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Lucivânia dos Santos Leal; Fabiana Rocha Pinto; Fernanda Sousa Martins Vilela; David Barbosa de Alencar; Gisele de Freitas Lopes

Abstract

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Published Date: 11/30/2019

Page.548-558

Vol 7 No 11 2019

DOI: <https://doi.org/10.31686/ijer.Vol7.Iss11.1909>

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Lucivânia dos Santos Leal

luci_tst06@yahoo.com.br

FAMETRO University Center – Brazil

Fabiana Rocha Pinto

fabiana.floresta@gmail.com

Engineering Coordination at FAMETRO University Center – Brazil

Fernanda Sousa Martins Vilela

eng.ambiental.fernanda@gmail.com

Engenheira Ambiental Fundação Univ. Fed. Do Tocantins, Campus Araguaína, Setor DINFRA, Divisão de Infraestrutura do Campus

David Barbosa de Alencar

david002870@hotmail.com

Galileo Institute of Technology and Education of the Amazon – ITEGAM

Gisele de Freitas Lopes

gikalps@gmail.com

Galileo Institute of Technology and Education of the Amazon – ITEGAM

Abstract

The paper describes the data of an exploratory research conducted after a fire that occurred in a favela space in the described Educandos neighborhood, located in the South Zone, peripheral area of Manaus. Educandos was formed over 100 years ago, when the first families began housing construction. At first glance, walking through the main streets of the neighborhood, there is no evidence of the irregular situation of the place, because masonry structures cover the stilt houses, installed near the Rio Negro bed, an area affected by the fire. Assuming that irregular occupation contributed to the cause of the fire, the study aimed to carry out the impacts caused by the fire. Tracing a qualitative and quantitative diagnosis of these impacts, it was observed through the Interaction Matrix that the impacts were negative in nature, 85% directly, has as local scale, irreversible for impacts to vegetation and social problems, high magnitude during the action. Of fire.

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1. Introduction

The increase in industrial and commercial activities of the Manaus Free Zone - ZFM created through Decree-Law No. 288, of 28/02/1967 [1] has created a great demand for manpower, thus having a great interest of the populations from other states and other municipalities, in the process of migration to the Amazonian capital, resulting in rural exodus, in this case causing a new adjustment in economic and social development [2]. However, this hasty migration led to the chaotic growth of unplanned cities, triggering serious environmental problems and social imbalances [3].

Among the main causes of irregular occupations are the lack of concern from the authorities and the absence of public policies directed to city planning, especially in social matters, where the growth of cities is inevitable, with state intervention to guarantee access to housing. for the entire population [4].

The same authors emphasize the importance of urban planning as a continuous tool, where its objectives must be changed, following a chronological order as time goes by. They also emphasize that this urban planning must be linked to an adequate environmental planning, having as its principle the valuation and conservation of the natural goods, in contrast, the sustaining of life and guaranteeing the quality of life of the populations.

Population growth in urban areas in Brazil was at first characterized by poor planning and disorderly growth in large urban centers. The cities grew unbridled and with this the emergence of new neighborhoods, deriving from irregular occupations, bringing risks to the local population. These risks can be attributed to the change of use of buildings, which after the intervention processes began to house commercial and service activities. This indicates that urban areas will continue to grow at a rapid pace, particularly cities in developing countries [5].

In Manaus, given the urban expansion, there was an accelerated and disorderly growth of the population. According to IBGE data in 2010, [6] in the 1950s, Manaus had a count of 139,620 inhabitants, and in 2010, the last count by the agency, the city accounted for 1,792,881 inhabitants in the urban area and 9,133 in the area. totaling 1,802,014, this means an increase of 92.3% in 60 years, indicating major impacts.

In this condition, there are still anthropogenic impacts, caused by this growth and given the condition of invasion the occurrence of fires. The choice of the region for analysis was based on the form of occupation, in which the fight for the right to housing, the great performance and intervention of the public power, the evolution of irregular areas in this region, considered as one of the pioneers in demonstrating irregular occupations in the region. City.

