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Environmental Education as a Tool for health Assurance on Environmental Jutaí-AM

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Abstract *— Connections between sanitation, public health and environment runs through the environmental knowledge, and provides to the men the understanding of it. Thus, the present study aimed to perform a diagnosis of the current environmental sanitation situation in Jutaí, Amazonas state, as a way of implementing an environmental education program as a tool for Environmental Health assurance in the city. The data were taken in available database of the Brazilian Institute of databases of Geography and Statistics (IBGE), the Ministry of Cities (National Secretariat of Environmental Sanitation) and in information research in municipal administrative sectors bodies. The physical and social characterization of the city was carried out through information provided by municipal administration and government. The guidelines of Environmental Education project will be proposed based on a Participation-Action Proposed Method for the Knowledge Construction - PROPAAC. As results, analysis presented that city water supply is underground, through pipe wells. Moreover, is remarkable that Jutaí has no sewage network. Solid waste gathering covers 90% of the city, held by a pickup truck purchased in 2012 and waste final disposal occurs in the open dumpsite. Thus, was observed that Jutaí is among the worst county of Amazonas state regarding to the sanitation system. Therefore, the effective implementation of environmental sanitation services and investments in environmental education programs in the city are proven necessary.*

Keywords *—* ***Environment. Sanitation. Public health.***

I. INTRODUCTION

The quality of life and health of the human being are closely linked to sanitation, because ineffective implementation of these sanitation systems can cause economic, social and environmental damages [1].

Serious problems such as failure to meet drinking standards, intermittent supply, which consequently jeopardize the quantity and quality of water supplied to the population, as well as deficient collection and inadequate disposal of solid serious environmental problems that directly affect public health [2][3].

By affecting public health, there is an increase in drug costs and hospital admissions. However, when adequate sanitation conditions are in place, the health status of the population is improved, since environmental sanitation has a direct effect in reducing many diseases by breaking the vicious circle established when the patient is medicated and returned to the unhealthy environment [4].

According to the National Health Foundation (2004) "for every R $ 1.00 invested in the sanitation sector, R $ 4.00 is saved in the area of curative medicine." However, what is observed is a mismatch between this information and public policies in Brazil when comes to basic sanitation. Evidence of this is the absence of a general sewage network that until 2008 reached a range of 53% of the population, affecting mainly the health of the population [5].

In this regard, it is possible to affirm that sanitation actions are indispensable for the quality of life, and if we look beyond the material, we will see that these actions are associated with the fundamental rights of human dignity.

Thus, based on discussions of this kind, interest arose for a research that sought unprecedented results of environmental sanitation data in the county, data that can support public policies directed at the quality of life of the people who live there.

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II. ENVIRONMENTAL EDUCATION A TOOL FOR ENVIRONMENTAL SANITATION

In a society at risk, Environmental Education is called to raise awareness about the socio-environmental risks that arise from the relation of man to nature, leading us to believe that it is capable of causing individuals to review their conceptions and habits [6].

Nevertheless, it can be said that Environmental Education is increasingly necessary, since society should not only take the present into account, but rather evaluate their actions so that there will be no consequences in the future, since only then can sustainability prevail. Regard sustainability is measured by the ability to conserve natural capital, allowing natural resources to be refined and even more so that it can be enriched for future generations [7].

Thus, Environmental Education as a tool for environmental sanitation would contribute to the maintenance of sanitation programs proposed by public policies, being an important part of improving the quality of life of our current populations, just as it was important in ancient civilizations.

Looking for a history of the question of sanitation, it is known that in antiquity Greco-Roman civilizations were the first to develop important sanitary criteria for the search of collective health, the Romans were pioneers in sanitation actions reaching a high level of knowledge [8]. However, in the middle ages there was a radical rupture of the man with the knowledge and with industrial growth, the lack of hygienic habits worsened causing a great sanitary regression, resulting in successive epidemics of diseases linked to the lack of sanitation [9].

