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Contingent unsustainable urban futures in São Paulo's peripheries

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(Article begins on next page)

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15. Contingent unsustainable urban future in São Paulo's Peripheries[1]

A. P. Koury and A. Mazzaro

Introduction

Between 1960 and 1980, São Paulo experienced an astonishing growth, with the urban population increasing from 3,7 to 8,4 million of inhabitants (IBGE, 1996) making it the largest urban agglomeration in South America. The low-income population was drawn to the city's economic strength and found housing in peripheral areas, often in large housing complexes or informal settlements characterized by clandestine subdivisions. In the absence of public policies capable of meeting their needs, residents directly addressed the lack of housing through self-managed initiatives or a collective action system (*mutirões*), increasing the presence of informal settlements.

In informal urbanization, contingency is the rule rather than the exception – unlike in cities governed by formal planning, where order and predictability are expected. Yet, rather than being an anomaly, informal urbanization prefigures the contingent scenarios that many cities increasingly face as they must act and adapt under conditions of uncertainty and under more fragile social pacts. The goal, however, is not to compare the vastly different urban conditions produced by specific contingencies, but to learn from the ways that con-

1 Acknowledgement: This study is a direct contribution to the research themes of the National Institutes of Science and Technology (INCT) – Klimapolis (CNPq Project No. 406728/2022–4), funded by the Brazilian Ministry of Science, Technology and Innovation (MCTI) and the National Council for Scientific and Technological Development (CNPq). Ana Paula Koury is granted a scholarship by the National Council for Scientific and Technological Development (CNPq Project No. 305521/2022–5), and the Torresmo case study is granted by São Paulo State Research Support Foundation (FAPESP Project No. 2022/00580–6).

tingencies – understood as unpredictable, unexpected, and unregulated situations – trigger conflicts and contradictions that shape urban processes. In the peripheral areas where informal settlements have developed, these contradictions are made visible through the conflicting operational modes that are locally in play. Engaging with the case study of Torresmo, a small community within Itaim Paulista, in eastern São Paolo, we aim to offer valuable insights into the challenges of how cities grow and function amidst complexity arising from facing contingent and uncertain futures. In the peripheries of São Paulo, where most of the city's informal settlements are located, the design and making of infrastructures are primarily shaped by entanglements between the municipality and construction companies, whose technical culture contrasts with emerging visions for a more sustainable urban future.

In particular, this chapter examines how interventions into an informally urbanized context both face and engender specific local contingencies – on top of the inherently contingent nature of development. It notes how a major disaster has enabled emergency interventions outside existing regulatory rules, thereby primarily supporting the benefit of local construction firms. We ask how and to what extent the method of a 'real-world laboratory', translated from a Global North context, can relate to these local contingencies and possibly open up leeway for more progressive agendas.

Starting from elements of planning theory to set out the various theoretical lenses, an outline on reflexive modernity where technicians set the planning agenda, and a discussion of peripheries to question order as the main aim of cities in the Global South, the chapter then introduces the area in which the community of Torresmo is located, as well as Lab Itaim, a real-world laboratory that operates there. From there, analysis delves further into the case study, presenting the contingencies of the emergency infrastructure and the processes involved. Finally, conclusions are drawn from the experience of Lab Itaim in Torresmo, which served as a testing ground for what is known as the real-world laboratory method, within the context of Brazilian political culture and informal urbanization.

The diverse analytical lenses we discuss in the theoretical overview help us grasp the periphery as a historical reality that has happened in Brazil since the sixties and simultaneously challenge both modernity and morality in planning theory. Real-world laboratories serve as a counter-ideology to modernity, rejecting the scientific anticipation present in models without rejecting science itself. Instead, they strengthen the empirical foundation of the scientific method, creating opportunities for society to negotiate its common future.

This chapter aims to bring together various theoretical lenses and a case study to explore potential paths for the future of cities.

