

Socio-environmental relations of residents in the João-de-Barro urban informal settlement, Boa Vista – Roraima, Brazil

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Received 31 August 2022.

Accepted 25 November 2022.

Published 30 November 2022.

Abstract - Urban informal settlements are a type of irregular settlements characterized by irregular development models and the lack of formal deeds and basic public services. The general objective of this study was to reveal the socio-environmental relations and interactions of people living in the settlement represented by a complex environmental system called João-de-Barro, located in the peri-urban area of the city of Boa Vista – Roraima, Brazil. The methodology comprised a literature review combined with documentary analysis, followed by field visits for participant observation and a survey conducted through a form. The research design consisted of a case study with an epistemological approach to the paradigm of the dialectic of systemic complexity. The results revealed that the João-de-Barro settlement stems from the struggle of social movements that originated at the Boa Esperança farm. The site was transformed into a Special Area of Social Concern in 2011. Based on the residents' perception, the researchers identified multidimensional aspects of social, territorial, and environmental nature in that settlement. Measures are necessary for the provision of basic services, as the site has been contributing to environmental degradation, evidenced by the irregular waste disposal, soil and groundwater pollution, among other environmental problems, especially around Permanent Preservation Areas.

Keywords: Settlement Dynamics. Multifunctional Space. Informal occupations. Lavrado. Amazon.

Relações Socioambientais dos moradores no Assentamento Informal Urbano João-de-Barro, Boa Vista – Roraima, Brasil

Resumo - Os assentamentos informais urbanos são um tipo de ocupação irregular, caracterizada pela falta de escrituras legais formais, modelos de desenvolvimento irregular e falta de serviços

públicos básicos. O objetivo geral do estudo foi desvelar as relações e interações socioambientais dos moradores do assentamento, representado pelo sistema ambiental complexo denominado João-de-Barro, localizado na área periurbana da cidade de Boa Vista - Roraima, Brasil. A metodologia envolveu a revisão da literatura combinada com análise documental, acompanhada de visitas de campo para observação participante e aplicação de formulário. O delineamento da pesquisa consistiu em um estudo de caso, com abordagem epistemológica do paradigma da dialética da complexidade sistêmica. Os resultados revelaram que o João-de-Barro é fruto da luta dos movimentos sociais, cuja gênese foi a fazenda Boa Esperança. O local foi transformado em Área Especial de Interesse Social em 2011. No assentamento foram identificados aspectos multidimensionais de ordem social, territorial e ambiental levantados a partir da percepção dos moradores. Foi constatado a necessidade de medidas para o provimento de serviços básicos, pois o local está contribuindo para degradação ambiental evidenciada pela disposição irregular de resíduos, poluição de solo, lençol freático, dentre outros problemas ambientais, sobretudo nos arredores das Áreas de Preservação Permanentes.

Palavras-chave: Dinâmica de ocupação. Espaço plurifuncional. Ocupações informais. Lavrado. Amazônia.

Relaciones Socioambientales de los habitantes en el asentamiento urbano informal João-de-Barro, Boa Vista – Roraima, Brasil

Resumen - Los asentamientos urbanos son un tipo de ocupación irregular, caracterizada por la falta de documentos legales formales, modelos de desarrollo desorganizado y la falta de servicios públicos básicos. El objetivo general de este estudio fue revelar las relaciones e interrelaciones socioambientales de los habitantes del asentamiento, siendo representado por el sistema ambiental complejo denominado João de Barro originado por la lucha de los movimientos sociales, cuyo origen inicial fue la hacienda Boa Esperança. El lugar fue transformado en Área Especial de Interés Social en 2011. En el asentamiento fueron identificados aspectos multidimensionales de carácter social, territorial e ambiental, levantados a partir de la percepción de los habitantes. Donde fue constatada la necesidad de medidas para el suministro de servicios básicos, pues el lugar está contribuyendo a la degradación ambiental, evidenciada por la disposición de irregular de residuos, contaminación de suelos, manto freático, entre otros problemas ambientales, sobre todo en las Áreas de Preservación Permanentes.

Palabras claves: Dinámica de ocupación. Espacio Plurifuncional. Ocupación informal. Lavrado. Amazonia.

Introduction

Urban Informal Settlements (UIS) are a matter of much debate and concern. The UISs are often irregularly built up by people with a common objective: the search for housing — a right guaranteed by article 6 of the Federal Constitution of 1988 (Brasil 1988). However, UISs are commonly related

to or associated with irregularities such as deforestation, environmental degradation, among other negative aspects (Fernandes 2011).

Studies related to UISs have shown that basic public and environmental services are inexistent and, in general, these settlements are linked to an urban fringe. Such conditions encourage further research to understand their dynamics, especially in the Amazon, with its biodiverse nature, which needs a particular look (Cardoso 2012; Rebello et al. 2019).

It was in this context of Boa Vista, capital of Roraima, in the far north of the country and the Amazon, that this study was conducted. It should be noted that this city has experienced an accelerated and disorderly settlement process, with a lack of planning, in a circumstance causing implications of all kinds — including environmental, demographic, cultural, and socioeconomic. The effects of this movement were new contours and new neighborhoods without adequate infrastructure and precarious sanitation (Falcão et al. 2015).

Cardoso et al. (2016, p.04) declared that settlement and urbanization processes in the Amazon in the 2000s promoted a specific phenomenon: “the urbanization associated with highways created the abandonment of rivers, people started to use roads as their main form of connection and movement in the region and developing cities”, on an intra-urban scale, resulting in a “progressive change in the pattern of settlement in the large plot of land, the suppression of backyards and vegetation, and the reduction of public spaces.” This means that the “traditional urban” was gradually transformed by the capitalist mode of production.

Thus, the urban-rural nature was changed through the separation of urban, rural and environmental policies. In the rural sphere, conflicts swarmed, arising from actions of public land grabbing in the Amazon, especially after the Constitution of 1988. The phenomenon mobilized civil society, social actors, and public institutions towards finding possible solutions. Hence were instituted mosaics of special settlements on public lands outside and around cities (Cardoso 2021).