But only in the last century, that began to have a greater concern with the quality of the water, this based on discoveries that were undertaken by several scientists who showed the relation between the water and the transmission of several diseases [8].

In Brazil the concern is expressed in the Federal Constitution 1988, in which it is mentioned that health is considered a right of all by law and an obligation of the State, and that it is also the responsibility of it to offer the necessary actions so that this right is guaranteed, as well as sanitation actions.

In this sense it is important to clarify that basic sanitation differs from environmental sanitation, since the former includes a set of services, infrastructures and operational facilities for drinking water supply; sewage treatment; urban cleaning and solid waste management to drainage and urban storm water management. Whereas environmental sanitation goes further, it encompasses the set of technical and socioeconomic public health actions, aiming to achieve increasing levels of environmental sanitation, where it is comprised by the adequate supply within the standards of potability, sanitary sewage, solid waste, atmospheric emissions, rainwater, vector environmental control, environmental control of land use and occupation, control and preventions of the excessive noise and even hygienic behavior that reduces disease risks and prevents contamination, with the purpose of promoting the improvement of the population's living conditions [10-12].

Thus, it can be affirmed that basic sanitation is inseparable from the concept of health, since it promotes preventive public health and consequently reduces the need for hospital search, because of less chances of contagion by various diseases [8].

III. METHODOLOGY

3.1. STUDY AREA

The research was carried out in the county of Jutaí, which is located in the Southwest region of the State of Amazonas, in the Northern region of Brazil, the county extends for 69,457,415 km², located at 99 meters of altitude, with the geographical coordinates of the county Latitude : 02 ° 44 '49' 'South Longitude: 66 ° 46' 01 " West, with an estimated population of 17,964 inhabitants, with an HDI of 0.516 [13]. Just below (figure 1) it is possible to observe the location map of the county under study.

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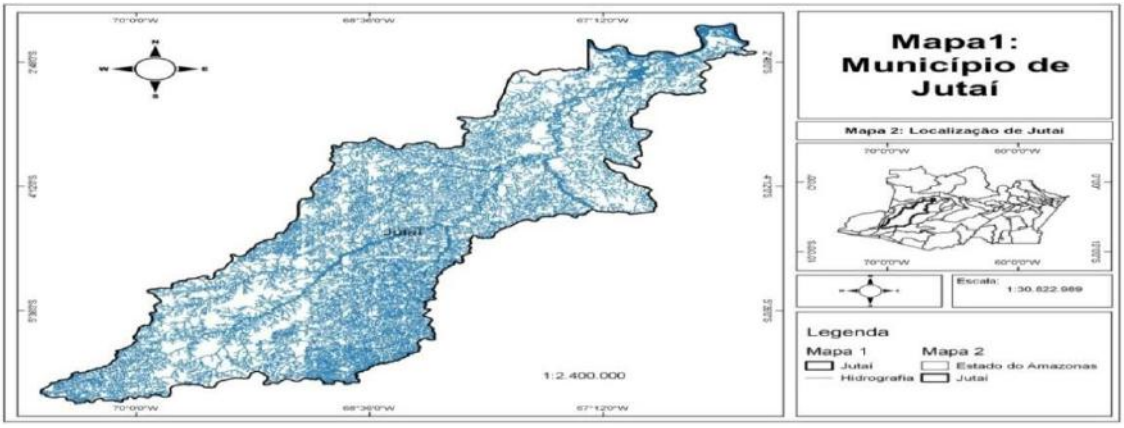

Fig.1- Location Map of the County of Jutaí- AM.
Source: Authors, (2019).

3.2. INFORMATION'S BASE AND DATA COLLECTION

The methodology of [14], with direct observation (direct observation in loco) and indirect observation (documentary research and bibliographic research) was used to carry out the physical and social characterization and diagnosis of environmental sanitation in the county.

