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Participatory Mapping as a Tool for Social Justice and Mobilization in Brazilian Informal Settlements

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Abstract

Participatory mapping's main aim is to represent the community's voice. It stimulates a powerful social mobilization that provides support for better and more efficient urban policies and social inclusion of marginalized populations, especially in Global South countries, such as Brazil. Our main urban challenges, such as poverty, inequality, and social injustice, are aggravated by climate change. The marginalized populations are often excluded from the decision-making process for planning our cities, which creates a mismatch between urban planning and the real demands of citizens. This article assesses how participatory mapping in informal settlements in Brazil can help to collect data from citizens that can make a difference in better local urban planning through prioritizing their demands and bringing to light their real concerns. Also, this article seeks to show how participatory mapping can provide products that improve communication between stakeholders and society reinforcing the need for urban planning improvements. Three case studies are presented, developed in São Paulo and Guarulhos informal settlements, with citizens' perceptions about their urban life conditions, highlighting inequalities such as environmental racism, gendered perspectives, and social injustice, as well as potential solutions and specific areas for interventions. The three study cases provided citizens a space to speak and to be heard, to identify problems and concerns in a deprived environment through community mapping and look for solutions and alternatives for better urban scenarios together. Also, this article highlights the importance of the development of an urban agenda, putting the periphery in the center of the decision-making process through participatory mapping and communication products development.

Keywords

Brazil; informal settlements; participatory mapping; social mobilization; urban planning

1. Introduction

Cities are facing increasingly complex and interconnected challenges, with serious environmental, social, and economic consequences that affect the health and well-being of citizens. The climate emergency and its impacts, as well as the challenges of poverty and inequality in cities of the Global South, are examples that burden cities, especially peripheral areas. São Paulo is the largest city of Latin America (located in the state of São Paulo), with more than 16 million inhabitants and 950 km² of urban area, and is part of the Metropolitan Region of São Paulo, connecting and exchanging resources and also socioenvironmental impacts with other bordering municipalities (Zimmermann et al., 2023). The city's socio-spatial dynamics are characterized by intense migration and inequality, spatial segregation, and uneven development, connected to environmental issues such as air and water pollution, lack of access to water and energy, and others due to fast and unplanned urbanization. The urbanization and economic investments weren't followed by suitable infrastructure planning, resulting in areas with more investments and infrastructure and areas with less (the peripheral areas). Urban–rural migration dynamics also contributed to population growth and the consequence is an expansion of peripheral areas and informal settlements which brings less resilience and more vulnerability to cities and citizens (Pasternak & Bogus, 2004; Prefeitura de São Paulo, n.d.).

The precarious conditions of peripheral areas, coupled with geographic exclusion, unemployment, and limited access to education and healthcare, further impact the lives of residents. To tackle these challenges, it is necessary to focus on understanding the citizens and the territory. According to Santos (2005), territory is not only the geographic space but also the actions and experiences that citizens have there. Analyzing urban territories helps us understand how people live, which is essential for developing fairer communities and creating better futures with suitable resources. To this end, specific participatory methods are required, such as participatory mapping. This article describes the application of participatory mapping in three informal settlements located in southeast Brazil and how the mapping process and products helped the community to show its voice and its demands in different ways that can support a more inclusive city planning. Also, this article seeks to highlight how participatory mapping can contribute, shape, and improve communication between social actors towards better communities, prioritizing peripheral areas. These case studies were selected because they were developed in different informal settlements in São Paulo state and on different time scales and produced diverse and impactful communication products that can show the citizens' demands/priorities and support better planning when considered by urban planners.

Participatory mapping can be seen as a vehicle for community communication. For example, Albagli and Iwama (2022) mobilised communities as protagonists in mapping and managing the risks of floods and landslides resulting from the impacts of climate change by combining social cartography and participatory geographic information systems. Akbar (2021) also describes case studies with innovative approaches, such as collaborative spatial learning, to strengthen public participation practices towards the SDGs and sustainability in Indonesia, among other examples that will be described further in this article. Moreover, these and other researchers corroborate that the primary goal of participatory communication methods (such as participatory mapping) is to support the expression of local people's knowledge, needs, priorities, and decisions through effective participatory and communication processes (International Fund for Agricultural Development, 2010). The mapping process, for instance, can facilitate communication between community members and other stakeholders (such as city planners) through the process itself and through co-created products that could range from articles, reports, booklets, videos, and flyers to presentations in

city events, websites, documentaries, and social media posts. These products help to educate the wider society towards community planning and can better connect citizens with other social actors involved in the planning.