In the city of Manaus, the demographic increase has concentrated in the last thirty years, due to the implementation of the Manaus Free Zone, with the need to hire people for the industrial area. However, the city had neither the capacity nor the infrastructure to absorb all migratory flows. Thus, low-income people have no alternative but to occupy the banks of streams, slopes, preservation areas and areas that are affordable to the reality of the person in need [7].

In Brazil, the urbanization process mostly occurred irregularly, few cities had a planning, characterized by an exclusionary growth. This growth and the lack of effective zoning policies contribute to the emergence of invasions and occupations that form risky areas, often clandestine and irregular, causing major impacts and polluting the environment [8] and can cause disasters, as observed in recent years. irregular housing

contributed to fires, resulting in human and material losses.

In the city of Sao Paulo, where more than one and a half million people live in 1,700 favelas, this type of disaster is so common that some residents experience it more than once. Between 2001 and 2012, registered by the Fire Department, a total of 1648 slum fires; In 2016, there were 202 cases; in 2017, 81 cases, [9].

In this context, fire safety must be part of a fire-fighting plan to manage or counteract disaster risks, as the costs of such an accident are high, globally in the tens of billions, estimated at 1% of annual global GDP [10].

There are countless cases of fires due to irregular occupations, in Brazil recent cases such as the one that occurred in Largo do Paissandu, in which a 24-story building occupied by a Social Movement for the Defense of the Right to Housing, occurred on May 1, 2018 caused the building to collapse, leaving four dead, four missing and countless families homeless, the cause of the fire being a short circuit in a socket that connected TV, refrigerator and microwave [11].

In Manaus, the population came across and experienced chaos in two areas of irregular occupation, taken by fire, being classified as the two largest occurred in this condition, in urban area occurred in the city. According to the Civil Defense of the State of Amazonas was considered the fire that occurred on December 17, 2018, the second largest in the state, with 600 homes consumed by the fire [12].

According to the Civil Defense, the fire was not bigger than in 2012, in the São Jorge neighborhood [13], with a total of 600 homeless families, in the Arthur Bernardes community, where the residents of this community were registered in the Social and Environmental Program of the streams from Manaus - PROSAMIM and awaiting relocation to another location.

The obligation to preserve urban areas makes it indispensable for the dynamics of fire safety, one of the main dangers that threaten these spaces. The occurrence of fires in peripheral areas, in slum areas or even in irregular occupations, has a series of negative consequences that can have a significant emotional and economic impact on the affected community. Immeasurable losses lead to the question of fire protection, the vulnerability of these areas to risks and the need to manage them, as they may affect the sustainable development of the affected area.

The direct and indirect losses resulting from fires are many, namely: standstill, damage to the environment, loss of historical heritage, loss of human life, financial loss, loss of information and damage to local businesses. The losses raise questions about the need to protect this community. It is also noted the need for more effective intervention by the government, considering the recurrent incidences of fire in these areas, with material and human losses [14].

Thus, this study aims to conduct a survey about the impacts caused by the fire in the neighborhood of Educandos, in the city of Manaus - AM, where from a previous diagnosis on the impacts caused by this irregular occupation; a qualitative and qualitative analysis of the impacts generated by the fire is envisaged; the characterization of impacts from the interaction matrix; besides the analysis of the scenario and its environmental losses: soil, water and air.

2. Materials and Method

The landmark of the Educandos neighborhood officially begins in 1856, when the establishment of the

Educandos Artifices was created, at the time an advanced model of vocational education that was being opened throughout Brazil. At that time, the town was confined to the “Alto da Bela Vista”, a verdant hill whose access was through a single path that began at the “port of catraias”, where the students of the artisans' educators and visitors from other locations.

With a population of 15,857 thousand inhabitants [6], the Educandos neighborhood is located in the south of Manaus, connected to the center by the Padre Antônio Plácido bridge and the Cachoeirinha neighborhood by the Ephigênio Sales and Jucelino Kubistchek bridges (Figure 1).