The data collected for the elaboration of the physical and social characterization of Jutaí-Am were based on information provided by the municipal administration and government of the county, such as: Municipal Secretary of Environment, Municipal Secretary of Education, Regional Education Coordination, Municipal Secretary Health Unit, Hospital Unit and Health Surveillance Foundation. Bibliographical research and virtual information were also carried out on databases of reference sites, such as the Brazilian Institute of Geography and Statistics - IBGE and the Health Information Book of Amazonas - Ministry of Health.

The data collection for the elaboration of the diagnosis of the county was carried out considering a detail of the public services of basic sanitation, as foreseen by the Federal Law nº 11.445 of 2007 and survey of the health services.

In this way, we tried to structure the diagnosis of this county based on the information provided by the municipal administration and government as well as the information collected in the databases of the Brazilian Institute of Geography and Statistics [13] as it will be presented:

- Water Supply and Sanitary Sewage Services: the information was provided by the Municipal Water Department, the body responsible for water supply in the county; Secretary of Environment, Secretary of Infrastructure, responsible for the components of Municipal Sanitary Sewage.
- Drainage and Rainwater Management Services: these data were obtained from the Secretary of the Environment and the Infrastructure Secretary.
- Urban Cleaning and Solid Waste Management: these data were collected through the Secretary of the Environment, which works along with the Infrastructure Secretary. All this information was confronted by data obtained by IBGE.
- Health Services: Health Department of the county.

The information provided by the municipal administration and government was collected through on-site visits through photographic records of the study system, document collection, interviews and semi-structured questionnaires carrying the representatives of the administration and government, backed by the Term of Free Clarification signed by each representative of the systems already mentioned.

The methodology of [15], which proposes a method based on the Proposal of Participation-Action for the Construction of Knowledge (PROPAAC), was developed after the study of the results obtained in this research).

IV. RESULTS AND DISCUSSION

4.1. PHYSICAL AND SOCIAL CHARACTERIZATION OF THE MUNICIPALITY OF JUTAÍ-AM

The county of Jutaí is bordered by the counties of Juruá, Fonte Boa, Carauari, Eirunepé, Itamarati, Benjamin Constante, Santo Antônio do Içá, Amaturá, São Paulo de Olivença and Tocantins. It has a rainy and humid tropical climate which is a characteristic that dominates the Amazon region, hydrographically speaking the county belongs to the Alto Solimões basin [10].

Regard to the local development, we can highlight the vegetal extractivism, which is known as the

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main economic activity absorbing large plots of local labor and characterized as a traditional activity, where the wood explorations stand out, contributing to the formation of income and generating foreign exchange for the county. In the county has pottery, bakeries, carpentry, mechanical workshops, pharmacies, hairdressers, seamstresses and restaurants among others. The following tourist activities that stand out in the county: Jutaiense Carnival with traditional Block "The Bacabeiros"; Festival of the Sardine, futsal championships, handball and field soccer and as a tradition the celebration of the festivities in honor of São José Operário patron of the county [10].

According to information provided by the Municipal Department of Environment, the county's headquarters is located on the right bank of the Solimões River, located on solid ground, with flat topography, the infrastructure of the municipality is still precarious, the streets are not all paved, there is no urban transport services (buses), but it has electricity service, fixed and mobile telephony and local radio station.

The county has a (01) Police Station, where there are a (01) Civil Delegate and twelve (12) Military Police Officers. The county has approximately twenty medium-sized commercial establishments and seventy small establishments, three banking correspondents, four hotels and some pensions, as well as restaurants and snack bars.

When it comes to Education, Jutaí has 06 Municipal Schools in the urban zone and 106 Municipal Schools in the rural area, which only offer basic education and early childhood education. For the educational complementation, the county counts on 03 State Schools in the headquarters and 01 in the rural zone that work with the secondary education and elementary school, all the schools added a total of 551 teachers in the year 2015. From the analysis of the data 1), there is an increase in the number of students graduating in the last 5 years in the Municipal Education Network, with a low drop in the number of graduates only in the year 2012 compared to the year 2011. While in the State Network, a decrease over the years equivalent to 15.51% in the year 2015 compared to the year 2011, this was due to questions of tuition adjustments and transfers of students to other municipalities.

