Urban resilience in a systemic perspective: the case of the Jardim Pantanal Neighborhood Plan

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Resiliência urbana em uma perspectiva sistêmica: o caso do Plano de Bairro do Jardim Pantanal

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Abstract
This article consists of a case study on participatory urban planning in a context of social exclusion in the face of climate emergency, aggravated by the Covid-19 pandemic, in the community of Jardim Pantanal, in the east of the city of São Paulo. The objective is to discuss urban resilience in the process of building knowledge and developing a neighborhood plan. We describe the conditions of the neighborhood and the participatory process in the search for alternatives to the socio-environmental vulnerability exacerbated by the Covid-19 context. The plan, drawn up between 2020 and 2021, had the collaboration of organized civil society and presents proposals for actions capable of mitigating the local impacts of the pandemic and promoting alternatives against hegemonic urban interventions. The planning process constituted social learning and engagement of local social actors with their creative potential, proposing legitimate actions regarding the context, such as extension of sidewalks, requalification of public space for community living, carrying out joint efforts and cultural activities. It appears that the initiatives enhance attributes inherent to socio-ecological systems, especially with regard to the expansion of adaptive capacity and resilience, promoting democratization in participatory socio-environmental governance and diversification of alternatives in facing urban vulnerabilities.

Resumo
Este artigo consiste de um estudo de caso sobre planejamento urbano participativo em contexto de exclusão social face à emergência climática, agravado pela pandemia da Covid-19, na comunidade do Jardim Pantanal, extremo leste do município de São Paulo. O objetivo é dialogar sobre a resiliência urbana no processo de construção de saberes e elaboração de um plano de bairro. Descrevemos os condicionantes do bairro e o processo participativo na busca de alternativas à vulnerabilidade socioambiental exacerbada pelo contexto da Covid-19. O plano, elaborado entre 2020 e 2021, contou com colaboração da sociedade civil organizada e apresenta propostas de ações capazes de mitigar os impactos locais da pandemia e promover alternativas contra hegemônicas enquanto intervenções urbanísticas. O processo de planejamento conformou aprendizagem social e engajamento de atores sociais locais com seu potencial criativo, propondo ações legítimas quanto ao contexto, como extensão de calçadas, requalificação de espaço público para convívio comunitário, realização de mutirões e atividades culturais. Constata-se que as iniciativas potencializam atributos inerentes aos sistemas sócio-ecológicos, sobretudo no que diz respeito à ampliação de capacidade adaptativa e resiliência, promovendo democratização na governança socioambiental participativa e diversificação de alternativas no enfrentamento de vulnerabilidades urbanas.

Introduction

The urban socio-environmental challenges of contemporaneity reflect, synthesize, and expand trans scale conditions, such as the risks associated to climate change and issues inherent to distinct knowledge management and production sectors, as is the case of social and environmental vulnerability determinants (WALS; PETERS, 2017). Thus, the planetary ecological limits delimit conditions and threats to cities, which may be verified by the tendency of increase in intensity and frequency of extreme climatic events such as rains and floods, which lack systemic management perspectives connecting the health hazards and the populations' quality of life to a multiplicity of local vulnerability factors, which must be managed in tune with the ascertainment of threats that transcend from global to local (WHITMEE et al., 2015).

An emerging and severe crisis such as the Covid-19 pandemic illustrates the degree of interdependence and of preexisting vulnerabilities in the urban environment, with a tendency of risk exacerbation, and, on the other hand, local possibilities for adaptations and change for the facing of critical conditions (ANDRES et al., 2021). This phenomenological indissociability between distinct dimensions and scales imposes the need to expand the dialogue and the forms of production of alternatives for the confrontation of high-complexity problems permeated by uncertainties. Thus, we address the needs for innovation in the forms of knowledge production as well as in the forms of action production and organization of more sophisticated and democratic management structures.

In the field of knowledge production, traditional hegemonic production by specialized peers must be democratized to bestow greater legitimacy upon the interrelation between science, society, and political processes. This constitutes a post-normal science production, broadening the peer community for the inclusion of distinct social players, as to build new consensual arguments to reinforce innovative social practices, and knowledge integration through social learning (JACOBI et al., 2020; FUNTOWICZ & RAVETZ, 1997). This new form of knowledge production must also reflect innovation in management and development of actions geared towards complex problems, obligatorily contemplating social participation in problem resolution, enabling cultural plurality inherent to vulnerable settlements (BEDIN; DIAS, 2021; CANIL et al., 2021).