Theoretical context

Reflexive modernity, climate change, and securitization of nature

As Raquel Rolnik (2022: 107) wrote, reflecting especially on São Paulo, 'we built cities that eternally condemn us to consolidate the precarious'. This request for continuous adaptation, if placed in the context of climate change, aligns with the concept of 'reflexive modernity' discussed in planning studies by Simin Davoudi (2014) and then recalled by Lizzie Yarina (2024: 156), in which a society is organized around the risks of its own making. Reflexive modernization is a concept initially introduced by Ulrich Beck, Wolfgang Bonss, and Christoph Lau (2003) as a shift in late modernity to a world that is increasingly organized around government's ability to manage individuals' perceptions of risk (Beck, 2015) and where progress is achieved through reorganization, optimization, and adaptation.

For Davoudi (2014), the manipulation of nature that was enacted by modernist planning and engineering, which aimed to fit nature to our purposes and free us from its hazards, led to a greater demand for security. Furthermore, she argues that in recent years discourses of climate change and fear of uncertainty have led to greater belief in technical knowledge, favouring risk-reduction-based approaches to environmental issues. Risk is perceived as calculable and controllable by technical experts through modelling, so these experts become the people who define agendas. In this regard, Maarten Hajer (1997: 73–103) talked of an 'ecological modernization' where environmental degradation is imagined as calculable and it is assumed that society can become more sustainable through technological and institutional changes while maintaining economic growth.

Reflexive modernity,[2] while actually implying the collateral damage of rational modernity, had as its consequence – ironically – the affirmation of the 1960s view of urban planning as 'a technical-rational decision-making process' and 'a reluctance to imagine places that do not yet exist' (Davoudi, 2023: 2281–83; 2014). In the context of flooding risks, Yarina (2024: 1) similarly wrote of hydraulic epistemology, 'an ideological assumption that experts can govern nature and manage risk through modernist abstraction'. In particular, she criticized the 'fashionable effort to reframe nature as modellable' because, as she argued, models maintain a degree of uncertainty in replicating the complexity of the atmospheric systems (Yarina, 2019: 149–50).

Similarly, (hydraulic) infrastructures, networked systems replicable by experts to control nature and ensure regular, predictable flows, are facing great socioecological uncertainty. Stephanie Wakefield (2018) proposed to reimagine them in a way that embraces unpredictability, and Mary Lawhon et al. (2022), through the example of mobile pumps used as a strategy to manage uncertain flood risk and not as an emergency procedure, talked of the emergence of a more fluid and flexible concept of infrastructure, an infrastructure that has a more dynamic and less predictable scalar and spatial character. In this infrastructural panorama, urban planners act as mediators of stakeholders, and their agency varies based on the institutional and socio-material context in which they operate. Furthermore, their possibilities of influencing how an infrastructure is planned, made or imagined are constrained by neoliberal governance and corporate interests in a given territory (Graham and McFarlane, 2014).

Rethinking modernity from and with the peripheries

Acknowledging some of the developments in planning theory that have happened in the last two decades, it appears that the objective of contemporary cities may no longer be the creation of order, as it was for modernist planning. Such perception becomes even clearer if the discussion is situated in the Global

2 Ulrich Beck wrote in *Risk Society* (1992: 19) that we are in a new phase of modernization where the 'production of *wealth* is systematically accompanied by the social production of risks.' Beck's reflections were made through a distinction between hazards that occur 'naturally' and risks as events linked directly or indirectly to human action – such as the modernist regularization of nature (Beck, 2012: 13–15). Subsequently, concerns about risk produced the desire for security – as the neutralization or avoidance of risk – leading ironically to the desire for a greater rational control of nature (Davoudi, 2015).

South and megacities such as São Paulo. Nowadays, spatial planners need to design cities in ways that face urgent issues such as spatial inequalities, affordable housing, social conflicts, migration, and climate change. Although planners aspire to fulfil these tasks, competing contingencies seem to arise: In the intrinsically contingent context of informal urbanization, these planners encounter another contingency, namely the enduring belief held by some actors in imposing an idealized order onto the city. This order may rely on morphology as well as perfect synergies between space, infrastructure, society, and nature, but also on the belief that a definite and precise future can be planned in a 'chosen' place. While this 'positivist thinking', as Davoudi (2012: 430–32) called it, still holds a dominant position in European planning, a more interesting idea for this chapter is one anchored in the Global South, of planning as the urban practice of negotiating with the future (Roy, 2005).