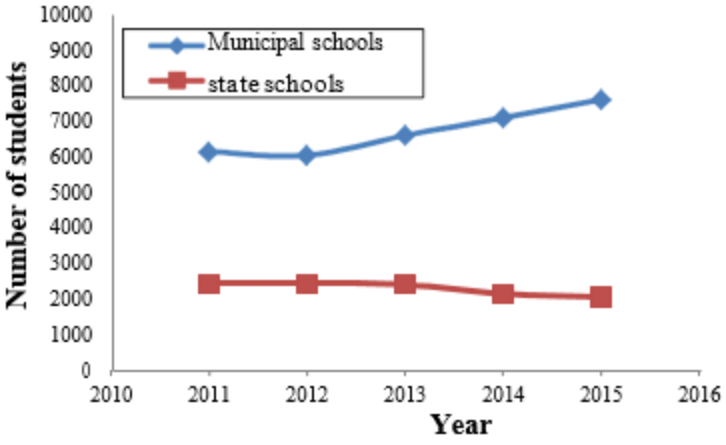

Fig.2: Graph - Number of Final Students 2011 to 2015.
Source: Authors, (2015).

4.2 DIAGNOSIS OF ENVIRONMENTAL SANITATION IN THE MUNICIPALITY OF JUTAÍ-AM

In the case of environmental sanitation in the county of Jutaí, according to [13] the sanitation system is divided into adequate, semi-adequate and inadequate, in which the surveys carried out in the databases between 2000 and 2010 showed that in the county of Jutaí in 2000, only 07 of the 3,165 households had an adequate sanitation system, 902 households had a semi-adequate sanitation system and 2,260 homes with inadequate sanitation. Studies carried out in 2010 show that there was a small increase that indicates approximately 10 houses with adequate sanitation system, an increase was obtained indicating 1,91 residences with semi adequate and inadequate sanitation.

Observing these data it is possible to affirm that the county under study is among the worst counties in terms of adequacy in the sanitation system, so it is possible to affirm the absence of policies regarding

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sanitation in the county. Corroborating this information, the [12][16] name the lack of sanitation in the counties of the State of Amazonas, in which it highlights the proportion of counties with sewage treatment of less than 10%, in which the state of Amazonas presented (4.8%).

In relation to the services of water supply in the county, the system of abstraction of water is underground, realized through tubular wells. According to data provided by the Municipal Environment Secretariat, the wells are divided according to table 1:

Table 1- Tubular wells in the county of Jutaí-AM.

Wells	SECTOR / IGHBORHOOD	HOUSES SUPPLIED
I	center	358
II	Good pastor	320
III	Block of Sand	249
IV	Beira Rio	160
V	San Francisco	110
VI	PX. Hospital	210
VII	Saint Peter	380
VIII	Saint José	290
Total		**2.077**

Source: Municipal Environment Secretariat, (2016).

The total number of homes supplied according to data provided by the Municipal Department of the Environment was 2,077 households, but the last [13] states that the total number of homes supplied by the general network was 1,991 households and that the number total of permanent private households in the municipality is 3,165. There was a discrepancy between the data on water supply provided by The Secretary and the data available at the IBGE, with the conclusion that The Secretary does not have effective control of the number of houses receiving water. Additionally, it is verified that approximately 70% of the households are supplied by the general network while the others are supplied by other sectors as shown in figure 3, according to IBGE data.