The way in which city expansion takes place, with the exclusion and marginalization of poorer people in environmentally sensitive areas (ROLNIK, 2019; TRAVASSOS et al., 2017), characterizes the imperative for society to observe adaptation actions and local resilience, especially in at-risk locations subject to multiple vulnerabilities. Such a premise is also convergent to the pursuit of the aims and Sustainable Development Goals of United Nations' 2030 Agenda (BEDIN; DIAS, 2021; GRANDISOLI et al., 2020).

In this sense, we focus on issues inherent to adaptation and urban resilience in an analytical point of view on social-ecological systems, which are understood by means of attributes linked to complex and self-organizing systems (FOLKE et al., 2010; PREISER et al., 2018). Thus, we seek to reflect upon the overcoming of the dichotomy between nature and society, valuing the creative possibilities of local players' knowledge and actions, which may be analyzed through narratives corroborating hybridization and democratization of knowledge and urban socio-environmental governance (GIATTI, 2019; KAY et al., 1999). In short, the goal of this paper is to dialogue on urban resilience based on social participation in the construction of knowledge and actions inherent to the Emergency Plan and Initial Proposals for the Jardim Pantanal Neighborhood Plan[1] (SOUZA et al., 2021), in the municipality of São Paulo. The vulnerability context refers to social exclusion and urban peripheralization aspects, accentuated by Covid-19 and by the geographical condition of flood-susceptibility, thus combining local and global factors, in this case, the exacerbation of risks related to climate change.

The methodological approach is a case study (YIN, 2015), in which the following are used as sources: public official data contributing to local and historic

[1]Plano Emergencial e Propostas Iniciais para o Plano de Bairro do Jardim Pantanal – The Emergency Plan and Initial Proposals for the Jardim Pantanal Neighborhood Plan, pertaining to the São Miguel Paulista regional administration in the city of São Paulo, was conducted by the São Paulo department of the Institute of Architects of Brazil (IAB), in partnership with Instituto Alana, in the context of the Urbanizar project, and representatives from the local community, and it can be found at the following online address:

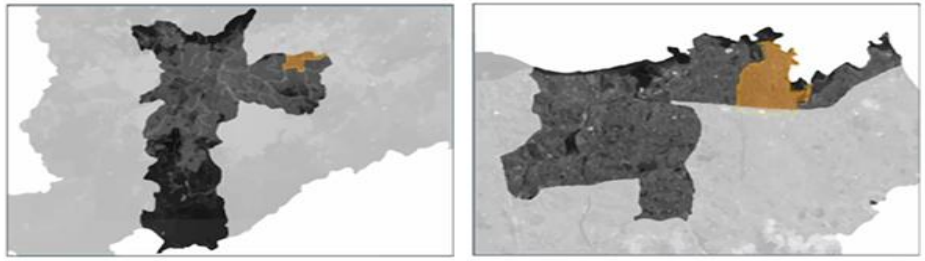
https://www.iabsp.org.br/jd_pantanal_plano_emergencial_e_propostas_iniciais_para_plano_de_bairro.pdf

contextualization; the Emergency Plan and Initial Proposals for the Jardim Pantanal Neighborhood Plan, as focal document in analysis; and descriptive data obtained from the first author's participating observation in the development process of the aforementioned plan and action implementation. The data of interest obtained from the Neighborhood Plan are classified and presented in charts 1 and 2, and the collected pieces of information were identified based on their pertinence as to the proposition of actions regarding problems related to the Covid-19 pandemic and socio-environmental vulnerability local problems. The studied case is therefore presented in a descriptive manner, and the analytical perspective is achieved through the dialogue with literature associated with resilience in social-ecological systems, social learning, and socio-environmental governance.

The article is subsequently divided into four sections: firstly, we describe Jardim Pantanal neighborhood's formation history and informality and vulnerability context; then we present innovations before the participatory experiences of the studied Neighborhood Plan; next, we discuss urban resilience in the dialogue between participation and governance in the pursuit of sustainable development; lastly, we draw our final considerations within the proposal of contributing to the comprehension of the relationship between the studied case, the social learning process, and the systemic perspective in analysis.

Formation of Jardim Pantanal Neighborhood – urban informal occupation

Commonly known as "Jardim Pantanal", located in the Jardim Helena district, jurisdiction of Subprefecture de São Miguel Paulista, extreme East of the municipality of São Paulo, the area was occupied in a disorganized manner from the 1980s. However, since 1920, the location has gained importance, due to the transportation of materials such as stone, sand, and lumber on Tietê river (SILVA, 2016). Figure 1a shows the municipality of São Paulo, highlighting the São Miguel Paulista regional administration, and Figure 1b represents the section of the regional administration and Jardim Helena district highlighted in orange.