2. Theoretical Framework

2.1. Peripherical Areas and Social Exclusion

Unplanned urbanization and the consequent increase in pressure on cities to accommodate new citizens through migration processes result in the expansion of peripheral areas and overloads in the urban dynamics, for example, transportation, jobs, basic resources availability, and basic infrastructure (Venter et al., 2021). In the São Paulo metropolitan area, the current urban challenges (disasters, poverty, vulnerability) are increased by the climate change impacts and threaten citizens' health and wellbeing, especially those living in peripheral areas. The city's social, economic, and environmental conditions impact the lives of all citizens but place an even greater burden on these areas that suffer most from environmental degradation and accelerated urbanization that increasingly exacerbates inequalities and segregation, and impacts on health and well-being (Vindigni et al., 2021). The precarious conditions of the periphery, coupled with issues of geographic and social exclusion, unemployment, and limited access to education and healthcare, profoundly affect the lives of residents for years, as Baptista and Santos (2022) state. For example, pollution, the negative environmental impacts of industries, high population density, the presence of high-risk areas, mobility difficulties, improper waste disposal, and violence lead to increased stress, anxiety, illness, and premature death. This is also known as "environmental racism," which is most prevalent in urban peripheries. These regions have higher percentages of ethnic and racial minorities, who suffer more from precariousness, poverty, lack of resources, exclusion, disasters, and the impacts of these factors on their lives (Baptista & Santos, 2022). The concept of environmental racism was shaped by professors Benjamin Chavis and Robert Bullard through research that showed that peripheral neighborhoods, where poorer people and also those belonging to ethnic and racialized populations live, were the neighborhoods that suffered most from environmental degradation and climate change impacts, and its consequences on health and daily life (such as landslides, floods, pollution and contamination of sites, inadequate waste disposal and diseases, and the absence or inefficiency of policies for local development; Ioris, 2009). Peripheral populations are usually excluded from the planning process and decision-making due to geographical exclusion, power imbalances, and structural barriers that lead to a lack of representation. Because of that, citizens live in risky areas, many of them unaware of it, and hundreds of families endure a lack of access to basic resources such as energy, water, or fresh and nutritious food. A just and inclusive urban planning requires citizens' needs as a reference and urban planning should count on specific methods to collect these insights. According to the City Statute in Brazil (Presidência da República, 2001), social participation is an essential condition for just urban planning. To this end, it is necessary to create and employ social participation methods to integrate citizens' knowledge into planning. There are several participatory instruments, and among them, participatory mapping stands out for specific reasons (described later in this article) and connects with community communication—a concept that encompasses all the ways a group of people, connected by a shared location (the urban territory), interact, co-create, and share information through dynamic and participatory methods. According to the United Nations Refugee Agency (n.d.): "Listening and talking to communities is a fundamental part of humanitarian response." The application of such participatory methods is an urgent need.

2.2. Participatory Mapping and Social Mobilization for a More Inclusive Urban Planning

Social mobilization refers to the process of bringing together various stakeholders, including community members, organizations, and government agencies, to work towards common goals (Dunu et al., 2015). In vulnerable peripheries, social mobilization can be a powerful tool for advocating for resources, implementing community-driven projects, and fostering resilience, building cities in a better way for everyone (Carvalho & Jacobi, 2023). Social mobilization involves various methodologies to engage and empower communities, and some key methodologies can be implemented together with the participatory mapping, as described in the study cases, for example:

- Workshops for community map development: These are organized to bring community members together to discuss issues, share ideas, and plan collective actions by developing a participatory map. These gatherings foster a sense of belonging and collaboration to improve local conditions based on citizens' demands.
- Focus group discussions: These are structured conversations with a small group of people to gather in-depth insights on specific topics, and it helps to understand community perceptions and practices besides the co-production of local knowledge.
- Advocacy based on developed participatory products: Mobilizing communities to advocate for their rights and needs through publications, campaigns, and developed community products such as participatory maps, for example. This can influence policy changes (Jordan et al., 2011).
- Capacity building and training: Providing training and resources to community members and urban planners to improve their skills and knowledge in urban development. This empowers the community to take on leadership roles and sustain mobilization efforts previously started. Also, to maintain continuity, to train a few residents to keep mapping and monitoring, ensures that.
- Use of media and communication tools: Leveraging traditional and digital media to disseminate information, raise awareness, and mobilize support. This can include radio programs, social media, websites/blogposts, community newsletters, among other products (Tarcia et al., 2023).
- Partnerships to develop all the above activities: Building alliances with other organizations (e.g., community associations), NGOs, government agencies, and stakeholders to strengthen mobilization efforts, including in the product's development and dissemination.