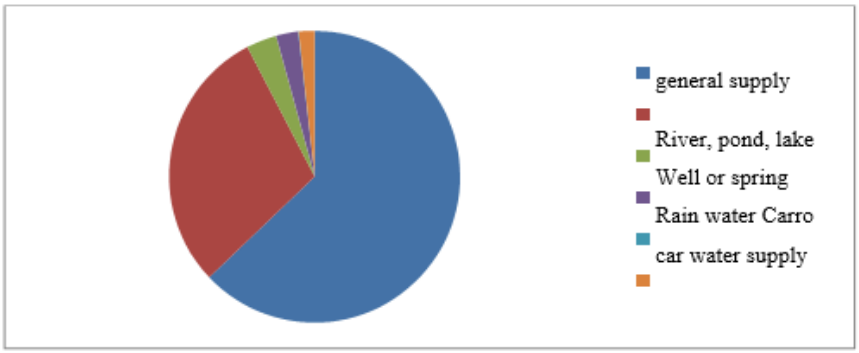

Fig.3: Chart: Sources of water supply.
Source: IBGE, (2010).

According to the county's water department, there is no continuous monitoring of potable water standards distributed to the population, since some of the wells that supply are operating for more than 30 years. A worrying fact is the inexistence of the charge for this service since the year 2002, since it is believed that if there was a charge, many problems would be alleviated, after all, to maintain this type of service is expensive and what is observed is that the city hall alone can not afford those expenses, which makes the service inefficient.

Data from the [17] confirm that the water from the county's tubular wells is being distributed to the population with a demand of approximately 3,548 cubic meters per day without any type of treatment. This contradicts the information of the Department of water of the county, which ensures that there is a simple

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disinfection by chlorine in the water distributed. This makes us worried about the health of the Jutaian population, since untreated water directly implies obtaining waterborne diseases, which is confirmed by the information of Brazil [19][20].

According to the [18], in the Amazon, only 17 municipalities have satisfactory water supply conditions to meet future demands; about the others, the investments for the necessary works result in approximately R $ 823.2 million in all the state.

In this way, the distribution of water with adequate quality and quantity for the population consists of the basic sanitation basic procedure, since it ensures the health and well-being of a society.

According to information from the Municipal Environment Department, reinforced with data from the [17], they affirm that in Jutaí there is no sanitary sewage network, a scenario faced by most of the cities of the state of Amazonas, a statement supported by information from the [18], which states that only 11 of the 62 counties in the state have the sewage collection system.

Data from the [13] indicate that permanent private households have bathrooms or toilets, according to Federation Units, Figure 4 shows which depletion systems are used in the urban and rural areas in the county.

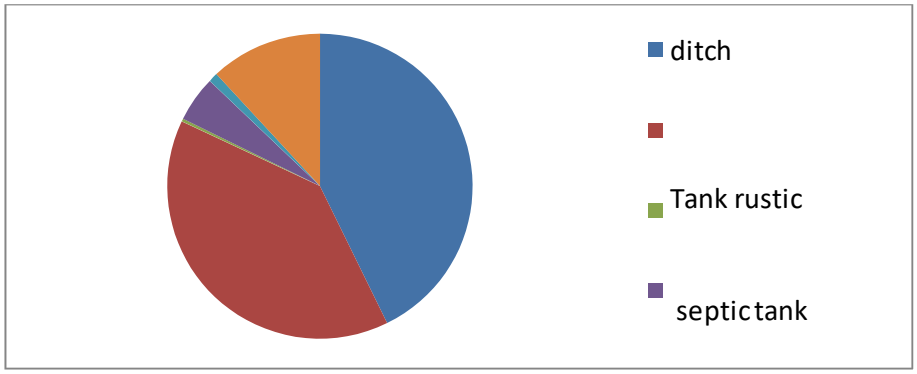

Fig.4: Graph:- Exhaust systems used in the municipality of Jutaí-AM.

Source: IBGE, (2010**).**

Based on the above data, it can be observed that 75.64% of the population use these alternatives of sanitary sewage, since the study area does not have a network of exhaustion. Because they contaminate groundwater, representing a high risk of disease spread, especially when installed in the vicinity of tubular wells.