Figures 1a. São Paulo municipality, and São Miguel Paulista regional administration, highlighted in orange (to the left); and 1b: São Miguel Paulista regional administration, and Jardim Helena district, highlighted in orange (to the right). Source: SOUZA, et al., 2021

São Miguel Paulista district presents a mosaic of realities, as well as other communities, with higher vulnerability indicators in lower income areas, which are those close to the bank of Tietê river, and with greater potential risk of flooding. The drier, more consolidated locations, near public equipment, are the ones concentrating on high income domiciles (SOUZA et al., 2021).

Among the districts of the São Miguel Paulista region, Jardim Helena is the largest, with 9.1 square kilometers, the second most populated, with 135 thousand inhabitants (36.55% of the total), and the second densest, with 148.39 inhabitants per hectare (inhab/ha). Jardim Pantanal's Paulista Index of Social Vulnerability (IPVS) is the highest, 6 – extremely high vulnerability, in the classification scale of subnormal urban clusters of Fundação Sistema Estadual de Análise de Dados (SEADE). The public services network has substantially grown but is still scarce to meet the region's demands (SOUZA et al., 2021).

Figures 2a and 2b show areas closer to the river and, therefore, more vulnerable, where it is possible to notice the precariousness of sidewalks and absence of asphalt, curb, and gutters. On the other hand, in those areas, automobile circulation is low, and the community, especially children and youth, use them to play and practice collective activities. "The streets, however, are calm, with low circulation of motorized vehicles, and highly used for children's play, as an extension of the house itself" (SOUZA, et al., 2021, p.29).

Figures 2a and 2b. Informal occupation areas in North Jardim Pantanal. Source: IAB/SP Collection, 2020

In Jardim Pantanal, as in other regions in the city of São Paulo with a history of irregular occupation on valley floors, the public agenda of urban planning needs to integrate, beyond the essential basic sanitation and drainage policies, public policies of participation as an axis of local governance (TRAVASSOS et al., 2017).

In this context, occupation and urbanization dynamics directly impact the geomorphological process of the floodplain areas. According to Sato (2018), the current urbanization pattern entails a series of consequences in use and occupancy of the environmentally protected areas of the Tietê floodplain, especially vegetation suppression, ground impermeabilization, and exacerbation of urban heat islands (SATO, 2018; ZANIRATO, 2011).

In the territory, the impact of floods became present from the 1990s, registered in the memory of the population by various floods of the Tietê river.

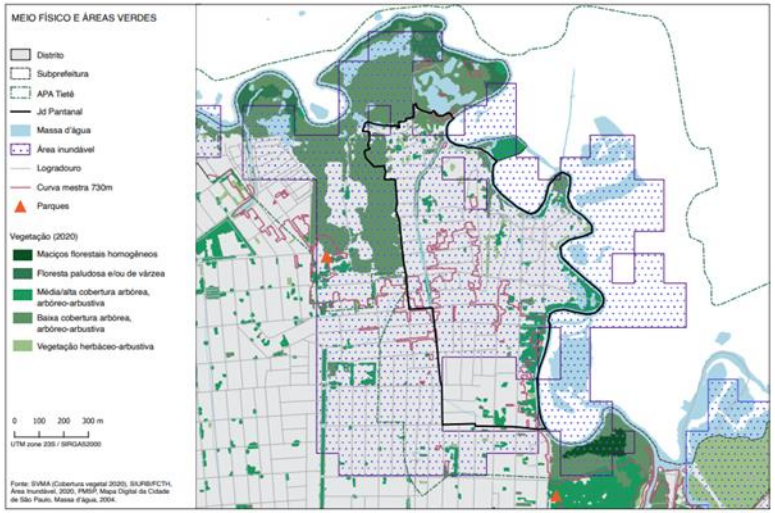
> As the edified city got closer and overpassed the flood plains, the debate on regularization of the banks and beds of the river became more present, since some flooding episodes began to reach homes and the built urban infrastructure (TRAVASSOS, et al., 2017, p.66).

Throughout the 1980s and 1990s, floodplain areas were plotted and occupied, especially by the low-income population, devoid of basic right assurances, as well as the presence of the State. To occupy such areas, land backfills were needed, causing significant geomorphological alterations of the floodplains (FUNDAÇÃO FLORESTAL, 2013). This urban expansion movement did not cease and currently, apart from the occupied areas, the meandering river's alluvial plains have been suffering greater pressures, and therefore the loss of floodplain areas (TRAVASSOS et al., 2017).