These methodologies are often used in combination to improve the level of participation, which creates a comprehensive and effective social mobilization strategy that improves the development of communication products and outcomes. According to Arnstein (1969), there are several progressive levels of participation that participatory mapping can help to implement, from tokenism to citizen power, depending on the depth of the process. Participatory mapping aims to engage citizens by creating maps that represent their perspectives, views, and experiences related to a specific territory, promoting an increase on the participation level, from simple consultation to co-creation of knowledge and empowerment. These maps give citizens a voice, serving as vehicles for communicating demands and needs, and can support more efficient urban planning focused on people's well-being. Therefore, it is a method that can help leverage the development of peripheral urban areas and neglected social groups, giving them better levels of participation in the planning and providing them with power (Carvalho et al., 2021; Denwood et al., 2022). Also, participatory mapping and community communication are interconnected processes that empower communities to visualize and share their local knowledge, fostering better planning and development

outcomes. Participatory mapping involves community members collaboratively stimulating community communication by creating maps that reflect their understanding of the area, while communication ensures the results are effectively shared and used for decision-making (McCall, 2003). However, facilitators should be careful with the level of their control over the process, risking the integrity of co-created knowledge by the community only. Also, the appropriate mapping tool should be selected according to the territorial context and citizens' preferences (Laituri et al., 2023).

As mentioned, in peripheral areas and informal settlements, citizens are usually excluded from the decision-making or planning process. Therefore, the planning of the cities must contain ways to include these population demands and perspectives into the development. When we use participatory approaches (and mapping), we are including these populations, highlighting their right to the city and how these people have this right severely violated by being excluded. The "right to the city" is a concept developed by Henri Lefebvre in 1968 and has inspired social movements advocating for the right of all urban dwellers to access, use, and enjoy urban spaces regardless of income, class, or gender. Therefore, these participatory approaches can support the improvement of this perspective for all citizens, promoting the rights of the city. Participatory approaches are essential for enacting the "right to the city," especially through spatial knowledge and knowledge co-production, by empowering citizens to diagnose, shape their urban environment, and have a say in decisions that deeply affect their lives (Ebrahimi et al., 2022). To achieve that, participatory approaches should be used, which allows citizens not only to understand the built environment but also to be part of the decision-making process.

Participatory mapping consists of several tools capable of capturing citizens' perceptions. The result is a map that represents the knowledge of this community. Researchers and city planners can spatialize this information and analyze it with other information using geoprocessing software. In other words, it is possible to have peripheral citizens map their own territory, identifying what types of problems occur and where, and cross-referencing this information with existing information, enriching the urban territorial knowledge. This makes it possible to highlight the inequalities and impacts that residents experience in their daily lives, in addition to developing more informed proposals and alternatives to overcome local problems in a more efficient way (McCall, 2003; Rainforest Foundation, n.d.). The use of participatory mapping has supported marginalized communities and groups in recognizing their territories and demands, and has resulted in an important instrument of empowerment for social transformations and the construction of better public policies (Carvalho & Jacobi, 2023), helping to identify and prioritize the main demands of peripheral urban areas, legitimizing these needs and being, therefore, an invaluable element to be considered in the urban planning (Gutiérrez-Ujaque & Jeyasingham, 2022). Our cities represent the power relations that reside within them; therefore, when citizens, especially those marginalized, have a voice through efficient means of communication, this entire process can modify and improve such power relations with better outcomes for all (Bassam, 2021).

To illustrate how this method can bring up citizen knowledge, putting excluded populations on the map, the project MapKibera represents this importance. Developed by local young people, the project involved a community digital mapping production showing main issues in the area, such as the lack of water, schools, sewage, and other essential elements and resources. The maps help the local population to manage local crises (e.g., flooding episodes, lack of access to basic rerources or how to manage local waste) and serve as advocacy material to demand basic rights. More information about the project can be found here: https://en.reset.org/map-kibera-the-digital-project-putting-nairobis-slums-on-the-map (Maina, 2025).