The study of this UIS and its various circumstances in Boa Vista was conducted under the umbrella of social justice. The prospect of improving the quality of life of vulnerable populations through research was encouraging, given that it is a “necessary condition to have accurate and consistent information regarding the aforementioned reality”, revealing the experience and daily life of residents to serve as a basis for more effective planning and public policies (Maciel 2016, p.250).

In face of this problem, the research was guided by the following question: How and why do irregular settlements occur in the João-de-Barro urban informal settlement in Roraima, Northern Brazil — and what are the environmental effects of these settlements?

In order to understand how the settlement dynamics occurred in the João-de-Barro UIS, it was necessary to identify and describe the socio-environmental relations and interactions experienced and enlivened by the residents from 2000 to 2021.

The research was developed through a case study (Yin 2015), while its descriptive, explanatory, and exploratory approach (Gil 2017) was based on Edgar Morin’s systemic complexity (Morin 2015), with qualitative-quantitative analysis. The study evinced the impacts of the settlement on the social, economic, and environmental dimensions currently contributing to environmental degradation.

Finally, this research aimed to reveal the socio-environmental relations and interactions of the residents of the João-de-Barro settlement in Boa Vista – Roraima to explain how these organizational dynamics take place, materialized by the irregular settlement process in the city, where this is an

increasingly common phenomenon, especially in the 21st century, in which socio-environmental issues have taken on new contours, demanding a new form of rationality (Leff 2001).

Material and Methods

In carrying out the research, primary and secondary data were collected. Secondary data were obtained from official documents – from the Municipality of Boa Vista – EMHUR, from three State government agencies — the State Company for Water and Sewerage of Roraima (CAER) and the State Foundation for the Environment and Water Resources (FEMARH) —, the Roraima Institute of Lands (ITERAIMA), along with the 1st Civil and Property Registry Office/Boa Vista (RI) and the 1st Notary's Office for Civil Registrations and Protested Notes of Boa Vista/RR (Loureiro Notary's Office).

The literature review was based on relevant books, dissertations, and journals to give consistency to the concepts and categories of analysis. The research participants were selected from residents, resident association representatives, and the Homeless Workers Association (ATST/RR).

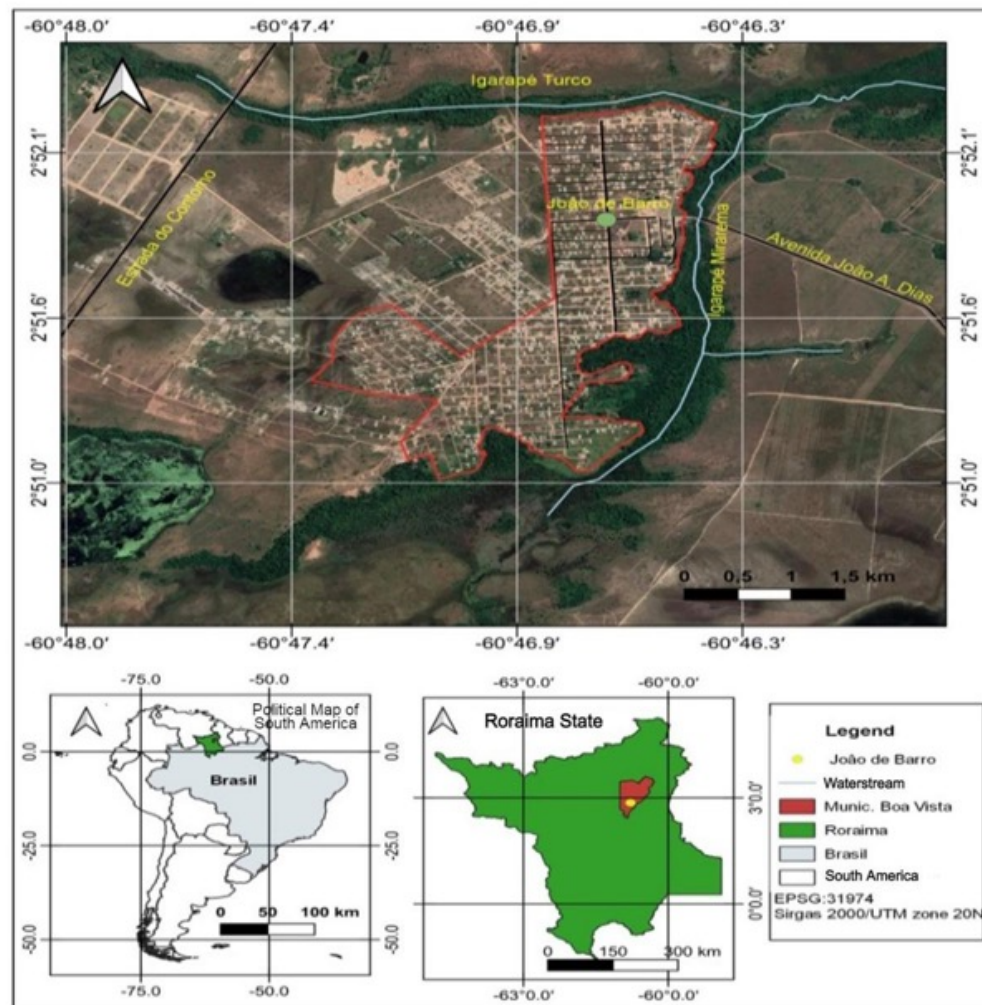
The empirical evidence comprised observation techniques such as participant observation, application of research instrument — a form with the script of an interview with nineteen semi-open questions on the following themes: personal data, housing conditions, place of living, social benefits and housing programs, basic sanitation, infrastructural and environmental problems (solid waste, quality of tap water, pollution of waterways, sewage, and air and noise pollution). A field journal was also used as a technique to record observations on the daily life of the settlement, using audio and video capture, as well as production of cartographic material.