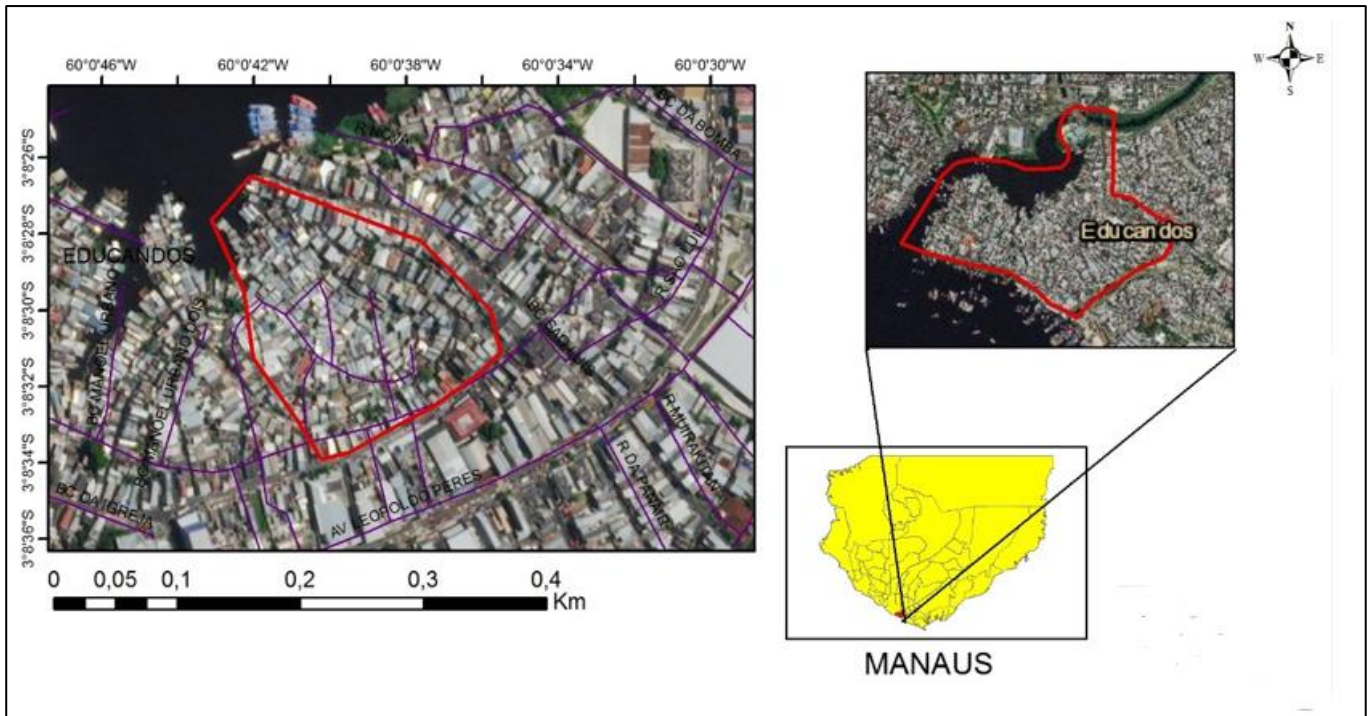


Figure 1. Location of Educandos Neighborhood, Manaus / AM.
Source: Thiago Barbosa Fernandes (2019).

2.1 Data collect

For this work we used exploratory research, seeking to describe the fire in the neighborhood of Educandos, which triggered social and environmental impacts on the community. The research approach is qualitative and quantitative, seeking to establish and understand the connection of the fire with the community, in addition to documentary research and on-site visit.

In addition, a checklist for data collection was carried out, observing a matrix of socioenvironmental impact of the area, aiming to demonstrate in a qualitative and quantitative way, the impacts occurred after the fire. Environmental impact assessment methods and techniques are then structured mechanisms for collecting, analyzing, comparing and organizing information and data on impacts of a proposal. These methods aim to determine the magnitude of impacts [15].