2.3. Participatory Mapping to Improve Communication With Society and Planners

Adedokun et al. (2010) state that community development is the process of supporting a community to grow and is done by community engagement. To include citizens in this process, it's necessary to communicate in several ways: to disseminate the importance of the local development for citizens, to mobilize, define priorities, and co-create products for outreach and advocacy. There are several methods that can serve this purpose, and participatory mapping is one of them. According to Bustillos Ardaya et al. (2019), participatory mapping can facilitate communication and social learning, creating reliable material for decisions. Moreover, participatory mapping acts as a powerful tool for social learning. As individuals work together, they exchange information and learn from each other's experiences, building a collective understanding of the issues affecting their community. The maps and data generated through participatory mapping are grounded in local knowledge, making them reliable and relevant resources for decision-making. These materials provide planners, policymakers, and other stakeholders with accurate, context-specific information that can inform the development of targeted interventions and policies. Also, information that is collected through the participatory mapping process is best communicated in a manner that acknowledges the central role of community members. Participatory communication seeks to apply local people's knowledge to promote social change, rooted in dialogue and in the sharing of this knowledge among social actors, and facilitates their empowerment and the exploration and co-creation of new knowledge aimed at addressing situations that need to be improved in the peripheral urban areas. Participatory communication can be used at any level of decision-making (local, national, international) regardless of the diversity of groups involved, with adequate adjustments in the selected tools (McCall, 2003; Kutto, 2014; International Fund for Agricultural Development, 2010).

For example, the collaborative processes described in Wild et al. (2021) enabled the researchers to identify key challenges and solutions in communicating health information throughout the Covid-19 pandemic. Partnering with communities can reduce inequalities in healthcare communication by enabling the development of better strategies for this purpose. This collaboration with the studied communities and the understanding of the cultural context ensures health-related messages are delivered correctly. This approach can be applied to community/urban planning as well.

Participatory mapping can also be a tool for communication and social change for marginalized social groups (Cochrane & Corbett, 2018). For example, it is an effective tool to be applied to marginalized women in gender studies. To meet the demands of specific groups like women, it's first necessary to understand how these challenges impact their lives, whether it's on their physical or mental health, access to education, and/or employment opportunities. Suitable communication channels with marginalized groups are the key (Carvalho & Jacobi, 2023). Finally, participatory mapping can produce a variety of products that help to visualize and communicate community insights and data, such as the community and thematic maps that highlight important features, resources, and issues within their neighborhoods, under specific topics. They can include landmarks, infrastructure, environmental hazards, and areas of social significance for citizens. Thematic maps focus on specific themes such as health, education, transportation, housing, or others. They help to identify and analyze patterns and trends related to these themes within the community and with the input of citizens. Another example is the story maps, a tool that combines geographic data with multimedia elements such as photos, videos, and narratives. They help to tell the stories of the community and provide a rich, contextual understanding of local issues. These main products serve as valuable tools for

communication, territory planning, and advocacy, helping to ensure that urban policies and interventions are aligned with the needs and priorities of the community (Brown & Kyttä, 2018). It's also possible to combine mapping techniques and other participatory approaches (e.g., focus groups) to boost the social engagement and data collection (Carvalho et al., 2021).

3. Case Studies and Methods

3.1. Guarulhos, São Paulo

Guarulhos City was rapidly urbanised with several social and environmental challenges impacting citizens lives (Atlas do Desenvolvimento Humano no Brasil, n.d.). Novo Recreio, an informal settlement located in Guarulhos, has developed from a land subdivision and always had a history of a lack of basic resources. The neighborhood has been served by initiatives, mainly through institutions such as the Clube de Mães Novo Recreio (a local partner NGO), which worked on social assistance and education projects for the local people. Brasilandia, also a case study to be presented in this article, is an informal settlement located in São Paulo city, with a similar origin, being previously rural and transformed into plots of land mostly occupied by northeastern migrants (Prefeitura de São Paulo, n.d.).

This case study was conducted in the Novo Recreio neighborhood, Guarulhos city, São Paulo state (Brazil), located in a region of mountains prone to erosion and landslides, characterising an area of environmental and social risk. Novo Recreio also lacks basic infrastructure such as access to energy, water, and fresh food, putting citizens into great vulnerability (Giatti et al., 2019).