This article is the result of the research project approved on August 17, 2020, by the Committee for Ethics in Research with Human Beings, in compliance with Resolution No.: 510/2016 of CNS/MS (Brasil 2016), with CAAE No.: 30545420.9.0000.5302, and legal opinion No.: 4.217.289.

Study Area

The urban informal settlement called João-de-Barro is located in the western portion of Boa Vista, the capital city of the state of Roraima, close to the Cidade Satélite neighborhood, in the area belonging to the Cauamé tract of land (Figure 1). The settlement can be accessed via João Aparecido Dias Avenue and the Estrada do Contorno Road, connected to the RR–205 state road and the BR–174 federal road, towards the municipalities of Alto Alegre and Pacaraima, respectively. The settlement under study is part of the Boa Vista Formation, which is characterized by sediments dating from the Tertiary and Quaternary, as well as by geomorphology belonging to the Boa Vista Depression (Silva et al. 2009).

Figure 1. Location map of the João-de-Barro Urban Informal Settlement in the city of Boa Vista, RR, Brazil.



The region under study is marked by the presence of two bodies of water, regionally called *igarapés*: Turco and Mirarema, which belong to the Cauamé river basin. The *buriti* palms (*Mauritius flexuosa*) in the area are interconnected by gallery forests (Campos et al. 2008) included in a Permanent Preservation Area – PPA.

The settlement, as defended here, is based on the Lavrado environmental system. The concept of *Lavrado* consists of a phytophysognomy of Savannah-like sparse shrubby grassland vegetation. The Lavrado's lake basins are shallow and small, and their water level is controlled by the rainy and dry seasons (Ignácio et al. 2017).

The term 'Lavrado' is commonly used by the local population. It emerged from the historical and cultural identity of the residents of the Roraima State and its inseparable relationship with the landscape unit where they live. It differs from other Brazilian biomes known as Cerrados due to the abundance of *Cyperaceae* (a type of herbaceous plant generally represented by grass-shaped herbs) and low floristic diversity (Carvalho and Vanzolini 1991; Carvalho and Morais 2015).

According to the Köppen classification, the climate is Aw - Tropical Savannah climate, the dry period extends from December to March and the heaviest rainfall occurs from May to July, with high annual average temperatures of 26 °C and average annual rainfall of 330 mm (Barbosa et al. 1997).

Research typology

This exploratory, descriptive and explanatory research lies in the area of Environmental Sciences. The analyses are qualitative-quantitative. The qualitative analysis was based on the authors whose concepts and categories of analysis formed the paper's theoretical framework, and the quantitative analysis used non-parametric descriptive statistics (Santos 2004).

The research design consists of a case study (Yin 2015) with an epistemological approach to the paradigm of the dialectic of systemic complexity (Morin 2015), which allowed an understanding of the phenomenon from the perspective of the whole and the parts, the objective and the subjective, the order and disorder.

Data collection procedure

The primary data collection procedure consisted of visits for direct observation and participant observation aiming to get to know the daily lives of the residents. The researchers monitored various occasions such as meetings/actions/events promoted by the residents and, on the occasion, the interview forms were completed.

Another strategy was to carry out interviews and conversations with legal representatives of associations and residents. The period on the field went from March to June 2021. Secondary data were obtained through literature review and documentary analysis. The audio recordings, videos, and cartographies were collected as a source of evidence for conducting the same survey on open platforms.

Research participants

The research participants were residents of the João-de-Barro settlement. According to the survey, their characteristics are: Brazilians, non-indigenous, and adults, between 18 and 67 years old. Through the snowball technique (Vinuto 2014) the interviews covered 14 residents who are also the heads of their households (I1... I14). According to Vinuto (2014), the number of interviews ends when data saturation is reached. A prominent finding during the fieldwork was the settlement's pioneer residents.

Theoretical Framework

The theoretical framework consisted of five main categories of analysis, based on the following concepts: firstly, of "Urban Informal Settlement", used by Fernandes (2011) as a common type of irregular settlement process, environmentally vulnerable, with irregular development models, lacking formal legal deeds and basic public services.

Secondly, the term "Multifunctional" (originally, *Plurifuncional*), which is described by Miranda (2009) as rural-urban transition spaces, such as multifunctional spaces in which urban and rural coexist in characteristics and usages of the land, whereas these usages are dispersed and fragmented, with an absence of a coherent urban structure that allows spatial unity, subjected to profound economic, social and physical transformations, whose organization dynamics is closely linked to their proximity with an urban core.

Regarding the "peri-urban area", according to Cardoso (2012, p.33), "in the dialectical process, the form-content of the urban transcends that of the city, advancing on old realities such as those of the countryside and those of the existing cities themselves, without canceling them, but recreating them, subordinating them, as is the case of development [...] of the peri-urban areas that increasingly constituted in transition

zones demarcated by the growing advance of the urban over the countryside [...] redefining the city-country relationship, which does not disappear, but is instead subordinated to an urban-rural relationship”.

The third is the concept of “Production of space”, used by Lefebvre (2006) as a production process considering three dialectically interconnected dimensions: spatial practice, representation of space, and space of representation. The fourth is “Environmental Justice”, based on Acsehrad (2010), defined as the access to the distribution of environmental benefits and liens and encumbrances among social groups.

And, finally, the “Systemic Complexity” proposed by Morin (2015) in the relationship of the whole and the parts, and in self-organization with the environment, where sustainability is essential to regenerate the system.

Results and discussion

The main findings during the fieldwork are comprised of the following dimensions: social, political, demographic, economic, and environmental.

Socio-environmental characterization of the João-de-Barro Settlement

The first finding in the field concerns the socio-environmental relations of the residents, especially regarding their use of the term “allotment”, which was often used in the interviews. Therefore, throughout the text, the terms “UIS” and “allotment” will be considered analogous.