At the beginning of the 2000s there was a call to situate the production of theories and policies on how cities function in the Global South. This was due not only to the inappropriateness of Western theories in studying and explaining megacities in the developing world but also to a desire to start learning from the urban transformations of cities like Rio de Janeiro, Mumbai, Jakarta, and Johannesburg (Roy, 2005). Following this path, it is important to accept Ananya Roy's (2005; 2009) advice that planners should learn how to work with states of exception and to introduce the ideas of European planners who lived in and learned with the Global South, such as Otto Koenigsberger in India in the 1950s and John F. C. Turner in Peru in the 1960s. Their contributions aimed to address the challenges that these places face, including intensive urbanization in depressed economies across different climate zones and cultures.

In Brazil, the earliest institution to address peripheral urban phenomena was the Brazilian Centre for Analysis and Planning (Centro Brasileiro de Análise e Planejamento, CEBRAP), created in 1969 in São Paulo. In that same period, Sérgio Ferro and Rodrigo Lefèvre were studying the large settlement of Cubatão, located near the Port of Santos – a city outside São Paulo. They realized that most dwellers owned their houses. It was a surprise to them: either the Cubatão favela was the only place in the country where redistributive urban reform had been secretly implemented, or there was something to be understood about the role of informal dwelling in Brazilian capitalism. In 1972, this research provided Francisco de Oliveira , one of the members of CEBRAP, with the empirical basis to propose a model of the peripheral capitalist economy in Brazil (Lara and Koury, 2022: 103–08). For de Oliveira, there was no duality between backwardness and modernization in Brazil, but rather an organicity.

The dynamic growth of the Brazilian economy during that period was based on rural principles of a subsistence economy, in which the self-production of housing, often through unpaid overwork, depressed workers' wages while allowing the pattern of economic accumulation to intensify. Nabil Bonduki and Raquel Rolnik (1979: 128–29) later questioned de Oliveira's conclusions, arguing that when workers build their homes, they produce an exchange value in the housing market that they can later use. Furthermore, analysing the role of the state in the production of subdivisions, Bonduki and Rolnik (1979) provide valuable clues for understanding the making of peripheries and informality at different political moments in Brazil. Following their work, it can be said that when the state fails to mediate the relationship between capital and labour, the informality and self-production of housing become a loophole that allows the system to accommodate the over-exploitation of labour in an ideology of 'freedom'.

However, a second position in this discourse can be drafted, which sees the state as having a conscious role in the production and demand for informality. In 'Urban Informality: Toward an Epistemology of Planning', Roy (2005) wrote that informality is a mode of urbanization produced by the state and not by the poor. In a later text, she stated it was an 'integral part of the territorial practices of state power' (Roy 2009, 84). The state does not fail to mediate the social dynamics of space production; rather, it is complicit in them. Realizing this also means going beyond a strict distinction between formal and informal that, as Colin McFarlane (2019) wrote, often constrains our understanding of urban processes.

Thinking with the peripheries, informality can be understood as a condition that is not completely regulated by state bureaucracy but is instead mainly produced through collaboration and the needs of inhabitants. As Judith Innes, Sarah Connick, and David Booher (2007: 198) wrote, the planning strategies of the inhabitants imply casual and spontaneous interactions and are 'neither prescribed nor proscribed by any rules.' This view paves the way for a non-moralizing vision of informality and land occupation (Jacques, 2001), or, in other words, to a positive view of contingency. In a *peripheral thinking*, the appropriation of space through irregular land ownership is part of the process of making housing affordable, even when this process is entangled in capitalist production: people occupying at-risk areas to build shacks and then rent them out to gain a living from others. The necessity of using spaces outside of the law, and in ways that people need, is situated alongside what Sara Ahmed (2019: 213) called *queer use*: 'how things can be used in ways other than for which they were

intended or by those other than for whom they were intended'. This opens a discussion between the proper use of space – its function defined through state bureaucracy, technicians, and planners – and its 'improper use', the one made by the inhabitants. As Melanie Lombard and Paula Meth (2016) wrote, by asking how and why a practice is considered informal, it is possible to understand how planning and governance in a place really work.