Figure 1. Novo Recreio community.

The participatory activities took place over four months at the NGO Clube de Mães, in 2017, which serves families in the neighborhood and is well-reported in this article (Carvalho et al., 2021). The main goal was to teach participatory mapping basic skills to young people to stimulate a territorial diagnosis through dialogue and the mapping itself to bring information that is not usually accessed. Having this information is crucial

for a better local urban development when this information is correctly presented and communicated to city planners and society. The project began with a presentation for the participants (14–17 years old) focusing on the participatory mapping concept and urban health, and implications in their local context. The main objective was to provide participants with a better understanding of their surroundings and to build knowledge about the importance of mapping the main issues they face in the territory. During the activities, in addition to participatory mapping, other activities were implemented, such as an integrated panel and a community newspaper, to complement the information collected through the mapping since a mixed methods approach is important to collect different aspects of citizens' information. While mapping allows us to geolocate main issues related to the territory, other participatory approaches support the collection of qualitative data that helps to produce a better local narrative. The so-called geonarratives support the acknowledgement of citizens' needs through the participatory maps (Palis, 2023), being therefore a communication outcome.

Regarding the participatory mapping application, sketch maps and scale maps were created to build a territorial diagnosis first. Sketch maps are known as mobilization tools and provide an initial diagnosis of the main environmental and sustainability problems faced. They also enable the participants to think about planning and the future of the region (Toledo et al., 2009). They were drawn by participants and include the main elements of the area, such as streets, houses, and where main issues are located, approximately. The next step was a more curated mapping (with geolocalized points) that can be done using online platforms or paper/pens. In this case, mapping was developed with paper and pen, and participants using pens could allocate on the printed map the main issues discussed in the sketch map phase.

The mapping focus was on social and environmental indicators of urban quality, such as mobility, access to water, energy, and fresh food, waste management, and locations prone to floods and landslides. Once a local diagnosis was obtained, an online platform (Maptionnaire) was used to build a future scenario with proposals

Figure 2. Sketch maps development during the collaborative process implemented in Novo Recreio in 2017.

for local improvements, such as more suitable locations for markets and community gardens, and locations for implementing leisure areas, among other ideas. The Maptionnaire platform was chosen with the intention of bringing one more mapping tool for the participants, aiming to engage them in planning the community's future using an online tool.

During the four to six months of participatory meetings and mapping, the participants went from knowing only basic elements of the territory or knowing the territory where they live but lacking awareness of local dynamics to a state of co-creation of knowledge and opinions, as well as considering and developing proposals for the future. Thus, it can be said that the participatory process promoted this change in state and, over time, produced significant social awareness and opportunities/plans for future mobilization (Carvalho et al., 2021).

Results were presented at two public meetings in local institutions that took place in Guarulhos in 2017 and 2018. The young participants enjoyed being part of a planning discussion about their community and managers also enjoyed the experience of listening to them and discovering their proposals. They were also proud of their maps and how they showed their urban reality. This process also allowed the connection among participants and other social actors.

After the participatory processes had been applied, the material produced was disseminated to the community and to Guarulhos society through workshops, articles, and other publications, such as blog posts on the project website and social media. A booklet was produced, containing the research experience and guidelines for replication in other communities (Carvalho et al., 2019).

3.2. Paraisopolis, São Paulo

Paraisopolis, the second largest informal settlement of São Paulo, also evolved from rural areas and farms and has a strong sense of community (observed when the Covid19 pandemic hit and medical assistance wasn't enough) associated with a lack of basic infrastructure. Volunteers took action to form a committee "against the virus," delivering food, masks, and disseminating information about the disease to help decrease contamination. This initiative was shown in several media articles around the country (Prefeitura de São Paulo, n.d.).

In the case of Paraisópolis, the participatory process, with sketch mapping and printed maps, was part of a Master's dissertation (Santos & Toledo, 2020) that applied action research (Toledo & Giatti, 2015) to better understand the community needs from the perspective of community health agents (CHAs). The mapping activity was chosen because it was considered a powerful tool to support the visualization of local socioenvironmental issues connected to citizens' health and was conducted in three in-person meetings with CHAs from the local basic health unit. This project was also reported in detail in the publication of Toledo et al. (2021). The main objective of mapping was to engage with the CHAs, considering the positive and negative determinants of health in the neighborhood (Santos & Toledo, 2020).