According to the account of a pioneer resident, a 58-year-old man (I1), the origin of the settlement was the Boa Esperança farm. It was later sold to an association named ATST-RR. The association, in turn, stems from the social movements called Movement of Homeless Workers (Movimento dos Trabalhadores Sem Teto — MTST) and Landless Rural Workers Movement (Movimento dos Trabalhadores Rurais Sem Terra — MST), who fought for the right to land ownership and housing in the first decade of the 2000s in Brazil (Amore et al. 2015).

In 2010, ATST purchased the equivalent of 96.14 ha of land from Antonio Minotto Neto for R\$ 1.6 million. The land was subdivided into smaller lots, and a document of sale and purchase was passed on to the associates.

In Law 1325/2011, there are two pieces of information regarding the total area. The first is in the descriptive memorandum: 553.30 ha located at coordinates N 317518.720 In and E 747423.325 m, whose limits are marked by the Igarapé Mirarema, the Santa Tereza Farm and the Contorno Oeste (*Anel Viário*).

The second piece of information includes an area of 520.12 ha officially named “João-de-Barro AEIS” area (Roraima 2011), which was divided into João-de-Barro I, II, III, and IV. It is noteworthy that new measurements based on data from the ATST demonstrated a total area of 180 ha, amounting to a difference of 340.12 ha of the AEIS not yet occupied. It has 2,500 plots of land measuring 10 x 25 m², and about 1,000 residents with fixed residence in the place.

Considering Fernandes (2011), conceptually speaking, João-de-Barro does not comprise all characteristics of an Urban Informal Settlement because it is not located on public land, nor is it environmentally vulnerable or located in an urban area. On the other hand, João-de-Barro fits other characteristics of a common type of irregular settlement process, such as irregular development models and the lack of formal deeds and basic public services. Although the settlement does not entirely fit the concept, this research considers João-de-Barro as an Urban Informal Settlement while proposing an expansion of the concept, a construct – a concept under construction.

In this sense, the choice of a mixed method allowed us to hypothesize that the collection of different types of data would forge a broader view on the research problem. From the survey, it was possible apply the general results to a population and then focus on a second phase with open qualitative interviews in order to encompass detailed views of the participants (Creswell 2007).

Adopting local terms based on the participants' perceptions means bringing invisible people to the light. According to Minayo (2006, p.622), first, it is necessary to “know the structuring terms of qualitative research, whose raw material is composed [...] of: background, experience, common sense, and action. And an approach [...] based on three verbs: understand, interpret, and dialectize.”

Historically, the place was still a farm until 2009, and the predominant phytophysiology was the Lavrado vegetation, without alterations and with few improvements, such as small crops, and pig and chicken farming. The land contained the farm's headquarters, a house for the employees, and an airplane runway, a daily landing place for approximately one hundred (100) small aircraft, serving mining areas in the State, as well as other services, according to the account of one of the interviewees, who was a pioneer in the process of occupation of that allotment.

In that year, social movements started occupying pieces of land and searching for areas with low market value, suitable for the conditions of a low-income population (Monteiro and Veras 2017). In this case, it took place outside of Boa Vista's infrastructure. From these organizational dynamics, the farm acquired common characteristics of a UIS. That said, the research findings revealed multidimensional and relational aspects of social, territorial, and environmental nature in the UIS, briefly outlined in Table 1.

Table 1. Main problems detected in the João-de-Barro UIS, Boa Vista, RR, Brazil, 2021.

Social	Territorial	Environmental
No schools available on site	Disorderly growth	Open burn of garbage and native vegetation
No health clinic available	Unpaved streets	Soil degradation
Few spaces for leisure	Infrastructure and sanitation poor	Groundwater pollution
Poor housing and low mobility	Lack of electric power in more remote homes	Removal and invasion of PPAs
Unsafety	Insecurity of land tenure or unsafety for land conflicts	Irregular solid waste disposal

These characteristics revealed the time and space dynamics of settlement movements in João-de-Barro. Starting with the social dimension, problems were mainly related to education, health, leisure, housing, mobility, and safety.

In education, considering the UIS is located outside the urban perimeter and no schools are available there, children stand a harsh process in order to attend school. They must wake up much earlier and wait for transportation to get to school in a timely manner. Education is a fundamental social right, therefore, access to education and the quality of the service should respect the principles of equality and equity (Santos 2019).

Another research finding was to start considering the Joao-de-Barro UIS as a rural-urban transition space. There coexists a mix of customs, such as the cultivation of manioc, corn, vegetable gardens, fruit

trees, and medicinal herbs, combined with urban housing, commercial areas, bars, stores, restaurants, and snack bars. In this context, multiple social relations take place, as well as knowledge exchange (Miranda 2009).

Based on the socio-spatial dynamics of the Amazon, the area under study points to the phenomenon of peri-urbanism (Cardoso 2007), which specifies that socio-spatial practices are diversified and complex, where rural and urban practices coexist and are perpetuated through the daily lives of residents linked to a metropolitan region.

Work is seen as a gateway to consumer goods, especially those of collective consumption. The lack of infrastructure mobilized residents to establish a collective usage of a pump to distribute water to the houses, as well as an energy transformer. This highlights solidarity as a common principle.

In the settlement, some residents are included in social programs (Bolsa Família and Auxílio Emergencial), while some make a living from commerce or public service. Thus, the current capitalist production mode reveals changes, at the same time, in social relations and individual labor relations. Previously, the residents would maintain close family-like relationships, especially regarding land management. Currently, some changes can be observed in this way of life. According to Harvey (2014), we live in a world that is a base for the history of capitalist accumulation.

The residents mentioned, as their main places for leisure, a soccer field, the Igarapé Mirarema water stream, and a hangar where commemorative parties and ATST/RR meetings are held (Figures 2A, B, and C). The profile of residents who attend soccer matches and visit the water stream is people between 14 and 30 years old. The stream is used by residents in general, as well as for parties/meetings, depending on the proposed topic. These moments of relaxation are like an act of solidarity coated of conscience and social responsibility (Morin 2015).