To contain some of the impacts, São Paulo State Government's Departamento de Águas e Energia Elétrica (DAEE) inaugurated, in 2011, the Parque Várzeas do Tietê (PVT), whose goal is to recover the floodplain areas as flood regulator to alleviate the effects of the rivers' floods. The depollution of affluents and streams, and the recomposition of riparian woodland also figure among the planned actions, although slowly conducted. The PVT was resumed in 2009, stemming from the Programa de Recuperação das Várzeas da Bacia Alto Tietê, and it inaugurated two nuclei between 2018 and 2019, Itaim Biacica and Jardim Helena parks, represented in Figure 3, with cultural, recreation, inheritance preservation, and community-strengthening activities, with the purpose of engaging the local population (SOUZA et al., 2021; SATO, 2018).

In Figure 3, sections of the floodplain's environmental preservation area (APA) are shaded in dashed green, the floodable areas, in dotted blue, the vegetation masses in shades of green, and Jardim Helena, in the Northwest, and Itaim Biacica, in the Southeast, parks are indicated by orange triangles.

In this scenario, it is appropriate to inquire: in the context of informal settlements, do green infrastructure interventions produce or exacerbate socio-spatial inequalities? Anguelovski (2019) corroborates that the planning of green areas must be done in a participatory manner and highlights: "green planning may better approach the risks of growth and climate, along with equitable community development" (ANGUELOVSKI et al., 2019, p.1).



PHYSICAL ENVIRONMENT AND GREEN AREAS
District; Regional Administration; APA Tietê; Jd. Pantanal; Body of water; Floodable area; Street; Master contour line 730m; Parks; Vegetation (2020); Homogeneous forest masses; Swamp and/or floodplain forest; Medium/high arboreal, arboreal-shrubby coverage; Low arboreal, arboreal-shrubby coverage; Grassy-shrubby vegetation.

Figure 3. Physical Environment and Green Areas of Jardim Pantanal. Source: SOUZA, et al., 2021

Before the complexities in the pursuit of solutions to the chronic problems of the territory, social participation in governance is a necessary condition to oppose the imposition of hegemonic solutions meeting the diversity of different locations' characteristics (BEDIN; DIAS, 2021; CANIL et al., 2021).

To this end, the perspective of analysis based on social learning as a methodology for potential local articulations of resilience, especially with the diversity of knowledge by means of knowledge production in the sciences area, may lead to new paths for development (JACOBI et al., 2020). We emphasize the approach of social learning, as choice of analysis for the articulation processes and participatory methodologies, for its proposal for dialogue between the social players stemming from the socio-environmental approach and participatory diagnoses, social mappings, and pursuits for joint solutions, especially because they may promote local change to reduce risk of disaster (GRANDISOLI, et al., 2020).

Innovation in a participatory intervention based on the "Emergency Plan and Initial Proposals for the Jardim Pantanal Neighborhood Plan"

The Emergency Plan and Initial Proposals for the Jardim Pantanal Neighborhood Plan (SOUZA et al., 2021) is divided into four chapters within two blocks. The first block, Chapter 1, presents a diagnosis with data from urban and social reading of the territory, already previously detailed in this paper. In the second block, Chapters 2 and 3, emergency and structural guidelines for the territory are presented, based on soil drainage, flooding containment, qualification of open spaces, and urban mobility. The last part, Chapter 4, brings some horizons for community articulation and mobilization to aid in the incidence of solutions and implementation of the Plan. The Plan's goal is to shed light on the most experimental solutions stemming from social participation and to encourage new horizons for other communities.

The material was drawn based on two workshops held with a mini public, a group of neighborhood residents formed by community leaders, young members of Banda Alana, staff of Instituto Alana (IA), technicians, and experts from partner institutes. The first workshop took place on November 23rd, 2020, with the participation of twenty-nine people in a hybrid manner, eight in person at Espaço Alana (Jd. Pantanal), and twenty-one online. Experts from IAB/SP (Institute of Architects of Brazil – department of São Paulo) and Aromeiazero, organized civil society institutions, presented the preliminary diagnosis of some collected data on the territory with the purpose of introducing the dialogue on the challenges in the process of the neighborhood's formalization. Online forms and flipcharts were produced to collect the residents' opinions for the choice of the neighborhood's primary macro themes, and they were as follows: 1. Infrastructure – Environment – Mobility; 2. Health; 3. Education; 4. Culture – Recreation – Sport.

The second workshop took place on January 20th, 2021, with the participation of eighteen people in person, and its focus was the presentation on the first workshop's results, with the co-creation and validation of the short- and medium-term solution propositions on the chosen themes. For the emergency and short-term actions, residents showed great concern with the absence of precaution and isolation measures in the territory in the pandemic context, nevertheless the theme of greatest interest for short- and medium-term was regarding urban drainage issues and the insertion of the neighborhood into the formal city (SOUZA et al., 2021).