The real-world laboratory: A path for sustainable peripheral transformation

Experimental modes of governing urban change have attracted major scholarly attention over the last 15 years. Phrased as the 'experimental city' (Evans et al., 2016), 'urban living labs' (Bulkeley et al., 2018) or, in the German context, 'real-world laboratories' (RwL), these modes comprise transdisciplinary urban research methodologies that integrate science and society to promote sustainable urban development and transformation. Unlike traditional research, RwLs operate directly in real contexts, actively involving researchers, practitioners, and the community in the search for viable solutions to complex urban challenges (Schäpke et al., 2018). According to authors on the topic (e.g. Schneidewind et al., 2016; Schäpke et al., 2018; Wanner et al., 2018), RwLs are characterized by five central aspects: (1) contributions to transformation by integrating different actors in order to enact the solutions agreed upon among them; (2) experimental methods adopted through interactive strategies to propose and test urban solutions; (3) transdisciplinary research integrating academic and practical knowledge to address real-world problems; (4) scalability and transferability of results from the local experiment, allowing for broader applications in different contexts, and (5) social learning and reflexivity.

Inspired by model implementations in German contexts, the real-world laboratory of this case study was used in Itaim Paulista, a subprefecture of São Paulo, not merely as a research method but as a tool both to act in place of local governance and to challenge that governance to shift towards deeper democratic processes. Contact with other practitioners of this methodology was established through a collaboration with German colleagues, particularly at meetings of the Klimapolis Research Laboratory – a joint initiative led by the Max Planck Institute for Meteorology, in Hamburg, and São Paulo University.

The first meetings of the Klimapolis Research Laboratory,[3] led by Prof. Guy Brasseur (Max Planck Institute for Meteorology) in 2018, brought a RwL experiment in Lockstedt, Hamburg, to Brazilian researchers (Kohler et al., 2021). This experience provided the opportunity to learn the research methodology and identify its key advantages in the Brazilian context. The real-world laboratory emerged as a viable alternative to prevailing practices in Brazilian urban planning, as it was neither top-down nor bottom-up. Co-design and co-production presuppose horizontality and laterality, offering a meaningful framework for deeper exploration.

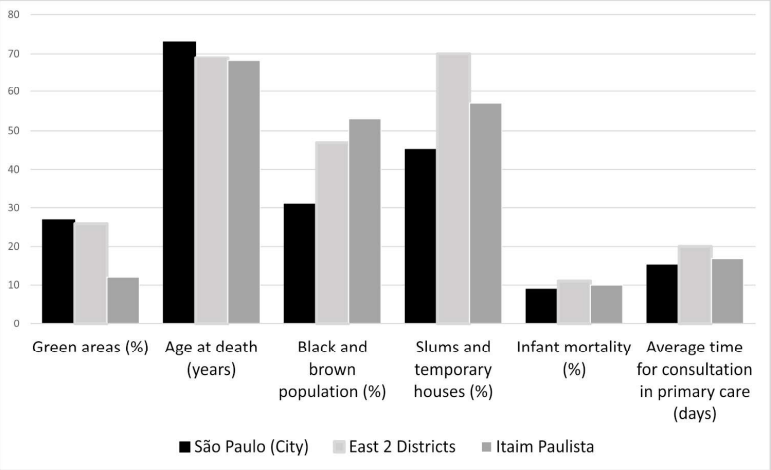
Implementing a real-world laboratory in Torresmo

Lab Itaim Paulista and the geography it enacts

The Itaim Paulista subprefecture is located in the eastern region of São Paulo. It is one of the most populous regions in the municipality, and more than 50% of its area has a population density greater than 40,000 inhabitants per square kilometre. As a result of this over-occupation of land, the subprefecture of Itaim Paulista suffers from a lack of green and public areas, presenting one of the lowest rates of vegetation coverage per inhabitant in the city, which exacerbates the effects of air pollution and contributes to the formation of heat islands (Koury and Cavallari, 2018). Socioeconomic indicators also demonstrate inequalities; compared to São Paolo as a whole, Itaim Paulista has a lower life expectancy, higher percentage of black and brown residents, and significantly greater presence of favelas and informal housing (Figure 1).