One of the interviewees revealed that his families' leisure on weekends is bathing on the stream and going to soccer matches: "sometimes I spend the entire day there, I take some meat and have my barbecue by the stream, then I go to the soccer field and play soccer with neighborhood friends" (I2, 39-year-old man).

Figure 2. Main places used for leisure by the residents: A) soccer field, B) the Mirarema water stream is usually visited on weekends and holidays and C) the hangar used for meetings and local events.



According to Mauad (1996, p.85), historical sources based on images, videos, and testimonies are “[...] like a mark of a past materiality, in which objects, people, and places inform us about certain aspects of this past — living conditions, ways of dressing, urban or rural infrastructure, working conditions, etc.”

In terms of housing, the interviews with the residents revealed they were moved by the search for a place where the price of land was considered low and its payment would be easy: “the price was really good and fit in my pocket, and I could still pay in installments.” (I3, 58-year-old woman); “it was the only opportunity I found to get out of rent and have a roof over my head to live with my family” (I6, 54-year-old woman).

The result was varied housing conditions, some unsanitary, built of plywood, with no windows or internal bathrooms, some without running water or power supply, others still under construction, as shown in Figures 3A and B. In contrast, there are masonry houses with an outer wall, a gate, some two-story houses, in addition to a swimming pool in the backyard, as well as commercial places that are also houses for their owners, as shown in Figures 3C and D.

Figure 3. Housing conditions in the settlement: A and B) improvised shacks and/or houses built from plywood material, a way of guaranteeing their housing, in contrast, there are C) well-structured residences and D) commercial points.



Monteiro and Veras (2017), when dealing with the housing issue, emphasized that capitalist cities are unequal, with different scenarios and antagonistic classes. In addition, a problem is created in the accelerated urbanization process of cities that were unprepared to receive new residents, resulting in the disorderly expansion of cities and affecting, above all, the working class, which, without resources or alternatives, starts to live in improvised, unsanitary housing in unsuitable areas.

At the UIS, residents also alluded to their not having an official address and that only one ZIP Code (69.317-488) is available. For that reason, all correspondence sent or received is delivered to the headquarters of ATST-RR. Maricato (2003b, p.86) clarifies that the “[...] official address is a fundamental element for the quality of life, personal satisfaction, providing people with dignity, facilitating the reception of correspondence, the search for work and the delivery of goods acquired in trade”.

In terms of mobility, only one bus from the municipal government has a route to João-de-Barro. However, the route ends at a bus stop at the entrance of the settlement. Circulation routes exist within the limits of the settlement and an exit is available via the RR-205 and BR-174 roads.

Although a part of the residents of the UIS have some type of transportation to get around, others walk a three-kilometer path to the next neighborhood, Cidade Satélite, in search of various services (employment, schools, payment facilities, among others). One resident reported that Venezuelan migrants are the ones who suffer the most from the aforementioned problem: “despite the difficulty of transportation, neighbors who have a means of transport are always helping with a ride, but Venezuelans suffer more because no one knows them, and it is hard for anyone to help.” (I6). Another resident, aged 33, mentioned: “I see many Venezuelans and Brazilians on the road, every day they follow the same route on foot or by bicycle, suffering a lot, I feel bad about it.” (I4).

Considering this distance, Monteiro and Veras (2017) warn that the construction of housing outside the limits of cities puts a burden on transport costs, makes infrastructure and urban mobility more expensive, generates traffic jams, and overloads public services.

Finally, in terms of public safety, local television newscasts and radio programs have been constantly reporting violence at that UIS, especially robberies, thefts, and violent deaths related to drug trafficking. Residents reported that a police station would be one of their priorities as they feel exposed to violence, and the lack of public safety causes constant fear. Souza et al. (2020, p.04) warn that “[...] urban violence causes irreversible damages not only in sociocultural and economic terms but mainly physical and psychological harm”.

Structural aspects of the place

From a structural point of view, the UIS is not characterized as a neighborhood, although it is perceived as such by the residents because it is close to the urban perimeter, counts with intense traffic of cars and people, and its houses are built near each other. However, people are unaware of the limits of their own settlement.

To be defined as a neighborhood, it would have to present a specific political-administrative format and limit. Lefebvre (1971, p.195-200), from the historical-social point of view, states: “The neighborhood [...] is a relative, subordinate sociological unit that does not define social reality, but which is necessary. Without neighborhoods, just like without streets, there can be agglomeration, urban fabrics, megalopolises. But there is no city.”

From the interviews with the residents, the following problems were observed in the settlement: unpaved streets, lack of basic sanitation, poor garbage collection, and public lighting not reaching the most remote houses. The provision of public services is difficult, as the only paper the residents have is a document of sale and purchase. According to Fernandes (2011, p.179), “the living conditions in informal settlements are of urban and environmental precariousness, and a portion of the population does not have legal security of tenure”.

The surveyed problems were evidenced in the field research and demonstrated in Figures 4 (Figures 4 A, B, C, D, E, and F). The photographic records represent the daily life of the residents — who are herein identified only by their initials.

Figure 4. Main problems raised in the interviews and evidenced in the field, such as A) the lack of sanitation, B) poor solid waste collection, in this case, three containers are used for waste disposal in the settlement, C and E) the difficulty of movement due to mud, D) debris in “empty” plots of land and F) clandestine electrical connections.



Pioneer resident (I6), wanted to see her street cleaned (Figure 4F). On an unexpected day, she shared the photo via social media with the researchers, saying: “other residents would throw construction debris in front of my house because the street was full of weed, but my street was cleaned today, there is still a lot of mud, but it will be great in a few more sunny days”, she says, demonstrating a feeling of satisfaction and relief for having her street cleaned.

