The concept "Biophilia" literally means "love for life" and was popularized when American biologist Edward Wilson published a book with this title in 1984. Ten years later, Wilson edited, with Stephen Kellert, another book, entitled "The hypothesis of Biophilia", which discusses the possibility of having a genetic basis for our appreciation for nature. There is no widely accepted research to prove this theory, but there is no lack of evidence of the healthy influence of green.

And the size of the effect of nature on emotional self-regulation in humans can be explained for what reason? The main reason is that 99.99% of our five million years of evolution as primates during nature. We would essentially be connected to it. The modern lifestyle separates human beings from such contacts. Therefore, this disconnection with nature can be an important contributor to psychobiological dysfunction.

One of the first to show that nature is good was Roger Ulrich, in 1984, when comparing patients in rooms with windows facing trees with those whose rooms overlooked a brick wall, in a hospital in Pennsylvania, in the United States. Their results showed that patients with access to green left the hospital earlier, took weaker or less

painkillers, had less critical comments about nursing and fewer minor post-surgical complications (Ulrich, 1984). Then, other studies (e.g. Evensen, Raanaas, Hagerhall, Johansson, & Patil, 2015) tested colored, but inanimate objects in place of plants, and found that plants offered slightly greater benefits. Based on Ulrich's research (1984), cited in numerous works, many authors (e.g. Dover, 2016) started to defend the construction of more green areas in hospitals and even contact with nature as a form of preventive medicine.

Over time, analyzes have also emerged in offices, schools and apartments, both on the use of nature indoors and outdoors. In a 2000 study, researcher Tove Fjeld, from the University of Agriculture in Norway, saw that complaints about sore throats, for example, decreased by 23% after an office was decorated with plants (Fjeld, 2000). The study by researchers Virginia Lohr and C. H. Pearson-Mims, from Washington State University, found that the presence of plants makes pain more bearable (Lohr & Pearson-Mims, 2000).

Explanations for the effect of nature on our health range from evolutionary factors to better air quality, or even an aesthetic taste for everything that is green or alive. Grinde and Patil (2009) listed possible causes pointed out by Ulrich in his work: being in nature is usually related to physical activities; activities in nature often encourage socialization; and nature offers an opportunity for temporary escape from routine and its demands.

One of the strategies that are suggested by several authors (e.g. Oschman, Chevalier, & Brown, 2015) to reconnect to nature is what the authors call "Grounding", "Anchoring" or "Earthing". Grounding, as some authors call it, involves placing your feet directly on the floor without shoes or socks as a barrier. The logic behind this practice is related to the intense negative charge carried by the Earth. This charge is rich in electrons, theoretically serving as a good supply of antioxidants, helping in metabolic processes such as participation in enzymatic processes and electrons can still act as free radical destroyers. When we put our feet on the ground, there is a direct relationship between the electrical charge of our bodies and the ground. That's because the heart, brain, nervous system, muscles and immune system are all electrical subsystems. When a person has an excess of negative charge (excess of electrons), he is absorbed by the Earth. The same happens when there is a deficiency of electrons that can be supplied by the soil. In this way it is possible to achieve balance.

Oschman, Chevalier and Brow (2015), observe reports in the literature and practices of different cultures around the world that walking barefoot on Earth increases health

in general and provides feelings of welfare. However, for a variety of reasons, many people are reluctant to walk barefoot unless they are, in some situations, for example: on vacation at the beach.

Placing your feet on the ground allows large amounts of negative electrons to be absorbed through the soles of your feet, which, in turn, can help keep your body with the same electrical potential of the negative charge as the Earth. Reconnection with Earth's electrons is a theory found to promote intriguing physiological changes and subjective reports of well-being (Chevalier, Sinatra, Oschman, & Delany, 2013; Chevalier & Sinatra, 2011; Ghaly & Teplitz, 2004; Sokal & Sokal, 2011; Chamberlin, Smith, Appasani, Chirgwin, & Rioux, 2014). So, Grounding refers to the discovery of benefits - including better sleep and reduced pain - from walking barefoot outside or sitting, working or sleeping indoors connected to conductive systems that transport Earth's electrons from the ground to inside the body.