3 Funded by the German Federal Ministry of Education and Research (BMBF) from 2017 to 2024, Klimapolis was a long-term German-Brazilian collaboration aimed at developing joint research on urban pollution and climate change in Brazilian metropolitan areas. Its aims were to combine climate monitoring, assessment, and modelling with participatory strategies of urban planning to foster interaction between actors from academia, society, and government to contribute to developing resilient cities. The Klimapolis Laboratory is still an ongoing research project under a Brazilian national network founded by the National Council of Research for Science and Technological Development since 2023.

Figure 1: Comparative socio-economic indicators for Itaim Paulista, the East 2 districts nearby, and the city of São Paolo as a whole.



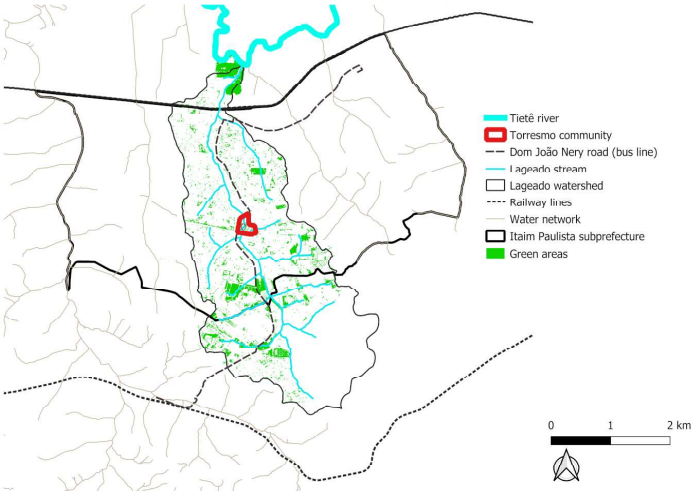
Source: Ana Paula Koury, elaborated with data from the 2024 'Mapa da desigualdade' (Inequality map) by Rede Nossa São Paulo, https://institutocidadessustentaveis.shinyapps.io/mapadesigualdadesaopaulo/ (accessed 5 May 2024).

Added to this picture of social inequality and the over-occupation of land and is the presence of six bodies of water, tributaries of the Tietê river – the largest river in the city of São Paulo, which cuts through the districts of the subprefecture of Itaim Paulista. In the south, towards the administrative limit to the south of the Subprefecture of Itaim Paulista, where dwelling occupations are more vulnerable, there is a large concentration of springs. Furthermore, the sectors with the highest population density are located in sloped areas next to streams, thus at higher risk of flooding (Secretaria Municipal de Desenvolvimento Urbano, 2016).

The Torresmo community is the location where we chose to implement an urban transformation process of transitioning from a precarious urban fabric to sustainable urban development. The goal behind this project is to transform the urban experience of a water-adjacent community frequently impacted by the floods of the Lageado stream (Ribeirão do Lageado) in Itaim Paulista into a sustainable model for São Paulo's peripheral urban development. Torresmo is situated at the midpoint of the basin, at the junction between Dom João Nery road and the Lageado stream (Figure 2). Approximately 200 homes are directly

affected by regular flooding, yet they benefit from the proximity to the road, which serves as a regional mobility axis. The specific conditions of this community and the area it is in form a valuable case study for observing flood impacts in settlements located in high-risk areas as well as the impact of drainage infrastructure.

Figure 2: Location of the Torresmo community in Itaim Paulista, at the junction of the Lageado stream and Dom João Nery road, in the Lageado stream hydrographic basin.



Source: Ana Paula Koury.

Lab Itaim Paulista, coordinated by Professor Ana Paula Koury, has been operating in the eastern periphery of the city of São Paulo since 2015 as a university extension group formalized in December 2016. It adopted the real-world laboratories method (Kraas et al., 2016; Schäpke et al., 2018) in 2018 to trigger urban transformation in partnership with the Klimapolis Laboratory and subprefecture of Itaim Paulista.