The [18] indicates a vacuum in terms of improvements in the sanitary sewage service, where it is possible to observe the lack of this service in much of the North Region, highlighting the city of Manaus in Amazonas.

It is observed that the lack of sanitary sewage networks is a reality that affects every country, especially the county of the State of Amazonas as is the case of Jutaí. The treatment of sewage is aimed at improving local sanitary conditions, reducing pollution and contamination foci, conserving natural resources, reducing diseases caused by water contaminated by waste, reducing significantly the resources used to treat diseases, which are related to the lack of an efficient solution of a sanitary sewage, among others [22].

In relation to urban drainage and storm water management services, it is a system that comprises a series of measures aimed at minimizing risks to the population, aiming to reduce damages caused by floods, especially in lower areas prone to flooding, enabling urban development in a harmonious and sustainable way.

According to the [17], the drainage and management of rainwater in the county of Jutaí is absent in the types of collection networks (separator, unitary or mixed). The management of this service is carried out by the municipal city hall, through the infrastructure secretariat, in which according to the responsible agency, the coverage of urban drainage systems is 50%.

According to the [18] in the state of Amazonas, only 22 counties have an urban drainage system, which is aggravating problems with flooding from unnatural causes. On the other hand, the IBGE warns that 40.8% of the counties in the country had numerous problems due to large floods, and that in Amazonas these cases are more serious, due to the counties being the banks of the rivers of the region.

Flooded environments are conducive to proliferation of vectors and venomous animals (rats, snakes, mosquitoes) because they find shelter and food due to inadequately disposed residues on the site, which increases the

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possibility of disease transmission.

Regarding urban cleaning and waste management, it was verified that the final disposal of solid wastes is a visible problem in the county of Jutaí, according to information from the Municipal Environment Department, the county has a coverage of 90% of the collection system of solid waste, carried out by a truck collector acquired in the year 2012 and a bucket, in which the final disposal of this waste is in open dump, this without any previous treatment, the county does not have selective collection and the management model used is of direct public administration. In relation to the public cleaning it was verified that the service is not charged and the quality of this cleaning service is monitored by means of rounds with motorcycles and also by denunciations of the population.

However, when we talk about coverage of the waste collection system, the Brazilian Institute of [13], contradicts the information provided by the municipal environment secretary stating that in Jutaí the coverage of this service is 11.98% in relation to households, that is, 379 households, the others use their waste as shown in figure 5.

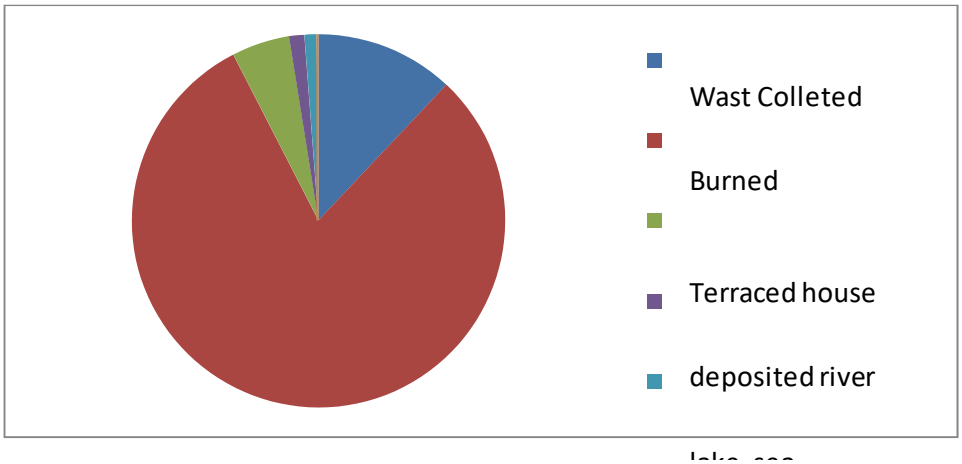

Fig.5: Graph: Destination of Waste.