A study (Chevalier, Sinatra, Oschman, Sokal, & Sokal 2012) published in the Journal of Environmental and Public Health entitled "Grounding: Health Implications of Reconnecting the Human Body to Ground Electrolytes" postulates that the earth may represent a potential treatment/solution for a variety of chronic and degenerative diseases. This study suggests that a simple contact with the Earth, through being barefoot or connected to grounded conductive systems, could serve as a natural and "effectively effective" environmental strategy against chronic stress, inflammation, pain, weak sleep, hyper-coagulable and many common health disorders, including cardiovascular disease. The study also concludes that the grounding of the human body can be an essential element in the health equation, along with sunlight, clean air and water, nutritious food and physical activity. According to the study, when the body is in contact with the earth, its electrical potential becomes equalized with the electrical potential of the Earth through the transfer of electrons from the Earth to the body. This, in turn, prevents the 60 Hz mode (ambient voltage) from producing an AC electric potential (alternating current) on the body surface and from disturbing the electrical charges of the body's molecules. People who receive more direct electron flow have been shown to be less stressed, have better muscle tension, and heart rate variability (Chevalier, 2010; Chevalier & Sinatra, 2006; Chevalier, Mori, & Oschman, 2006). Another study, conducted by the Department of Neurosurgery at the Military Clinical Hospital in Powstancow Warszawy, along with other affiliates such as the Medical University of Poland, found that blood urea concentrations are lower in individuals

connected to the land (Sokal et al., 2013). However, there are only a few epidemiological studies on the relationship between nature and health. Epidemiological studies carried out in the Netherlands have shown that residents of neighborhoods with abundant green space tend, on average, to enjoy better general health (De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Maas, Verheij, Groenewegen, De Vries, & Spreeuwenberg, 2006). This correlation was found to be strongest among the elderly, housewives and people from lower socioeconomic groups (Health Council of the Netherlands, 2004; De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003). However, the study by Beyer et al. (2014) pointed out that even for poor people who lived close to vegetation it was even more likely that they had a higher level of peace and happiness than a richer person who lives in an area with less vegetation. A longitudinal Japanese study showed that living in a neighborhood with relatively accessible green space for walking correlated with lower mortality risk (Takano, Nakamura, & Watanabe, 2002).

It is an established fact, although not widely appreciated, that the Earth's surface has an unlimited and continuously renewed supply of free or mobile electrons. The planet's surface is electrically conductive (except in limited areas, such as deserts), and its negative potential is maintained (that is, its replenished electron supply) by the global atmospheric electrical circuit (Williams & Heckman, 1993; Anisimov, Mareev, & Bakastov, 1999). Thus, scientific evidence suggests that the Earth's negative potential may create a stable internal bioelectric environment for the normal functioning of all body systems. In addition, fluctuations in the intensity of the Earth's potential may be important to adjust the biological clocks that regulate the rhythms of the daytime body, such as cortisol secretion (Oschman, 2008).

Even better, about several studies you don't have to be climbing a mountain or paddling a kayak. Beneficial contact with nature can range from an extensive wilderness excursion, spending time in a park or even your backyard, gardening and even watching nature scenes on TV! Even looking at images of nature scenes in a book or magazine can have a beneficial effect. All these possibilities and scenarios can positively contribute to the issue of emotional self-regulation.

Another way to enjoy the benefits of contact with nature is beaches and waterfalls, why? The human being needs an air volume of approximately 10,000 liters per day and this air needs to be of good quality. In addition to oxygen and nitrogen levels, our body needs air to have an energy charge. The feeling of well-being by a waterfall or sea can be explained by the release of negative ions. When