The checklist consists of identifying and enumerating the impacts from the environmental diagnosis of the physical, biotic and socioeconomic environments, listing the impacts resulting from the implementation and operation phases of the enterprise, categorizing them as positive or negative, according to the type of anthropic modification. to be introduced into the system analyzed, since the fire had already occurred in

the study area.

Observing the environmental impacts, object of study the article 1 of the Resolution n° 001/86 of the National Council of the Environment [16], environmental impact is "any alteration of the physical, chemical, biological properties of the environment, caused in any way matter or energy resulting from human activities that directly or indirectly affect: the health, safety and well-being of the population, social and economic activities, biota, environmental aesthetic and sanitary conditions, as well as the quality of environmental resources. "

Therefore, the definition of Environmental Impact is associated with the change or environmental effect considered significant through the project evaluation of a particular project, which may be negative or positive [17].

The methodology used to identify the environmental impacts of fire was the interaction matrix, which refers to a two-dimensional control listing that relates factors to actions [18], commonly applied for impact analysis of operating enterprises, for example. correlate the activities performed with the aspects to be analyzed and the possible impacts caused [19].

According to [18] the interaction matrix method allows easy understanding, addresses social factors, accommodates qualitative and quantitative data, provides good guidance for conducting studies, and introduces multidisciplinary.

The evaluated criteria used in the Interaction Matrix for the fire occurred on December 17, 2018 have two classifications, one qualitative and one quantitative. The qualitative criteria used were:

- Nature: Indicates when the impact has beneficial / positive (POS) or adverse / negative (NEG) effects on the environment.
- Form: Refers to the way in which the impact, ie direct (DIR), arising from a project action, or indirect (IND), arising from another and / or other impacts generated directly or indirectly.
- Scale: Indicates impacts whose effects are felt on the spot (LOC), which may affect wider geographic areas (REG) or even strategic (EST). The local effect is considered to be the restriction of the area of direct influence, which is restricted to the contamination plume, the regional one that affects the Areas of Indirect Influence, the strategic one when relating a chain with boundary extrapolation.
- Temporality: differentiate the impacts, according to the immediate manifestation after the impacting action last in the short term (CP), in the medium term (MP) that is in intermediate situation. Finally, those whose effects are only felt after a period of time in relation to their cause, ie long term (LP).
- Dynamic: is the time of impact, is classified as permanent (PER), ie those whose effects manifest indefinitely and temporarily (TEM), those that occur for a specified period of time and then cease.
- Reversibility: classifies impacts according to those that, after manifesting their effects, are irreversible (IRR), reversible (REV) or cyclic (CIC). It identifies which impacts can be fully avoided or can only be mitigated or compensated.

The quantitative criteria analyzed in environmental impacts are usually assigned with numerical values relating the intensity range, which are:

- Magnitude: refers to the degree of incidence of an impact on the environmental factor in relation to the universe of this environmental factor. It can be low (1-3), medium (4-7), high (8-10), depending on the intensity of transformation of the pre-existing situation of the impacted environmental factor. The

magnitude of an impact is therefore treated exclusively in relation to the environmental factor in question, regardless of its importance, as it affects other environmental factors.

- **Importance:** refers to the degree of interference of the environmental impact on different environmental factors. May be No importance (<<), Unimportant (<), Important (>), Very Important (>>) to the extent that it has more or less influence on the overall local environmental quality.

3. Results and Discussion

In the study an analysis was made of the social and environmental impacts from an urban fire, the fact occurred in the neighborhood of Educandos in the municipality of Manaus, State of Amazonas, the neighborhood began through an irregular occupation.

During the research, it was observed that the population growth of the neighborhood had a direct influence on the impacts caused by the rural exodus of that decade [3] and because of this event, people began to see irregular occupations as the purpose of guaranteeing the right to housing. Another factor to consider is the implementation of Public Policies through the PROSAMIM program, however some families even registered in the program had resistance to leave the place, since they have a whole affective history with their place of origin, thus being at the mercy of a area without infrastructure.