Green infrastructure and nature-based solutions are known as model tools to make the urban fabric more adaptable and resilient to impacts resulting from climate change HERZOG; ROSA, 2010), as well as the involvement of local communities to generate engagement of representatives from the segments who will be affected by the project (NETTO; CERVELLINI, 2021). The publication in question, the indicated paths are alternatives to the hegemonic logic, often used in a mass and standardized way in the contexts of different realities (SOUZA et al., 2021; TRAVASSOS et al., 2020).

In the context of Jardim Pantanal, one of the great impacts worsened by the pandemic pertains to the economical conditions of some of the residents who work in informality and who need to move and circulate around the city, exposing themselves to the contamination risks. In this sense, the publication introduces some guidelines so that the return to the "routine" can be done with more quality and within the perspective of requalification integrated to the territory (SOUZA et al., 2021).

Thus, the material suggests some measures for the solution of emergency and structural social-environmental problems in Jd. Pantanal, organized in the following Charts 1 and 2. The publication focuses on, in addition to the severity of the current pandemic, measures for a near future geared towards the adaptation of the spaces and valorization of open-space activities. The choice for prioritizing adaptation measures in school units is due to the importance of the essential service provided to the population (SOUZA et al., 2021).

Chart 1 – Guidelines, goals, indicators, and emergency actions for the solution of problems related to the pandemic – Jardim Pantanal Neighborhood Plan, 2021

GUIDELINES	GOAL	INDICATOR/ACTION
1. Attention measures until the population's mass immunization	A) Gradual return to school with hygiene and social distancing measures	• Signage to guide distance and paths of students and teachers. • Directions for safe distancing between students, and between students and teachers. • Directions for hygiene habits in common spaces, bathrooms, and eating areas. • Creation, in all schools, of a commission for the safe return to in-person classes. • Prioritizing open and ventilated spaces in the schools. • Implementing, by regional and municipal administrations, access to broadband internet for students and teachers of the public system.
	B) Prevention and social distancing control measures, by the population, service providers, and public equipment	• Complying, by the population, and control, by the public administration, of measures determining the requirement of mask use in all public areas and commercial buildings, public transportation, streets, and squares. • Monitoring of the population during the night, by the public administration, to ensure the ban on parties. • Social distancing and attendance control in health public equipment. • Provision of 70% alcohol hand sanitizer in public transportation vehicles.
2. Measures for mitigating the impacts of the pandemic	A) Mitigating the impacts of the pandemic on the theme: Health	• Reinforcement on the population's Covid-19 contamination prevention system. • Intensification of Estratégia Saúde da Família (ESF).
	B) Mitigating the impacts of the pandemic on the theme: Domestic Violence	• Creation of points of support for domestic violence. • Itinerant Women Defense project. • Implementation of an online reporting channel.
	C) Mitigating the impacts of the pandemic on the theme: Employment and Income	• Distribution of food baskets to the lower-income population. • Negotiations with property owners of rental properties to prevent evictions. • Professional qualification actions for Youth and adults, and professional reintegration.

Source: The authors

The emergency measures focused especially on guidelines during the Covid-19 pandemic (Chart 1), present suggestions for communication actions with signage and markings on the floors and walls, apart from reminders on sanitary care communicated by sound car or bicycles. The plan also suggests governance actions between local institutions and public administration with the purpose of reaching problem resolution in a more continuous, collective, and collaborative manner. This experience produces knowledge construction and joint collaboration, with participation as an essential link for the construction of sustainable and resilient societies (HERZOG; ROSA, 2010).

In this sense, the mini-public[2] experience held in Jardim Lapenna, neighborhood close to Jardim Pantanal, identified some potentialities of qualified participation by means of the Coletivo Delibera project, held in partnership with Fundação Tide Setúbal, and whose proponent was the Jardim Lapenna Neighborhood Plan Collegiate. The project's goal was to deliberate on the requalification of the neighborhood's main street as the first initiative of Jardim Lapenna Neighborhood Plan[3], and it highlights:

> The experience held at Jardim Lapenna, in the city of São Paulo, reveals that the reduction in the distance between public opinion and political decision, apart from solving practical problems, offers cognitive gains to the participants of the participation process. It is possible to observe that, throughout the deliberating process, the categories of the discourse context modify as technical and more precise information is acquired as well decision's scenario and consequences are analyzed (NETTO & CERVELLINI, 2021, p.2).