water molecules hit rocks or beach sand, their electrons escape and attach themselves to other nearby particles. The atom or molecule resulting from this fusion has more electrons than protons, and the negative ion is created, which has benefits for human health. In addition, negative ions can also be found in large quantities in forests, mountains and seas. In urban environments these ions are rare because the pollution of air, water and electromagnetic waves from electronic devices, generates many positive ions, which can be harmful to health. This energetic charge brings well-being and good mood to our lives, in addition to acting in a bactericidal way, as the bacteria cannot handle the modified electric charge due to its microscopic size. They are made primarily of ions, that is, parts of atoms that come off themselves. The sensation is measured by the number of negative ions per cm^3 of air. On the beach, where we have a high energy load, there are approximately 50,000 negative ions per cm^3 . Inside our homes, the average drops to an impressive 10 negative ions per cm^3 . To leave our home with that cozy feeling, we can increase the number of negative ions inside it by purchasing air ionizing devices based on this principle. Ionizers work with negative ions. In ambient air, small controlled negative charges lead to considerable relief, through electrostatic charges causing the suspended particles to be attracted to it.

So, to reiterate: psychobiological theory states that human beings have developed restorative responses to nature and emotional self-regulation. Therefore, exposure to nature, according to this theory, will reduce negative emotions and increase positive emotions (affective restoration). And several surveys support this claim. Being exposed to a natural environment after watching a scary movie has been shown to improve mood more than being exposed to an artificially constructed environment (Van den Berg, Koole, & Van der Wulp, 2003).

It was only part of the last 100 years that most of us in industrialized countries began to spend most of their time indoors. However, for most of our history as human beings, we were out: hunting, farming, walking or simply watching nature (Ulrich, 1993). Although several studies have been able to demonstrate the positive effects on mood and attention of exposure to nature (e.g., Berman, Jonides, & Kaplan, 2008; Bowler, Buyung-Ali, Knight, & Pullin, 2010; Hartig, Evans, Jamner, Davis & Gärling, 2003; Van den Berg et al., 2003), such research has focused less on the everyday uses of nature than on emotional regulation. However, some relevant studies have been conducted. The use of favorite places for self-regulation is highly similar to the use of nature for emotional regulation and an experimental study has shown positive effects (in

restorative experiences) of prescribing visits to a favorite place once a day, although only a third of visits in this place study went to natural environments (Korpela & Ylén, 2007).

In the article mentioned "The 'transpersonal' benefits of nature" by author John Davis this is well explained. Examples of transpersonal benefits from contact with nature include:

- Nature is a trigger for the best experiences. Jesus, Moses, Buddha and Mohammed had mystical experiences in wild environments;
- Nature can trigger spiritual awakening;
- Nature is an antidote to a world that is overly rationalized;
- Nature can promote a change from what is invented (the ego, built structures) to what is essential (what existed before or before human action).

Davis, in another article entitled: "Psychological benefits of nature experiences: an outline of research and theory" goes even further and says that there is limited, but suggestive, research, that these discoveries are cross-cultural and universal (Davis, 2004).

A dose-response analysis for depression and high blood pressure suggests that visits to green spaces outdoors for 30 minutes or more over the course of a week can reduce the population prevalence of these diseases by up to 7% and 9%, respectively (Shanahan et al, 2016). Given that the societal costs of depression alone in Australia are estimated at \$ 12.6 billion a year according to European Agency for Safety and Health at Work (2014) e to, LaMontagne, Sanderson, & Cocker, (2014), the savings for public health budgets across all health outcomes can be immense.

Another study brings interesting figures on the influence of walking in natural environments. After the second day of wandering in a local forest, a certain type of white blood cell, the body's defense cells, had a 56% increase in the individuals monitored (Miyazaki, Ikei, & Song, 2014). Still, according to this study, 23% more cells compared to the original state were maintained for a month after walking and returning to urban life. For these researchers, this was a clear sign of how nature can contribute to preventive medicine. Because of this, since 2005, in Japan, there are several places where you can practice "Forest Therapy" (called Shinrin-Yoku), a walk-through green area with the potential to cure stress. The Japanese government has invested, since 2004, US \$ 4 million in research on the subject, also aiming to establish more than 100 places where one can participate in the therapy.