A brief history of the community of Torresmo and the area they inhabit

The Torresmo community is a small, informal settlement, also known as a favela, and currently comprises around 200 families. During heavy rains, the houses form a barrier against the water and are hit from two directions: the runoff coming down and the water overflowing from the river. The original nucleus was formed between the end of the 1960s and the beginning of the 1980s, as families from the northeast region of Brazil migrated in search of work and better living conditions. They settled near the Lageado stream in an unoccupied area, when the river was still clean, 'with good water and fish', and they created community ties that continue to this day. This nucleus was consolidated in the 1980s and expanded from the 1990s onwards, as new sectors were added (Silva, 2024).

Torresmo is now made up of four distinct sectors. On the eastern bank of the stream, adjacent to Dom João Nery road, is the original sector. The west one is the first expansion of the community – the second sector – which occurred between the 1980s and the 2000s. In 2003, behind the original sector, a housing complex was built, and the area in front of it was designated for the preservation of the riparian vegetation of the stream (Anelli and Kiste, 2024). In July 2017, the vegetation was removed, and in August, the first informal houses started to appear, forming the third sector of the community. In 2023, the 64 families occupying this sector were relocated to make way for the construction of a large-scale water retention basin. In 2018, the most recent land occupation, by 20 dwellings, of the area close to the Tereza Setuko Koshimae Hatori municipal primary school, on the left bank of the river, formed the fourth sector (Figure 3).

Figure 3: Torresmo community sectors.



Source: Ana Paula Koury; elaborated from satellite image, Landsat/Copernicus.

The residents of the Torresmo community have formed neither an association nor an organized leadership (Silva, 2024). However, the two consolidated sectors of the dwelling occupation, the first and second, are mostly regularized, having access to power and running water services. The sewage network connection is relatively recent, having been installed in 2023; however, it still presents many problems due to the poor work carried out by the Basic Sanitation Company (SABESP).

Building scenarios for urban transformation

Currently, the Torresmo community's most significant problems are the floods. They suffer from inadequate rainwater drainage problems, which exacerbate other issues, such as irregular waste disposal and a lack of garbage collection services in the alleys. The Itaim Paulista subprefecture serves the area, and despite the administrative structure it has in place, the subprefecture lacks the means to handle such a multitude of complex demands. Lab Itaim aimed to support the subprefecture in building a good relationship with Torresmo dwellers and helping them to achieve improvements in their living conditions.

The subprefectures are the smallest administrative units in the city of São Paulo, established during the military dictatorship (1964–1985). They had a sub-

ordinate role in the administrative system and, initially, were only responsible for carrying out local maintenance. In 1989, with the popular government of Luiza Erundina (1989–1992), the subprefectures took on a leading role. They become a tool of administrative decentralization and local autonomy, bringing the population closer to the city governance. They would be the political articulators of popular management at the local scale. However, the city council did not approve expanding the powers of the subprefectures, and it was only in 2002, during the administration of Mayor Marta Suplicy (2001–2004), that the subprefectures were implemented as an entire administrative entity, although without full autonomy to plan and develop the city from local perspectives (Correia and Koury, 2021).

The subprefectures have become vulnerable to political clientelism and, in some cases, to administrative opportunism. This has caused invested resources, especially in peripheral regions where local political participation levels are lower, not to be translated into the improvements expected by the population or proportional to the investments made. The case of the emergency infrastructure works in the Lageado stream, which we will report in the next section, was profoundly affected by such political processes.

Lab Itaim was officially established in December 2016. Its members' first official visit to the subprefecture was facilitated by students of the architecture and urban planning course at São Judas University who were residents of Itaim Paulista. Many agreements have been signed since then, with the Itaim Paulista subprefecture, the Secretariat of Urban Development, and the Secretariat of Climate Change. These documents represent a significant political step that enabled academics to gain access to the subprefecture and the Torresmo community more frequently, demonstrating the openness of some administrators at multiple levels of government to establishing new approaches within the system.