The research exposed a scenario before the fire, the neighborhood of Educandos showed lack in basic sanitation, desirable for a neighborhood, to have effective drinking water supply systems, sewage collection and treatment, public cleaning, a system of rainwater drainage, according to [20] without intervention by the government to regularize, organize and supervise, the State is totally absent and irresponsible, leaving apparent the neglect of slum areas, thus preventing the natural development of social activities. and economical of these places.

Thus we can see the environmental impacts during the fire as point factors, using this concept we point out: Soil Degradation - The site has had an impact since the invasion was implemented, since all vegetation was removed, and it was eutrophied, causing siltation on the Rio Negro riverbed. During the fire process there was an immediate disposal of nutrients by burning material, which could be used for the recovery of degraded areas, however there were toxic elements such as plastics, as well as burning of heavy materials through electro-electronic material. For a better soil verification, chemical analysis and physical analysis through soil compaction are suggested, as there was burning of inorganic materials and not easily decomposed (non-biodegradable). The burning process, in turn, causes soil wear and the emission of toxic gases into the atmosphere [21].

Social Impact - The present study also showed that the environmental conflicts in urban centers are problems of past decades, and that the extension of this problem comes with the perception that the work of raising awareness among the population and according to [22] pay attention to projects and improvements in urban spaces, based on environmental monitoring and supervision, educational practices, with emphasis on environmental education continues, and effective in land use plans and regulation, always seeking a social and environmental set. The event in addition to material losses left an even greater trail of social impact, where even with the existence of implementation of public policies in that area, there is a difference between residents of the neighborhood, with those who actually lived in the favela, the growth

in its disorder, it highlighted the differences between housing, access to public services, as well as social inequality, causing spatial segregation. It is not possible to say which is the best way to deal with the situation in question, however, as [23] the social impact is the causes of environmental problems, the quality of the environment in the face of anthropic actions and the measures taken by society in the face of such pressures. , should take this context into account.

Degradation in the air - In the invasion process it is possible to show CO₂ emission to atmosphere due to vegetation removal and during the fire there was emission of other pollutants, because the place had a lot of combustible material, among them plastic emitting carbon monoxide, the process LPG gas emitting methane, the decomposing material emitting sulfur. Also according to [24] biomass burning smoke contains a large number of chemicals, including gaseous particles and compounds, namely particulate matter (PM), carbon monoxide and dioxide (CO and CO₂), methane (CH₄), non-methane hydrocarbons (HCNM), nitrogen oxides (NO_x), nitrous oxide (N₂O) and ammonia (NH₃).

Following is a Matrix that contextualizes and measures all these impacts by correlating the physical, biotic and socioeconomic and cultural environment.

Table 01. Matrix of Environmental Impacts from the Fire

Analysis Medium	Environmental impacts	Qualitative Features						Quantitative Features	
		Nature	Form	Scale	Temporality	Dynamics	Reversibility	Magnitude	Importance
PHYSICAL MEDIA	1. Likely contamination of soil by improperly storing and disposing of solid waste during fire.	Neg	Dir	Loc	MP	Tem	Rev	3	>
	2. Likely change in water quality due to tailings to the Rio Negro bed.B6: B10	Neg	Dir	Loc	LP	Tem	Rev	5	>
	3. Change in temperature, heat, generated by the action of fire.	Neg	Dir	Loc	CP	Tem	Rev	9	>>
	4. Reduction of air quality by emission of particulate matter and gases due to the burning of fuels and woody material (stilts house).	Neg	Dir	Loc	MP	Tem	Rev	6	>
	5. Probable alteration of the Rio Negro characteristics due to the siltation process.	Neg	Dir	Loc	MP	Tem	Rev	5	>
	6. Removal of vegetation cover for installations of irregular occupations.	Neg	Dir	Loc	LP	Cic	Irr	8	>>
ECONOMIC AND CULTURAL	7. Likely accidents during the fire, including burns and inhalation of toxic fumes.	Neg	Ind	Loc	CP	Tem	Rev	5	>>
	8. Generation of homeless or homeless.	Neg	Dir	Loc	LP	Cic	Rev	9	>>