Another problem raised by the residents regards the issues experienced during periods of drought and greater volumes of rain. During the dry season, they are subjected to dust, especially on João A. Dias Avenue, the main access road, as reported by resident and merchant (I5), who is 65 years old: “I really like the place, I chose to live here, but the problem is the dust.” Another interviewee (I7), a

52-year-old man, agrees: “this is a good place, I have my own business, but there is a lot of dust, I wish it gets paved soon because I have lived like this for years.” He added, “when it’s sunny, we suffer from dust, and when it rains, it’s all mud.”

In the rainy season, residents suffer from flooding and mud, causing greater risks, as shown in Figure 4C, in which a resident lost control of the vehicle and fell into a hole because of the mud. Therefore, the UIS was characterized as an area of rural-urban transition (Miranda 2009), in which residents are included in a portion of the population deprived of access to urbanization and basic conditions for citizenship, meaning they are in conditions of social vulnerability.

This transition between strictly rural spaces and urban areas (peri-urban areas) denotes a urban-rural interconnection arising in the urbanization process, as the settlement process is influenced by the urban aspect of the city and vice-versa. Discussions about the phenomenon must consider the local reality, the daily life of the residents, as well as the particularities of the Amazon region, in order to broaden the debate around peri-urbanity, and thus to “update ‘spatial’ public policies and specific policies for peri-urban spaces in the Amazon” (Rebello 2019, p.18).

In response to questions about the formal document of the plot of land and their knowledge about the irregularity of the area, the residents replied that the only document they have is that of sale and purchase, and, during the first years in the settlement, they were not aware of the area being irregular. Today, they understand this issue as the main factor that hinders the provision of public services.

For that reason, it is expensive to live in informality, as is the case at the João-de-Barro UIS, since residents have to pay abusive prices to access improvised services, with increasingly higher prices to live in poor conditions (Fernandes 2011).

As an example, among other negative factors, there is the issue of public lighting in the UIS (Figure 4F): during the first ten years of the settlement process, it was non-existent. In 2019 and 2020 (Boa Vista 2019) public lighting was installed in stages, but not all parts of the settlement are currently provided with the service.

One person (I5) explained that he was one of the most active residents on the issue of electricity and that the problem of energy is old: “politicians promised energy and water, but they did not deliver. The first project, Calha Norte, had failed [...]. We got together and bought an energy transformer that, at the time, would cost approximately 16 thousand reais, but CERR (the Energy Company of Roraima), currently Roraima Energia, was constantly cutting [electricity] out”.

The state of the art revealed a moment of crisis imposed by the current capitalist system, in which the residents of João-de-Barro are part of the socially vulnerable majority but still a disadvantaged social class. The place also presents aspects of socio-spatial segregation, a process that “fragments social classes in different spaces of the city, marked by unsafety, violence, poor housing, a lack of infrastructure, and access to basic services and leisure” (Cavalcanti and Araújo 2017, p.1).

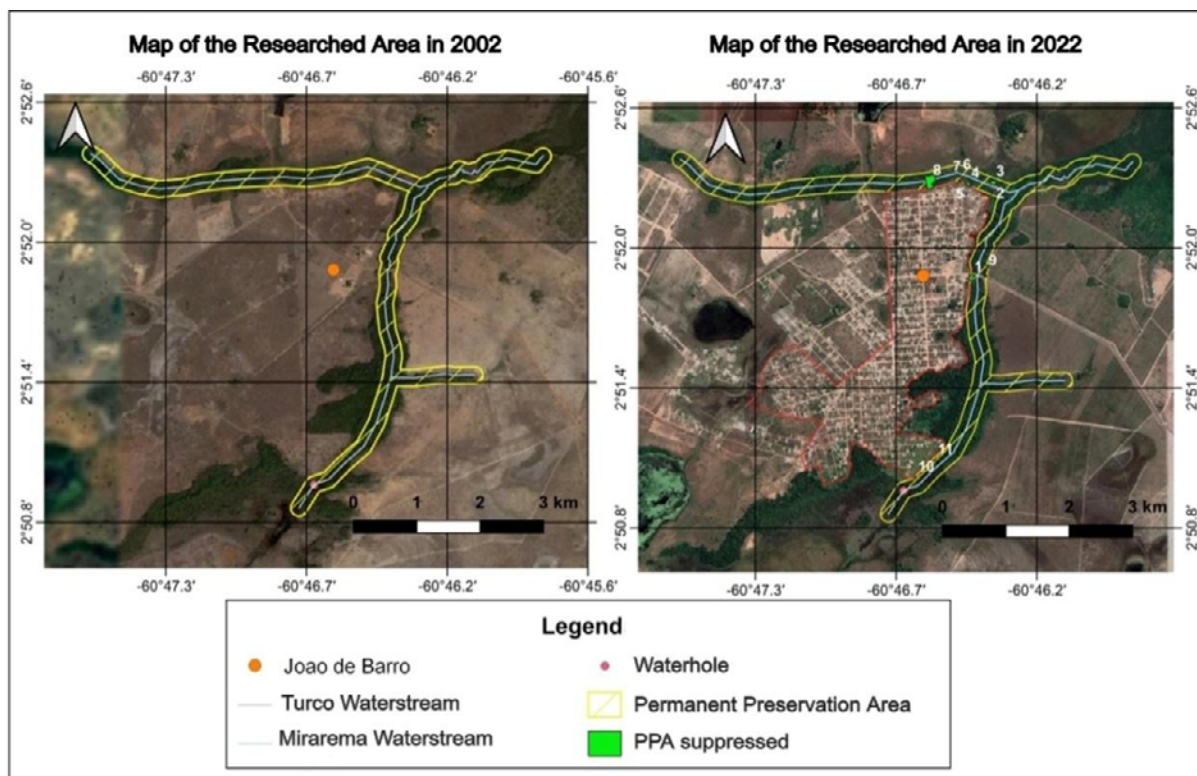
Environmental Aspects

It is known that economically disadvantaged people tend to inhabit territories subject to greater environmental risks. This means the residents of João-de-Barro are part of a socially vulnerable class and are living in a scenario of environmental injustice, subject to environmental risks. In this context, there is a correlation between poverty indicators and the occurrence of diseases associated with the absence of sanitation and with pollution due to water scarcity (Acsegrad 2002; Acsegrad 2010).