Chart 2 – Guidelines, goals, indicators, and structural actions for the solution of problems related to the pandemic – Jardim Pantanal Neighborhood Plan, 2021

GUIDELINES	GOAL	INDICATOR/ACTION
1. Soil drainage and flood containment	A) Recuperation of Tietê river's floodplain B) Intervention strategy on floodable landscapes C) Use of the budget for flood prevention and cleaning of maintenance holes and streams	• Recomposition of riparian woodland. • Depollution of streams. • Implementation of recreation and sport nuclei, ensuring the preservation of the riverbanks. • Implementation of drainage squares or parks. • Implementation of green infrastructure (green streets/paths; pluvial ponds/retention basin; wetland; dry pond; pluvial flowerbed; rain garden; bio-ditch; and permeable pavement). • Governance with the local public administration for flood prevention actions.
2.Qualification of open spaces	A) Creation of squares and leisure spaces. B) Creation of community vegetable garden. C) Democratization of internet access. D) Expansion and qualification of public lighting. E) Implementation of eco points and waste recycling collection.	• Creation of collective spaces for socio-environmental activities. • Mapping of places for potential interventions on the ground and street furniture for the creation of a square. • Organization of actions for the creation of an urban agriculture project for Jardim Pantanal. • Expansion of the federal internet program. • Increase of free internet access points. • Installation of public lighting on all streets and public spaces, at the pedestrian scale, illuminating sidewalks and locations with bicycle infrastructure. • Creation of eco points and waste recycling collection.
3. Urban Mobility	A) Road safety. B) Education and formation. C) Road configuration. D) Pedestrian mobility. E) Stimulus to active mobility. F) Bus/School Transportation/Motorized individual Vehicle.	• Holding interventions for traffic calming in the vicinity of equipment used by children, elderly, and people with mobility restriction. • Adequation of crossroads, by redesigning the local streets' geometry. • Bring CET closer to the territory through local action and education campaigns. • Implementation of infrastructure: curbs, gutters, sidewalks, paving, etc. • Implementation of adequate horizontal and vertical signage on the streets. • Planning underground and surface drainage work for the road system. • Creation of priority pedestrian routes between key public equipment. • Leveling, accessibility, and enlargement of sidewalks. • Creation of the school path program, to ensure safety on the access to schools. • Supplying bicycle racks for students and employees. • Expansion of bicycle racks, creation of safe bicycle routes, and implementation of infrastructure for the circulation of bicycles, connecting the territory to the train stations. • Expanding the supply of bus lines, with the substitution of the fleet for electrical minibuses for the transit in the territory's narrow streets. • Allocation of specific parking areas.

Source: the authors

[2]The concept of mini-public has gained more space lately, in which the main motivation in democratic innovation, with the reduction of the distance between public opinion and political decision-making. In other words, it refers inviting citizens affected by a certain decision, even with a small attendance, who are representative in the context and analyze the scenario and solutions with the object of deliberation and opinion formation, stemming from the best possible decision for that collective (NETTO; CERVELLINI, 2021; WARREN; GASTIL, 2015).

[3]The Jardim Lapenna Neighborhood Plan, neighborhood pertaining to the São Miguel Paulista regional administration in the city of São Paulo, conducted by Fundação Tide Setubal with representatives of the local community is hosted on the online address: https://fundacaotidesetubal.org.br/publicacoes/plano-de-bairro-jardim-lapenna/

The urban surface drainage solutions to counteract floods and standing water areas in the territory are urgent, for they impact the community's day-to-day life and, oftentimes, cause children and youth to face obstacles such as puddles and mud to access the schools (SOUZA et al., 2021).

The plan presents some alternatives for rainwater that falls upon the territory and that may be absorbed in diverse ways. This is the case of drainage squares and parks that conform to the concept of floodable landscapes with the goal of reducing water speed and the amount of water draining and preventing the drainage system from being overloaded. Community vegetable gardens are also implemented, both to provide more permeable areas and food safety and subsistence of the residents (SOUZA et al., 2021; HERZOG, ROSA, 2010).