During the three meetings, when the CHAs were working in groups, two maps were produced: one showing elements of the neighborhood that have the potential to improve residents' quality of life and could be used to mobilize the community and inform fairer local urban planning; and another showing elements that negatively impact citizens' health, such as precarious sewage, waste, pollution, flooding risks, housing conditions, and others. This final map served as a local diagnosis and, ideally, should be distributed to the

community to promote greater mobilization. Thus, participatory activities promote greater territorial knowledge which allows for greater mobilization toward citizens' needs. Furthermore, this project was developed with female community agents, and therefore, the mapping approach gained a gender perspective, focusing on the well-being and care of local families. Toledo et al. (2021) concluded that participatory mapping, when applied to women's groups, can serve the purpose of mobilizing the female community and including it in local planning. In this case, it's important to highlight the engagement of health professionals in the development of territorial knowledge in peripheral areas and how this participation can improve communication and provide better community conditions for everyone. Bezerra and Feitosa (2018) also applied the affective maps method as a work tool with CHAs to better understand the territory and improve their work with local families, showing that co-production of knowledge through mapping and publications can support the development of proposals to be connected to policies and planning in the future.

3.3. Brasilandia, São Paulo

Brasilandia has 41 neighborhoods in total, also developed from previous farms and migration dynamics, and it's not considered only one informal settlement but a district with several informal settlements within, lacking basic infrastructure and services (Prefeitura de São Paulo, n.d.). In the Brasilandia community, as part of the event "Dialogues on Socio-Environmental Inequalities: Parallels Between Injustice and Environmental Racism (Brazil–United States)" (promoted by IEE/EACH/USP, Instituto Polis and Instituto Perifa Sustentavel), participatory mapping was applied to a group of participants during a three-hour meeting. The goal of this activity was to engage residents in discussions about the main social and environmental issues they face in their daily lives in the neighborhood. Rather than highlighting problems, they were asked about solutions and new ideas for specific areas in the region. Thus, at this meeting, basic maps were created, also based on the participants' key statements. The maps were created manually and then digitized using the QuantumGIS software.

The meeting was attended by approximately 20 residents and began with an informal discussion group where they could speak freely about the main challenges and problems they face daily in the neighborhood. Subsequently, sketch maps were developed in groups (Figure 3), attempting to identify the problems described in the previous stage as well as proposals for solving the issues discussed. The maps were presented by the respective groups and later digitized. A final report was produced to summarize the dynamics, present the pictures of the maps, the digital map, and also summarize the main local dwellers needs, such as: lack of social projects; precarious housing; few leisure options for children and youth; violence and a sense of insecurity for everyone; poor sanitation, with irregular waste disposal; open sewage; flooding; lack of parks and urban green spaces, and those that exist are poorly maintained; poor and inaccessible transportation ("transportation is not based on reality," according to one of the participants); racism and inequality being faced daily; and social and geographical exclusion (for residents, it is necessary to commute to the city center, for better job and education opportunities). Also, the concept of invisible periphery was mentioned (many participants related a sense of invisibility regarding the city planners and even the city itself).

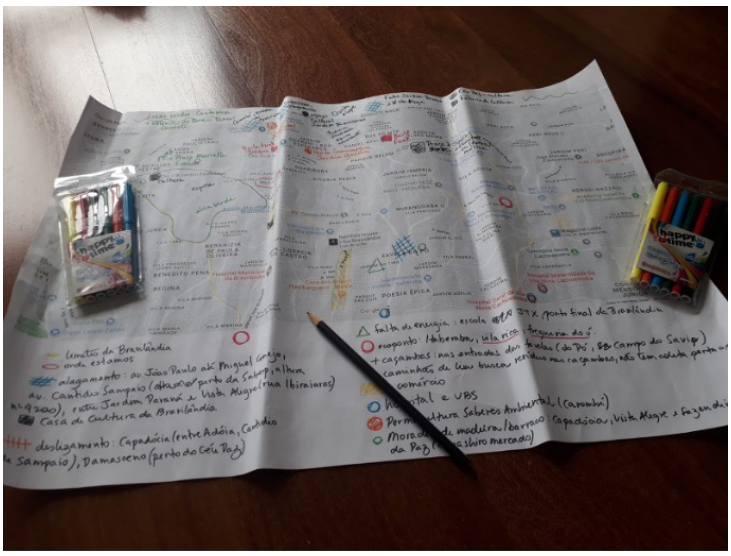

Figure 3. Sketch map produced with citizens from the Brasilandia community, focusing on local problems (sewage, landfill, precarious housing, lack of energy access, and flooding).