Source: IBGE, (2010).

Faced with this, we can see a great deficiency in urban cleaning services, the curious thing to note is that there is no collection of values for this service, the same happens with the water supply system, which makes us rethink about the municipal administration model, since the collection of taxes, in a fair way is necessary in some cases, so that there is implantation and maintenance of these types of services that imply directly in the social welfare. On the other hand, it is inferred that as the city has chosen not to charge these services, which at least makes them available to the population.

The current condition of the final disposal of the waste in the county, which is in the open dump (figure 6), can not be underscored. In this dump operated by the Municipal Government, all types of which represent a high risk for both the environment and the population.

Fig.6: Open dump in the county.

Source: Municipal Environment Secretary (2016).

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When waste is improperly disposed of in landfills, for example, sanitary and environmental problems are unavoidable, because these sites become suitable for vectors of various diseases, this type of situation is also responsible for pollution of the air, caused by the burning of residues, soil and both surface and underground water contaminated mainly by manure, so that the more adequate and efficient the final disposal of waste, the lower the impacts on the health of the population and the environment [9].

Within this context, it was observed that in the area of Health the county presents a negative factor in relation to the Information System on Agravos, which is a system that stores information on the number of cases of diseases and deaths occurred in the county and administered by the Municipal Health Department, which only started to be fed in 2014, regarding the cases of diarrhea the system indicated the number of 3,375 cases and only 02 cases of deaths registered in the year 2014, already in 2015 was possible to note an increase of 35.64%, that is, 5,244 case numbers and 03 recorded deaths, which leads us to inquire about the quality of the water offered to the population, since this disease is waterborne.

Some diseases are transmitted by insects, called vectors that relate to water, as species that transmit filariasis (etiological agent Wuchereriabancroftie vector Culexquinquefasciatus), malaria (etiological agent Plasmodium spp. And vector Anopheles spp.), Yellow fever (etiological agent Flavivirus e Aedes aegypti vector and Haemagogus genus), leishmaniasis (etiological agent Leishmania spp. and Lutzomyialongipalpis vector), among other diseases.

The Health Surveillance Foundation registered in the county between 2010 and 2015 a total of 624 cases of filariasis, which in Brazil is known as elephantiasis, is a parasitic disease, caused by three species of nematode worms, which affects only the and is not contagious.

Jutaí presented between the years 2010 to 2015 the number of 6,837 cases of malaria, among which 5,719 are of the species *Plasmodium vivax*, which in turn is more frequent and the only one capable of surviving long winters, 1,093 is of the species *Plasmodium falciparun* that is is a species associated with more severe forms and finally there may be the possibility of transmission of these two species at the same time *P. vivax P. falciparun* which is rare, which sum a total of 25 cases, as we can see in figure 7.

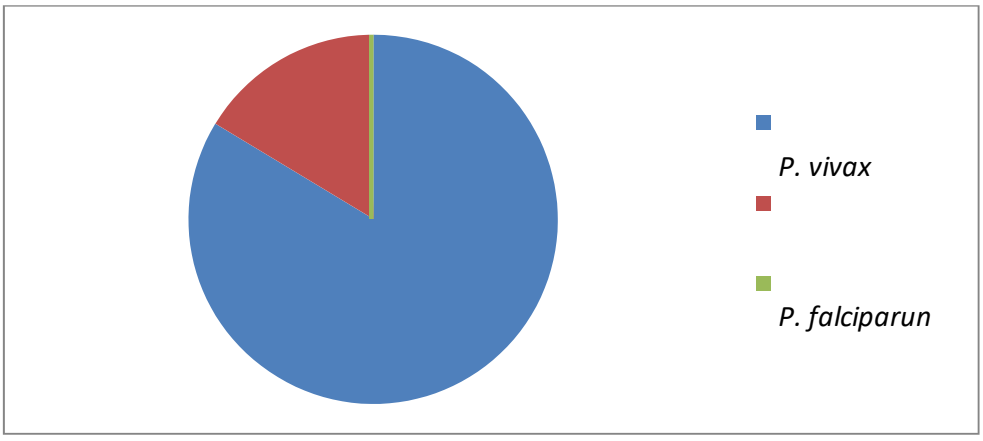

Fig.7: Graph: Number of malaria cases in the county of Jutaí-AM.