For city dwellers struggling to find green spaces, therefore, there would be an alternative: just populate balconies, tables and walls with beautiful flowers and shrubs to feel the difference. In Brazilian territory, Cariocas have a great advantage in relation to enjoying the benefits of green areas. In 2012, the Municipal Secretary of the Environment showed: Rio boasts an average of 55.83 m² of remaining area of the Atlantic Forest per inhabitant - a number well above the minimum 12 m² recommended by the World Health Organization. Other benefits that we can consider about of contact with nature, according to the research cited:

A. Relaxation, stress reduction and mindfulness. These benefits affect individuals directly and *focus* on levels that differ from people to people, such as those discussed the follow. Most have strong empirical evidences;

B. Relaxation, restoration, peace, tranquility. Reducing the burden of roles, conflict and ambiguity. Reduction of burnout and boredom. Faster recovery from stress in response to nature's *stimuli* than built configurations. More than 100 research studies show that stress reduction is a key perceived benefit of wilderness recreation. More detailed comments on this issue have been made by studies such as those conducted by Hartig, Mang and Evans, 1991; Kaplan, 1995, among others. These discoveries include a variety of nature settings close to the wilderness. This focus is on physical, cognitive and affective relaxation. An example is a survey that presented a stressful video (such as industrial accidents) to survey participants and shows that a video of a subsequent nature leads to a faster recovery than a video with other content (Ulrich, 1984);

C. Faster recovery from stress. "A consistent finding in more than 100 research studies of recreational experiences in wild and urban areas has been that stress mitigation is one of the most expressive benefits expressed verbally" (Ulrich et al., 1991).

V. RESEARCH AGENDA

More and more studies, as pointed out by the study by Goenka and Andersen (2016), focus on how urban design and transport to promote healthy lives, both physically and psychologically. In this sense, the knowledge of Psychobiology, can contribute, in a lot, to base and advise these urban planning. Therefore, urban spaces, from this perspective, can be a fruitful area of research, since, until then, due to the recentness of Psychobiology, they are currently incipient.

VI. CONCLUSION

Emotional self-regulation can largely determine the quality of our lives. It happens and manifests itself in any relationship we have, at work, in friendships, with family members, and in our intimate relationships. They can save our lives, but they can also cause serious damage. They can lead us to actions that we think are realistic and appropriate, but deficits in terms of emotional self-regulation can also lead us to act in ways that we later regret.

As we saw, in this essay, the regulation of affective states can benefit from contact with nature, with its importance characterized by the knowledge of the theory of Biophilia and Psychobiology, in such a way that, in one way or another, this contact with the natural can enable quality of life for humans. Experimental research increasingly confirms the hypothesis that direct contact with nature leads to increased mental health and psychological development. Several studies have found strong evidence regarding exposure to natural environments and the recovery from physiological stress and mental fatigue, supporting the Theory of Recovery from Stress and the Theory of Restoration of Attention. In fact, exposures to natural environments protect people from the impact of environmental stressors and offer more physiological, emotional and attention restoration than urban environments.

Natural places that allow the renewal of personal adaptive resources to meet the demands of everyday life are called restorative environments. Natural environments cause greater reassuring responses than urban environments, and in relation to your vision, there is a general reduction in the physiological symptoms of stress. Exposure to natural scenes mediates the negative effects of stress by reducing negative mood and, above all, increasing positive emotions. In addition, the decrease in cognitive performance associated with stress can be recovered, especially reflected in attention tasks, through the salutary effect of observing nature.

Green space has always been present in urban and suburban areas, but in recent decades it has been taken more seriously because of the decline in its global percentage. Although research shows massively the importance of nature for people's physical and psychological balance, green space is declining due to factors such as parks are not being properly served and the replacement of green spaces for further urbanization, such as parking lots, shopping malls, etc. This decrease in green space alerts us to a concern about a decrease in physical activity, and people's mental health (Pietilä et al., 2015).

Since then, the connection between vegetation and therapeutic or preventive medicine has been gradually broken, partly due to the advancement of medical science and the accompanying technical approaches to healing. In the past few decades, however, considerable research has been carried out with the effects of being in nature and adding plants to otherwise sterile environments. To the extent that the results are positive, the idea that access to nature can help to cure or help prevent disease can eventually be incorporated into evidence-based medicine.