This report and maps were presented in public events and also made available online on social media to disseminate the case study (Medium portal from Instituto Perifa Sustentavel). This brief meeting demonstrated that peripheral residents are the most knowledgeable about the challenges of the area where they live, and participatory activities that allow their presence are the most effective means of co-creation of knowledge and of communicating their main demands and perceptions to the wider society.

4. Discussion

These case studies promoted multilevel dialogue, social mobilization and enabled the mapping of citizen perceptions, interests, and practices of marginalized citizens in different contexts and occasions. Participatory mapping allows the inclusion of marginalized groups in the dialogue of planning the community, a key factor to social justice and mobilization. The method used also promotes complete, integrated, and accurate socio-environmental analyses supporting coherence in public policies through the developed products such as maps, reports, social media, and booklets. Table 1 summarizes the case studies' outcomes and the impacts on communication within the community and throughout other stakeholders.

These outcomes are products built by the community that allow community education and fight misinformation which could trap citizens in the cycle of poverty and exclusion. One of the purposes of this article is to show that these outcomes can be connected to the educommunication concept which is the union of education (or social learning) and communication to build knowledge in a participatory way, such as the community maps (Citelli et al., 2019; Tarcia et al., 2023). For example, for Case 1, local workshops were hosted by the city hall so that the planners could learn more about the project. The presentation served as a tool for education and communication for planners; however, there is a need for more integration with urban planning and other sectoral collaborations to get, for example, an implementation of a new green area or a new school for the neighborhood (these are only examples provided by residents). Also, this article highlights the importance of community education and communication, especially in informal settlements, to focus on better urban planning and sustainable development.

Table 1. Summary of the case studies presented and outcomes connected to communication.

	Methods	Outcomes during the participatory process	Impact on communication
Case 1	Sketch maps, community mapping, community newspaper, and online mapping	New proposals for local improvements, such as community gardens, water conservation and storage, rainwater harvesting, renewable energy sources, adequate waste disposal sites, environmental education, deforestation avoidance, and immediate intervention in the mapped areas	Booklets in Portuguese and English, blog texts, scientific articles, local workshops, and lectures open to the citizens (city hall and local institutions, e.g., Serviço Social do Comércio—a local institution that provides services, culture, and education for the community)
Case 2	Sketch maps	Maps representing positive and negative factors that affect citizens' health at a local level	Scientific article for an academic audience containing a step-by-step guide to replicate this research
Case 3	Informal discussion and sketch maps	The main challenges were represented in a previously printed map; proposals were discussed and also included in the map when possible	A report, blog posts, and a presentation at one public event

The mix of different participatory approaches facilitates the definition of proposals for the neighborhood, which are not restricted to the studied location but can also impact municipal policies. Based on the products (e.g., community maps, focus groups) and their potential, one of the recommendations of this article is to better connect participatory mapping and social mobilization with urban planning tools and instruments.

According to Geekiyanage et al. (2023), it is also important to mention that implementing participatory mapping in vulnerable peripheries can be quite challenging due to barriers in community engagement, especially in areas where there is a lack of trust in external organizations or authorities. Building trust and ensuring active participation requires time and consistent effort. Pilot participatory projects can promote support in the dissemination of these methods to local planning and facilitate engagement. Also, resource constraints and lack of local capacity are issues that can hinder the implementation of these methodologies. Adequate funding and skilled personnel are essential for conducting participatory mapping and mobilizing the community. Ensuring the accuracy of the data collected through participatory mapping can be challenging. The data needs to be validated and cross-checked with the community to ensure it reflects the real situation. Considering the mapping activities, continuous engagement and follow-ups are necessary to keep the community motivated and involved in the long term. Even so, when the process runs smoothly within the community, political dynamics and social hierarchies can pose significant challenges in the implementation of the co-created solutions.