In the case of this UIS, the scarcity of water draws special attention. The water consumed by the residents comes from rustic water wells popularly known as Amazon wells. In this process, the water can be removed with the aid of a pump, which according to the residents has low costs, as not everyone can afford the costs of an artesian well. Others, alone or in groups, build artesian wells and share among themselves, an act that constitutes the value of solidarity, which for Morin (2015) is an essential aspect of social organization.

The relationship between residents and the environment takes place on the banks of the Turco and Mirarema streams. As can be seen in Figure 5, these watercourses are perennial and intermittent, about 10 km long. The size of the Permanent Preservation Areas (PPAs) in 2002 and 2020 was calculated, and the areas have suffered a reduction of 1.21 ha from the original 97.26 ha.

Figure 5. Delimitation of the study area referring to 2002, showing the Boa Esperança farm, the PPAs — measuring 97.26 ha—, and to 2020, with the reduction of 1.21 ha.



According to Law 12,651 of May 25, 2012, art. 3, item II, which provides for the protection of native vegetation: A Permanent Preservation Area is the “protected area, covered or not by native vegetation, with the environmental function of preserving water resources, the landscape, geological stability, and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil, and ensuring the well-being of human populations”.

The parameters determined by this law follow linearly from 30 (thirty) to 500 (five hundred) meters, taking into account the width of the watercourse of less than 10 (ten) meters or greater than 600 (six hundred) meters and accounted for “from the edge of the regular riverbed” (Brasil 2012, art. 4). Considering the streams are 30-meter wide, the width of the protection range should be 50 meters.

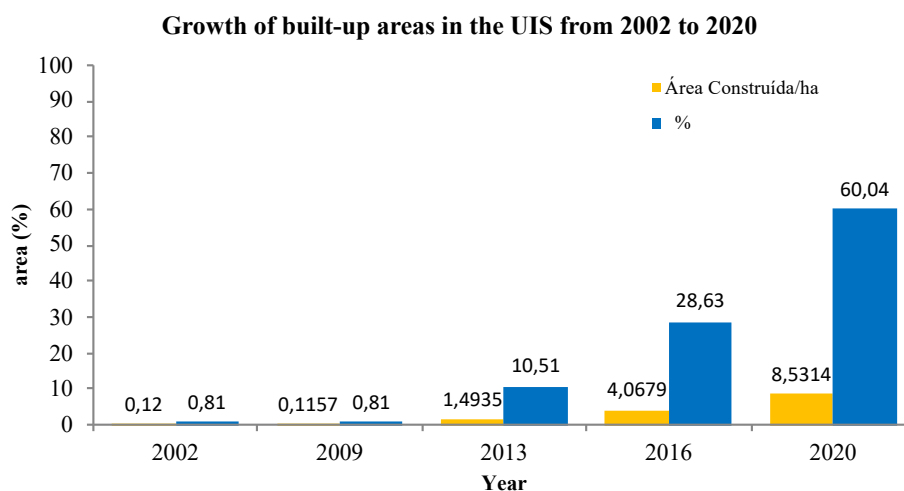
The delimitation of the PPA was based on Law 12,651/2012 and refers to the years 2002 and 2022 (Law No. 4.771/1965, effective as of 2002, provided for the same parameters in that regard). A waterhole can be found in the area, as shown in Figure 5. Areas 1 to 11 were suppressed in João-de-Barro during the occupation, as demonstrated in the 2022 map.

From the documentary research, it was possible to identify an environmental infraction resulting from the removal of native vegetation in PPAs aiming to build streets and carry out other works using environmental resources, done by the ATST and the Brazilian Cooperative for Multiple Health Services (COOPEBRAS), in an area of 29.87 ha and 0.29 ha, respectively (Roraima 2015).

The author Maricato (2003a) states that illegal allotments or settlements on irregularly occupied land are a common practice in popular initiatives, seen as a solidarity movement. In the case of the settlement under study, people have conserved the PPAs, since less than 2% of their total area was degraded.

Environmental degradation in the UIS was intensified in 2016 with the accentuated settlement dynamics and an increase in built-up areas in the settlement, as shown in Figure 6 (Chart 1). One of the factors may have been the phenomenon of migration, especially into Northern Brazil and mainly into Boa Vista. The city is the main destination for migrants from neighboring countries, especially Venezuela, starting in 2015 (Roig 2018). And, as seen on the field, Venezuelan immigrants are living in rented houses and/or improvised shacks.

Figure 6. Increase in built-up areas from 2013, showing the beginning of the informal settlement process, and 2016, with the accentuated advance of migration (mainly Venezuelan) in the settlement.



Given this context, it is noteworthy that, in this UIS, problems related to environmental and/or urban health conditions, along with the lack of adequate infrastructure and basic sanitation, are expressive factors, decisive for the emergence of infectious diseases such as dengue, zika-virus, malaria, and others (Almeida et al. 2020).

In that regard, environmental justice “is, therefore, an emerging notion that integrates the historical process of subjective construction of a culture of rights” (Acsehrad 2010, p.09). Also, promoting environmental justice at João-de-Barro from the perspective of inclusiveness allows the integration between environmental and social dimensions and development, whereas these three aspects are linked in both discourse and practice, aiming at sustainability (Corte and Portanova 2015).

The discussion around the notion of environmental justice helps understand the violations of human rights to which the residents of the UIS are subjected. These rights are violated by the absence of public housing policies allied to social and environmental vulnerability, as basic principles of the reproduction of life are not observed (Acsehrad 2009).

Relations and interactions

Faced with a new paradigmatic vision that requires thinking in an integrated and joint way, complexity is addressed based on the daily life of people at work and in society, like a social organization, in which every person collaborates with the whole. Therefore, in the researched settlement, each resident is a subject of productions and reproductions through everyday life and life together, establishing social relations and interactions (Morin 2015).