In general, research shows that the percentage of green space in people's living environment has a positive association with the perceived general health of residents. The green space seems to be more than just a luxury and, consequently, the development of the green space must be allocated in a more central position in spatial planning policy.

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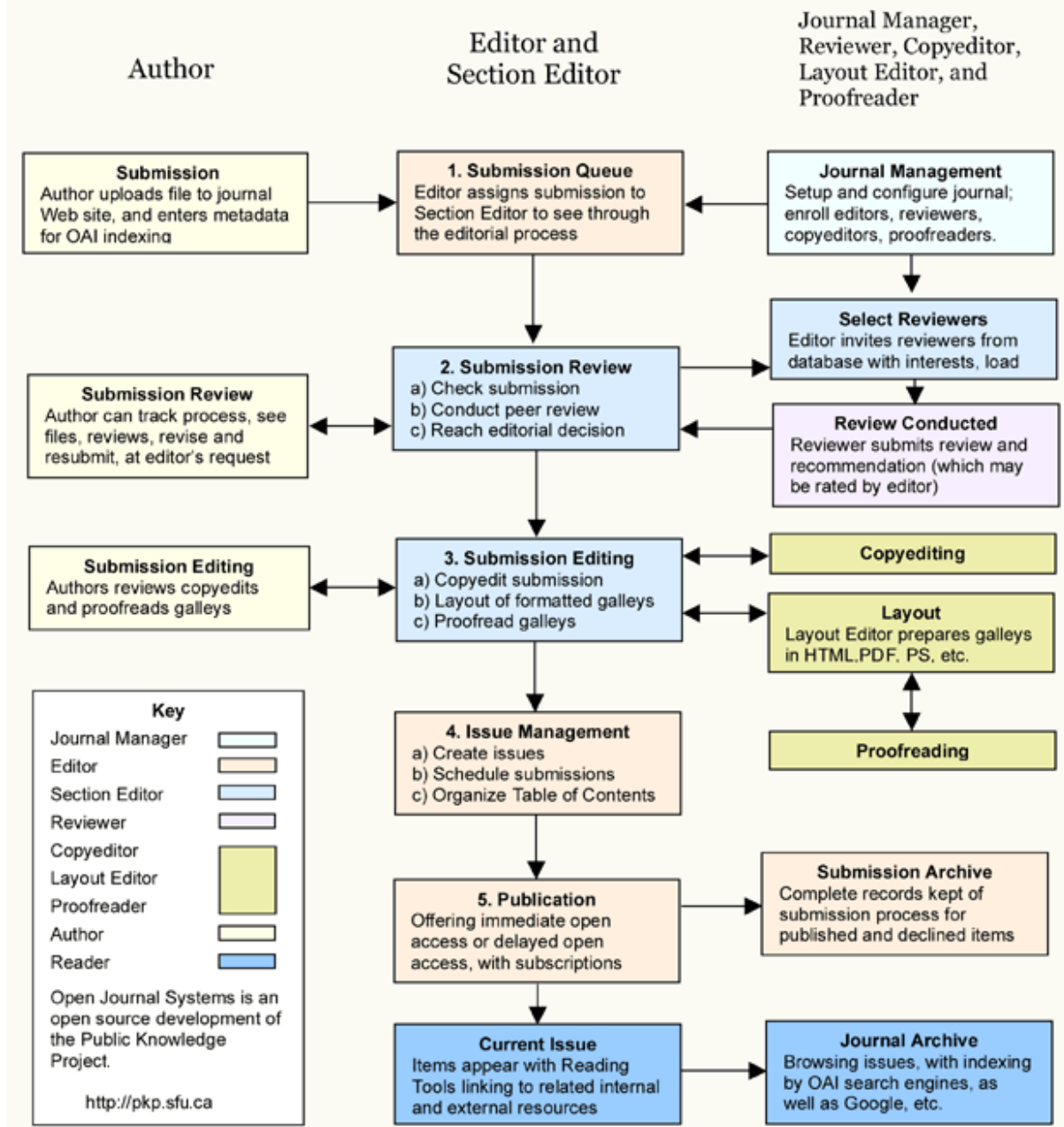
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