All these factors impact the development of communication products as well. Therefore, strategies to overcome the challenges in implementing participatory mapping for social mobilization should be considered in the planning of the activities. For community engagement, building trust within the community is essential, as mentioned previously. This can be achieved by involving local leaders and influencers who are

respected by the community, and this process takes time. In Novo Recreio, the trust building process was developed months before the start of the activities through informal meetings. In the other presented cases, the connections were developed by a researcher or mobilization team with adequate time. In conclusion, regular meetings, open communication, and transparency about the project's goals—what to expect and what benefits can be created—can help in gaining the community's trust and increase active participation. Partnerships with local NGOs, schools, associations, government agencies, and international organizations can be beneficial, providing additional funding, expertise, and people, when possible. Additionally, training community members to take on roles within the project can help in utilizing local resources effectively, ensuring that the project continues over time.

Engaging local cultural experts or community members in the planning and implementation phases can also help in ensuring cultural appropriateness and boost mobilization towards the mapping objectives. To ensure the accuracy of data collected through participatory mapping, it is important to use multiple data collection methods and cross-verify the information. Training community members in data collection techniques and involving them in the validation process, when possible, can also enhance the reliability of the data and ensure the continuation of the process. Providing ongoing support, resources, and training can ensure long-term success and social impact, as well as better communication products.

These cases showed how mapping helped citizens organize their local knowledge and how this knowledge is not known by authorities, policy makers, and city planners. They also demonstrate that participatory processes can provide territorial knowledge, stimulating engagement, and consequently generating proposals for improvements through communication tools. It is also important to connect participatory dynamics to urban planning instruments to ensure that solutions can be implemented. The role of participatory approaches is primarily to create awareness, stimulate dialogue, and mobilize people in prioritizing demands to be resolved or in co-creating better alternatives, but there is a need for a concrete connection with urban planning tools. The case studies described refer to projects that were responsible for mobilizing society and co-creating relevant knowledge, indicating the need to broaden the scope of such projects and connect them to current urban planning tools and people.

5. Conclusion and Recommendations

Participatory mapping contributes to the co-creation of territorial knowledge and thus serves as a basis for formulating more efficient urban policies that are aligned with the demands and needs of citizens. This process involves engaging local communities in the collection and analysis of data about their own neighborhoods, which helps to identify key issues and opportunities from the perspective of those who live there, especially in informal settlements. By involving residents in mapping their environment, urban planners and policymakers can better understand of the unique characteristics and challenges of different areas, if they can access these outcomes and products. This collaborative approach ensures that the resulting policies are fairer and effective as they are grounded in insights of the community. Ultimately, participatory mapping empowers citizens to take an active role in shaping the future of their cities, fostering a sense of ownership and responsibility for their urban environment.

The application of participatory mapping in peripheral areas highlights vulnerabilities that need to be addressed in ways that can support community education and sustainable urban development overall. This

process involves engaging residents in identifying and documenting the various challenges they face daily—such as inadequate infrastructure, lack of access to essential services, and environmental hazards—as presented in the study cases in Brazil. Additionally, participatory mapping draws attention to more complex social inclusion issues, such as the marginalization of certain groups (such as women, children, and the elderly), disparities in resource distribution, spatial inequalities, and barriers to social and economic opportunities. This approach ensures that urban planning is informed, inclusive, and responsive to citizens' needs and demands, promoting a more resilient environment. The participatory activities described here can be replicated in any informal settlement, with contextualized adjustments.

Moreover, it is necessary to create spaces for public participation to make urban planning more inclusive, such as community forums, consultations, and interactive workshops, where citizens can voice their opinions, share their experiences, and contribute to decision-making processes. By involving the community in urban planning, we ensure that the diverse needs and perspectives of all residents are considered, leading to more equitable and sustainable development. Their knowledge and insights are invaluable in shaping a city that reflects the collective aspirations and addresses the unique challenges of its inhabitants.

Finally, participatory mapping helps to improve community communication through its products. By involving residents in the mapping process, these initiatives create valuable tools such as detailed maps, visual representations, and data sets that reflect the community's insights and experiences. These products serve as effective communication tools, facilitating dialogue between community members, urban planners, and policymakers. They help to bridge gaps in understanding, ensuring that the voices of all residents are heard and considered in decision-making processes. The collaborative nature of participatory mapping promotes empowerment among participants, encouraging ongoing engagement and cooperation within the community. Ultimately, these products enhance transparency, build trust, and promote a more inclusive and informed approach to urban development.

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Conflict of Interests

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