Figure 4. Composition of images of tactical urbanism intervention actions on the community's streets. Source: the authors

Social participation was considered essential for the proposed green infrastructures to be efficient, contributing to the potentializing of new solutions based on the location's livingness and experience, being necessary a "systemic, comprehensive, transdisciplinary approach" (HERZOG; ROSA, 2010). On the composition of Figure 4, the stages between the planning and execution phases of the tactical urbanism intervention are represented. Initially, stemming from the act of listening to the community on the most problematic areas in need of urgent action, the contributions of experts for the design of the intervention, taking advantage of the local creative potential, the holding of the action joint effort with the young involved in the plan. And finally the end outcome, whose goals were the expansion of sidewalks, and requalification of the public space for safe community cohabiting. The elements registered on the image highlight the legitimacy of the planning and the undertaking of local actions, enabling engagement, social learning, and potentializing the creative ability of the risk subjects. In the intervention area, on the corner of Serra do Apodi and Cachoeira Itaguassava streets, the sinks installed by Sabesp are located to minimize the effects of the pandemic in the neighborhood. are located.

> The intentions of the project involved: Tactical urbanism action with light materials; expansion of sidewalks on crossroads, across commercial buildings; narrowing of the carriageways, implementation of pedestrian crossings, delimitation of the space with vases, whose seedling planting took place in the assembly event by the community, implementation of benches, creating conditions of comfort, and delimitation of safe distancing for the public (SOUZA, et al., 2021, p.73).

Resilience and participation: necessary transcendences for sustainable development

Recent extreme climate events demonstrate the need for urban planning and social care with the most vulnerable populations in occupations in at-risk areas (IPCC, 2021). The sixth IPCC report[4], published in early August 2021, stresses even further the urgency of actions, and indicates that we must treat climate change as an immediate threat. In this sense, social learning practices may contribute to reduce the risk of disaster in the preparation for potential consequences of climate change. Adapting

[4]The Sixth Assessment Report of the Intergovernmental Panel on Climate Change titled "Climate Change 2021: The Physical Science Basis", published on August 9th, 2021, is hosted on the online address: https://www.ipcc.ch/report/ar6/wg1/

and reducing impact with planning and ability to deal with emergencies is indispensable for the current challenges (GRANDISOLI et al., 2020; MONTEIRO et al., 2020).

In various cities in the Paulista Macro metropolis, such as São Paulo, the configuration of vulnerability contexts occurs in a more profound way, as the result of a greatly unequal development. Such social inequality is especially reflected in urban segregation. This stems from the fact that real estate speculation pressures low-income populations to move, subduing these people into occupying green areas in the city surroundings, amongst which, floodplain areas, due to the lower price of a square meter of land. It is a reality that has been repeated since the 1960s, mainly – which has been called urbanization by periphery expansion. Thus, socio-spatial segregation organizes the territory in a way in which economic power is a condition for urban occupancy.

> The periphery of RMSP (São Paulo Metropolitan Region) is currently an area with supply of commerce and services, but with a precarious urbanistic standard, with low-quality infrastructure, which has grown in terms of population, creating important sub-centralities, but which do not breach the unequal development and socio-spatial patterns characteristic of this metropolis (ROLNIK et al., 2015, p.146).

The production of the urban space of São Paulo is directly associated with the relationship between formal and informal city. It is possible to observe that the formal city is where public investment is concentrated, and in the informal city, growth is intense on informality, a fact which contributes for the formation of urban spaces void of urbanity attributes (GROSTEIN, 2001). The occupations of valley floor areas, along the rivers' floodplains, have turned into "key-locations" for the execution of infrastructure public interventions for socio-environmental wellbeing, be they for integration to the water and sewer systems or the urbanization of precarious settlements. However, the absence of an integrated urban agenda hinders the co-responsibility and execution of such interventions (TRAVASSOS et al., 2017; HERZOG; ROSA, 2010).

The inexistence of interlocution between entities of the public sphere and the deprivation of listening to the community result, oftentimes, in incomplete interventions: "linear parks with polluted rivers, favela urbanization in areas at risk of flooding, among others" (TRAVASSOS et al., 2017). Nor is community participation in decision making stimulated in this dialogue, despite being a key point to ensure implementation and social control of public policies in the territories (VERA; LAVALLE, 2012).

Within the urban contexts, the concept of resilience sheds a new conceptual milestone regarding the urbanization processes and contributes to integrated planning to reduce vulnerabilities, in catalyzing adaptative resolutions and transformative potentialities (WALS; PETERS, 2017). The need to find urgent responses has caused the pursuit of new ways that focus on community resilience before the emergencies of extreme climatic events.

Interpreting the cities as social-ecological systems refers to the considerations as to some attributes inherent to their complexity and potentiality for self-organization. Social-ecological systems, by definition, express the indissolubility between social/human and ecological dynamics and attributes. Preiser et al. (2018) indicate essential characteristics of such systems, and we highlight some of them from the perspective of self-organization: adaptive capabilities; behaviors established as a result of dynamic processes; and emergent qualities resulting from complex coincidences. In short, and pragmatically, we strongly considered the creative ability and the plasticity of systemic dynamics that conform in urban communities, such as the one studied here.