The allotment is also in a constant flux of order/disorder/interaction/organization, whereas all of these aspects are interdependent. The process begins with the disorder in which the allotment is currently found, primarily due to a territorial issue: residents say the place is an allotment, but they also call it a neighborhood. This is the first novelty of complex thinking, in which disorder cannot be denied. However, it is necessary to think of it as the cause of opportunities or possibilities.

In this sense, to think about disorder is to experience a social, territorial, and environmental contrast. At this moment, interactions, or social relations, come into play, despite all the troubles experienced by residents, who seek to solve their problems through formal and informal meetings, often with divergent ideas but with a common goal.

Although the UIS is a multifunctional space (Miranda 2009), there is a tendency to concentrate consumer goods trade in a “downtown” area where a greater flow of people and social relations consequently arise.

The new dynamics of space production in the capitalist production mode require a new organization, able to serve the population. The phenomena in which commercial points disperse and scatter have determined that “downtowns” are the holders of commercial centrality, both for their historical significance and for their proximity to goods and services. However, this has lost strength with the emergence of new neighborhoods (Veras 2009).

In this aspect, the UIS and the closest neighborhood, Cidade Satélite, are related. Residents go from the UIS to this neighborhood to access public services, as mentioned above.

According to the Brazilian Institute of Geography and Statistics — IBGE (2010), Cidade Satélite originated from an official allotment with housing projects within the Minha Casa Minha Vida program by the Federal Government. However, the local government of the city of Boa Vista has been experiencing a process of contradiction. On the one hand, some neighborhoods were planned with infrastructure, with paved streets and new trees; on the other hand, one can see clusters of people in unpaved neighborhoods without infrastructure, as is the case of João-de-Barro, among other places.

And to compensate for the lack of public policies in the UIS, existing social movements in the neighborhood, such as the Neighborhood Association and ATST-RR, have been organizing events with the aim of providing assistance in various segments. The social organization in the settlement reflects the solidarity found in the exchange and share of work materials, objects, and consumer goods, such as water and electricity.

However, the current capitalist production mode is also responsible for environmental contamination through the degradation of soil, water, and air (Harvey 2014). In an attempt to reconcile human beings and nature, socio-environmental standpoints seek the relationship between inclusive development and environmental conservation (Acsegrad 2010).

Conclusions

The socio-environmental relations and interactions of the people who live in the João-de-Barro Urban Informal Settlement were revealed through elements of a social organization established spontaneously, sometimes in order, sometimes in disorder, and comprised by a network of relationships, in the form of social groups represented by social movements that fought for a common goal: the access to housing.

The organization dynamics reveal the reflection of the current capitalist production mode, which is profit-oriented. The urban space is seen as a commodity, causing fragmentation, inequality, and social and environmental injustices that serve a dominant class. In this context, people who are unable to occupy the so-called privileged spaces found a way to circumvent the crisis experienced at the time.

The João-de-Barro UIS was the result of an informal settlement process, as it did not follow the legal procedures for the implementation of a formal settlement. It was rather idealized by a social movement originated in the Boa Esperança farm. The study revealed social, ethnic, and racial diversity.

The research demonstrated how the irregular settlement process led to it becoming an Urban Informal Settlement, shedding light on the concept and its usage in Boa Vista, far from exhausting the discussion. It is considered a settlement because many people live there; it is informal because they do not have essential services such as basic sanitation, infrastructure, quality electricity, among other aspects mentioned throughout the study; and it is urban because, even if it is not in the urban perimeter and is classified as 'rural' by competent authorities, the logic underlying its social relations, work, and interactions is that of an urban place.

Regarding the total area of the João-de-Barro AEIS, the limits were different for areas I, II, III, and VI, and the new measurements also differed from the previous ones. Maps or cartographies of the aforementioned AEIS were not publicized by the authorities researched and could not be found in any other location within our scope. For that reason, the design of the map was based only on a floor plan shared by ATST/RR.

Concerning the problems experienced at the UIS, measures are necessary for the provision of basic services, including basic sanitation, infrastructure, and quality electrical power for all. Because the settlement's population has grown in recent years, it should be ready to meet the needs of the new residents.

The settlement contributes to local environmental degradation, beginning with its installation on a peri-urban fringe of Boa Vista-RR, evidenced by irregular waste disposal, soil and groundwater pollution, and other socio-environmental problems. In this context, the relevance of the phenomenon of peri-urbanism in the elaboration of 'spatial' public policies is highlighted. Actions on this matter should include the promotion of environmental awareness of residents, environmental knowledge, and environmental conservation to achieve sustainability in the João-de-Barro settlement.

Acknowledgments

We are grateful to the residents of João-de-Barro, their associations, the Minotto family, and the public authorities for the information provided. We would like to express gratitude to the Coordination for the Improvement of Higher Education Personnel (CAPES) for granting a master's scholarship for the main author to carry out the research. Also, thanks to the Natural Resources Postgraduate Program at the Federal University of Roraima/PRONAT-UFRR.

Authors' contributions: FCS, MADM, MRM, CMR – collected and analysed the data and wrote the manuscript; MTF, MJAP – coordinated the field work and the writing of the manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards and other licences: this article is the result of the research project approved on August 17, 2020, by the Committee for Ethics in Research with Human Beings, in compliance with Resolution No.: 510/2016 of CNS/MS, with CAAE No.: 30545420.9.0000.5302, and legal opinion No.: 4.217.289.

Data availability: the data are part of the Master's thesis of the first author. The thesis is available in the University (UFRR/PRONAT): <https://ufrr.br/pronat/banco-de-dissertacoes>

Funding information: this work was supported by CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior). The authors would like to thank the Institutional Program for Research Support for supporting scientific journals and the Graduate Program at the Federal University of Roraima PROPESQUISA/PRPPG-UFRR.

Conflict of interests: the authors declare that they have no conflict of interest.

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