9. Decrease in local income due to commercial job posts being affected by the fire.	Neg	Ind	Loc	MP	Cic	Rev	6	>
10. Decrease in the quality of life of residents of the area affected by the fire.	Neg	Dir	Loc	LP	Cic	Irr	8	>>
11. Allocation of investments for financial compensation to affected households.	Neg	Dir	Loc	MP	Cic	Rev	7	>>
12. Loss of historical information from residents of affected area.	Neg	Ind	Loc	LP	Per	Irr	8	>>

SUBTITLE

NATURE: Pos = Positive, Neg = Negative;

FORM: Dir = Direct, Ind = Indirect;

SCALE: Loc = Local, Reg = Regional, Est = Strategic;

TEMPORALITY: CP = Short term, MP = Medium term, LP = Long term;

DYNAMICS: Tem = Temporary; Per = Permanent, Cic = Cyclic;

REVERSIBILITY: Rev = Reversible, Irr = Irreversible;

MAGNITUDE: Low (1-3), Medium (4-7), High (8-10);

IMPORTANT: No importance <<, Unimportant <, Important>, Very Important >>.

Given the likely environmental impacts previously raised through the Matrix, measures to mitigate negative environmental impacts are proposed.

Table 02. Environmental Impact Measures

Study Medium	Environmental impact	Environmental Measures	Measurement Classification
physical	1	Properly dispose of solid waste generated by the fire, according to the execution provided for in the National Policy on Solid Waste - PNRS, Law No. 12,305.	1
	2	Conduct water quality monitoring; Install containment hoses on the riverbed.	1
	3	Impact was punctual and no mitigation measure was required.	1
	4	Air quality monitoring; Pulmonary health monitoring of the residents of the neighborhood of the Educandos neighborhood.	1
	5	Restoration of the riparian forest, respecting a minimum width of 30 (thirty) meters, for the waterways.	1
	6	Implement and execute the Degraded Area Recovery Plan - PRAD.	1
ECONOMIC AND CULTURAL SOCIO	7	Preparation of an Emergency Response Plan - PAE with the Civil Defense and Fire Department for fires in slum areas.	1
	8	Public Policies - Housing and fundraising program; develop housing projects aimed at establishing programs to facilitate the access of the low-income population to housing, as well as the improvement of housing and urban and housing conditions.	1

9	Public Policies with funding support for local merchants and entrepreneurs.	1
10	Public Policies with Housing Construction - COHAB including in this, recreation area, health center, school and police station, at the fire place or adjacent area.	1
11	To verify with the City Hall the progress of the Detailed Response Plan (PDR), where it requests resources from the Federal Government to reinforce the assistance to fire victims, the PDR was based on Law 12.340 / 2010, in addition to Decree 7.257 / 2010 .	2
12	Intervention Measure - Environmental Education, including cultural, economic and immersion insertion, where the person affected by the fire can understand and feel part of that environment.	1

SUBTITLE:

1 - Mitigating Measures

2 - Compensatory Measures

Previously raised through the matrix, mitigating measures for negative environmental impacts are proposed.

4. Conclusion

As the study was a qualitative and quantitative analysis addressing the social and environmental impacts, it is of utmost importance that studies are conducted in the area of fire, with quantitative analysis instruments through the assessment of environmental impacts on soil and water, so that they are measured and quantified, I thus try to gain a statistical understanding of how the environment and the people living there were affected, taking into account irregular occupation as a cause of the fire.

It was also observed that the population growth of the city of Manaus was, in fact, responsible for the aggravation of problems related to soil occupation, lack of basic sanitation, damage to the vegetation cover, with the removal of the riparian forest there was a siltation process. Rio Negro, as well as pollution of water bodies. Homelessness was intensified, resulting in a fire that occurred in this area, the population even at the mercy of all these problems, came across the fire, which brought aggravating social problems.

Finally, the rapid growth of urban space, social exclusion and the neglect of public power were conditions for the emergence of irregular occupations, these movements created a new housing format that generally does not meet urban standards, as well as not. provides safety to the community, resulting in tragedies as reported during the study.

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