In this perspective, adaptability, inherent to the urban community, is an elemental attribute and refers to a creative ability ingrained to the cultural context and grounded on the conditions of the physical and environmental environments. Adaptation in a social-ecological system consists of dealing with disturbances or scarcity challenges, producing plural solutions composed by the interaction of diversity of abilities related to environmental conditions, socio-political competences, organizational capabilities, moral values and knowledge, technologies, infrastructures, and economic resources. The reach of the adaptive capability characterizes resilience, which is to say, the ability of the system to recover its integrity and functionality within certain limits, after suffering disturbances. The rupture of such operational limits and the constitution of new different ways of organization, new functions, and evolution configure the system's changeability, or even the collapse tendency (FOLKE et al., 2010; WALKER et al., 2004).

Thus, we argue that the participatory and community-led way of action planning to face the risks of climate change and the Covid-19 crisis in Jardim Pantanal characterizes an important innovation, considering the attributes of such a social-ecological system. A key issue for this understanding resides on the legitimacy indicators of the Neighborhood Plan regarding the involvement of local social players. This can be assessed, for instance, in the workshops held for the listening of the community, with the purpose of producing a more realistic diagnosis, in which the participants listed the exact points where water accumulates and slowly drains, or the locations in need for road adaptation for greater space supply for pedestrians and cyclists (Figure 4).

Participation and social learning have been amply recognized as crucial in the pursuit of solutions for contemporary socio-environmental problems and injustices (JACOBI, 2015; LEFF, 2017). But in this case study, we value the participatory process, for considering it the primary element of innovation and overcoming of urban planning hegemonic models, which are incapable of dialoguing with the subjects at risk and their knowledge. The conventional absence of interaction inhibits the legitimate and pertinent adaptive ability regarding the insertion of people in the local context. Social participation promotes the attachment between the potential for self-organization and local adaptability with the field of formal knowledge on planning and decision making of public policy development (GIATTI, 2019; SOUZA; WALS; JACOBI, 2019). Promoting social participation also means distributing power, and, in this sense, broadening democracy in the governance process, but also stimulating more sophisticated ways of governance, as an outcome of diversity, and, therefore, more adaptable (PAHL-WOSTL; HARE, 2004; WUTICH et al., 2018).

Diversity gains space for the construction of resilient urban conditions, broadening the possibilities of response to citizens' demands. Participatory methods became valued as tools geared towards good local governance, leading to greater efficiency and transparency in the democratization and empowerment processes (BAIOCCHI; GANUZA, 2017). Successful innovation experiences of diverse democratic nature are commonly concentrated on civil society institutions, as empirical and successful initiatives of social control, which are less susceptible to political-partisan influences (VERA; LAVALLE, 2012). Deliberative mini-publics may meet these conditions (NETTO; CERVELLINI, 2021; WARREN; GASTIL, 2015). Ultimately, we consider that legitimate participation and social learning undertaken in urban planning contribute to the broadening of urban vulnerable communities' resilience.

Final considerations

Innovations in participatory governance play important roles in the dialogue between scientific knowledge and the production of local knowledge. In applying urban policies to foment sustainability and ecology culture in the community, it is possible to ensure better quality of life for all. Citizenship is a human being trait, and it is a potential for socio-environmental transformations before public policies.

The institutionalized presence of organized civil society proved to be a crucial factor in the interlocution between community and technical experts and the public administration. The unfolding may be in social learning itself in the territory, considering the individual and collective knowledge articulation, a basic principle for community coexistence. Social learning is a tool capable of mobilizing to exercise a more critical and conscious "thinking" and a "perspective" geared towards the world's issues in a more civic, more collective, and therefore more solidary manner.

Social participation in socio-environmental governance seeks a potential future, based on fundamental human rights for coexistence on the planet and, in this perspective, aims for human beings to act towards the achievement of their fundamental rights, in the perspective of a better world. We consider the pertinence of an analysis employing the concept of resilience in the perspective of social-ecological systems, and social learning process that promotes knowledge and action democracy, corroborating diversity, legitimacy in participatory processes, and, therefore, expansion of adaptability and resilience of vulnerable urban communities.

Thus, we signal that the confrontation of vulnerabilities must contemplate community protagonism in the management and co-production of knowledge. This democratization must, in turn, be a contribution for the process of regularization of land use (confrontation of informality) for a permanent inclusion in the city's territory. Thereby, we verify that the concept word "resilience" must be assumed as a component of entailment to the city by means of democratic patterns in dynamic, interactive, and diversified processes.

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