Through such agreements, the real-world laboratory can document the local reality through videos, field surveys, and participatory mapping. They also enable the expansion of local technical capacity by providing studies on problem situations, primarily related to drainage and mobility, as well as providing training courses and other forms of capacity building for the technical staff of the subprefecture. One of the outcomes achieved by Lab Itaim was the establishment of partnerships with the State Institute of Technological Research (IPT) to promote the development of community leaders and provide locals with information on hydrological risks and interventions in electrical networks. In terms of field dynamics, we promote productive

dialogue between residents and the subprefecture, reducing violent discourse and facilitating residents' proposals of urban improvements through the use of illustrated scenarios.

One of the most significant studies conducted by Lab Itaim, in partnership with the State Institute of Technological Research, was the 2020 hydrological modelling of the Lageado basin. This modelling process involved participation from the administration, residents, and students. As a result, we calculated the impact of urbanization on the flood wave at the mouth of the Lageado stream, combining different types of knowledge to build hydrological scenarios. We also identified a system of open spaces for implementing sustainable drainage solutions distributed throughout the watershed. The scenarios were presented to the subprefecture and the municipal secretariats. The goal was to develop an urban scenario for the Lageado basin that could transform the precarious situation and implement a sustainable urbanization model by adopting nature-based solutions and green and blue infrastructure.

Contingencies of unsustainable futures: The emergency infrastructure works

The heavy rains that hit the eastern periphery of São Paulo at the beginning of 2020 were the first contingency that dashed hopes for sustainable local transformation in the Lageado basin, where the community of Torresmo was expected to be the pilot case study for Lab Itaim. The municipal administration, led by Mayor Bruno Covas (2020) and later by Ricardo Nunes (2021–), opted for an emergency solution in response to the flooding. An emergency solution does not require a project proposal, a bidding process, or the application of participatory instruments mandatory in standard Brazilian urban legislation. It is an exception to allow the administration to respond immediately to emergency losses; in this example, these losses were affecting the low-income population living in flood-prone areas along streams and rivers, which lack adequate infrastructure in the peripheral areas of the city.

The second contingency is that, in some cases, the emergency exception rules also serve as a means for engineering companies to construct substandard drainage works at inflated costs, as they are eager to secure a high rate of capital return; these manoeuvres are possible through political clientelism and administrative opportunism, thereby undermining different levels of administration. Under these two contingencies, the administration's political

response placed the solutions presented by Lab Itaim out of reach. The emergency works were presented by the Secretariat of Works and Infrastructure (SIURB) as an unavoidable emergency solution to address the exposure of peripheral populations to hydrological and geological risks. In the Lageado stream basin, the works were carried out in six critical sections. Authorized in August 2020, December 2021, and March, May, July, and August 2022, the technical solutions for each section varied according to the reported emergency and were not guided by a general drainage plan (Silva, 2024).

The negative consequences of the disjointed interventions, lacking a broader urbanization and drainage infrastructure planning, were felt by all parties involved in the process. The residents were not always satisfied with the interventions, and in some cases, new problems arose as a result of the emergency works. The new administration of the subprefecture in 2023 found itself overwhelmed with new demands for maintaining the area and providing resident support. The Municipal Secretary of Infrastructure was questioned about the unexpected negative consequences and the quality of the works, which varied greatly depending on the contracted engineering company.

Lab Itaim sought to mediate the process by monitoring the works, producing technical reports on the execution of the projects and the building site, and trying to establish contact with the construction company to avoid future problems for the residents. Lab Itaim's involvement triggered an unforeseen element of participation in the emergency works process, which was welcomed by the residents and by the administration's political articulation, which acknowledged the evident mistakes in the ongoing work. In this sense, through intervening in the top-down process and seeking to create openings, Lab Itaim was the third unexpected contingency that operated in the situation.

In Torresmo, the works were contracted in May 2022, and the first construction machine arrived on 29 July 2022. In November of the same year, a landslide directly beneath the Dom João Nery bridge caused the fall of a person passing through the area, which outraged the residents. Fortunately, the person just suffered minor scratches. On the same day, the executing company began depositing U-shaped concrete culverts onto the streambed. The culverts were simply placed alongside each other on the streambed. Three culverts were required to match the channel's width (Figure 4).

Figure 4: The Lageado stream emergency channelization works; infrastructure work on the canal, consisting of three culverts.