Source: IBGE, (2010).

According to the health department of the municipality in the last 6 years no case of yellow fever and only 4 cases of leishmaniasis were found. It is important to note that none of the health-oriented agencies knew how to report any deaths in the last six years due to insect-borne diseases.

The mosquito Aedes Aegypti has been the focus of research, according to [5], one of the main reasons for the proliferation of this mosquito. is the lack of investments in basic sanitation. However, according to the Health Surveillance Foundation, the county of Jutaí does not currently have this transmission vector, which generates a relief for the Jutaian population, since this disease has caused dread in the population of numerous Brazilian cities.

4.3 PROPOSAL OF ENVIRONMENTAL EDUCATION PROJECT FOR THE COUNTY OF JUTAÍ

4.3.1 PROPOSAL SUMMARY

Environmental education is concerned with educating citizens who are aware and concerned about the

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environment and the problems that affect them, in order to bring the population closer to the environmental reality so that they realize that the health of the environment is the responsibility of all. The environmental education project proposal of the present research is aimed at the formal and informal education of the county of Jutaí, where it contemplates the school, labor and community, having support to the current conservationist and environmental management.

4.3.2 PURPOSE OF THE PROJECT PROPOSAL

To suggest to the public administration a possible implementation of the Environmental Education project so that it can sensitize the population in relation to the importance of Environmental Sanitation and how the behavior change can help in the quality of life and in the maintenance of this sanitation system.

4.3.3 METHODOLOGY

The methodological approach will be based on the Proposal for Participation-Action for Knowledge Building (PROPAAC) [15], which consists of a matrix methodology that leads to the application, elaboration, analysis, reconstruction, based on a dynamics of construction, in order to obtain a critical and comprehensive understanding of environmental systems.

4.3.4 PROPOSALS FOR THE APPLICATION OF PROPAAC

The Propaac methodology can be applied in a training module of Environmental Education multipliers, consisting of a process of collective elaboration and re-elaboration of six matrices.

Matrix 1- Identification of socio-environmental problems. This matrix makes it possible to analyze and diagnose problematic environmental situations at the global, national, regional and local levels.

Matrix 2 - Potentialities of the environment and sustainable development. Identification of environmental potential at different levels.

Matrix 3 - Matrix of establishment of the interrelations of the problems identified.

Matrix 4 - Selection of problems and possible solutions. Evaluation of defined solution strategies

Matrix 5 - Curriculum Matrix, to identify community or school Environmental Education activities to help solve problems.

Matrix 6 - Curriculum Matrix for educational and methodological planning to implement Environmental Education activities to be carried out.

V. RESULTS TO BE ACHIEVED

It is hoped that this proposal will create subsidies to aggregate knowledge, ethical values, strengthen the relationship between education and reality, and promote the adoption of compatible ways of life with the conservation, preservation, prevention and minimization of environmental problems in the county of JUTAÍ.

VI. CONCLUSION

It was concluded that there is a need for efficient implamentation of environmental sanitation services in the county under study, in order to promote monitoring and continuity, especially in public policies that can contemplate this type of service independent of the current government. it is also necessary to invest in environmental education programs so that the population is aware of the problems involved in the county.

in this way, the quest for the health of the environment must be continuous, so that society can not be excluded from its responsibilities towards the environment, since such a process is substantial to build sustainability and improvements in public health of the population. municipality of JUTAÍ.

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