Source: Drone survey, Lab Itaim Paulista, July 2013.

The work did not include levelling the riverbed, dewatering, or installing foundations. The culvert pieces were not interlocked, and there was no planning for compatibility with the sewage network or a drainage system to handle rainwater runoff from the slopes. The wall formed by the culverts' profile, which divides the community from the stream, was raised with block masonry. This unstable construction system creates a barrier for the water descending from the slopes, trapping it between the wall protecting the stream's bank and the community, thereby increasing the flooding impact from rainwater, especially in the second sector of the community. In addition, the infrastructure also made it difficult to clean the stream, which now requires cleaning teams to traverse the same path of the stream three times to clean all of the culvert channels.

During the execution of the emergency works, Lab Itaim carried out participatory mapping with the community to identify critical points where it was necessary to integrate micro and macro drainage systems. These maps drew the subprefecture's attention to the need for a sewage system and led to a tech-

nical report highlighting the problems encountered during the execution of the work. In an attempt to address these issues felt by the community, the subprefecture carried out a series of complementary works and adaptations to the ongoing project. These unavoidably temporary measures, due to the lack of compatibility between the work and the related infrastructural systems, further compromised the integrity and impermeability of the adopted structural system.

Although the inspection report that initiated the work in the Torresmo community section, issued in May 2022, characterized the situation as an emergency due to the 'partial collapse of the sidewalk, curbs, gutters, and the carriageway of the arterial road and drainage system [...] which poses a risk to [...] local pedestrians and vehicles', the work was officially delivered in May 2023 with an unfinished appearance. The risky conditions of the sidewalk and drainage system had not been altered by November of the same year. In the same month of November, just 22 mm of rainfall was enough to flood the second sector of the community; that had never occurred before the works began, even with as much as 40 mm of rain. The city government has invested tens of millions of reais to improve the lives of the Torresmo community, and while the original sector has seen significant improvements in flooding, residents on the other side of the stream have experienced the opposite.

Two major contingencies undermined the jointly designed proposals for a sustainable urban future in a peripheral area of São Paulo: the heavy rains of 2020, and the influence exerted on the city administration from engineering companies that demonstrated a lack of commitment to an environmental agenda. A third contingency, less expected, was the presence of Lab Itaim, whose project monitoring altered somehow altered the trajectory of emergency works in that location, which achieved unexpected visibility. Although Lab Itaim could not implement a new model of sustainable urbanization, its involvement through issuing technical reports and making demands of public authorities undoubtedly shifted the roles and perceptions of social actors within the urban dynamic.

Smaller, day-to-day contingencies – stemming from poorly planned and executed work in the informal settlement – triggered a snowball effect. The drainage and sewage systems had to be improvised, resulting in a cascade of issues for both the subprefecture and residents. The worsening of drainage conditions in the basin sparked widespread dissatisfaction, prompting complaints from residents and scrutiny from the public prosecutor's office. These

accumulating issues gradually eroded political support for the project, ultimately leading to a reorganization of the involved actors.

From the heavy rains to the infrastructural solution, Lab Itaim sought to foster connections between the subprefecture and the Torresmo residents. As part of the real-world laboratories method, Lab Itaim avoided a premature or moralistic judgment about the works in progress. It maintained adequate distancing, giving voice to the actors and feeding the process with systematic documentation and solid information. Technical reports and scientific meetings facilitated the constructive evaluation of the solutions adopted at the building site. At scientific meetings, we promoted the integration of academics, residents, and administrators. Additionally, the project aimed to facilitate the process of social participation by maintaining an open channel of communication between the actors involved, including public actors, residents, and the contracted company, through periodic meetings.

Analysing what happened in Torresmo, it is important to understand that first, the choice of using grey infrastructure in Torresmo instead of small sustainable drainage solutions should be read within the Brazilian approach to city building, characterized by entanglements between the state and construction companies. For many years, the city of São Paulo has had ties of political interests with construction and engineering companies (Millington, 2021; Petrella and D'Almeida, 2017). Second, the channelization of the stream flowing through Torresmo is rooted in a way of thinking that seeks to control and securitize nature. The presence of this grey infrastructure indicates that the primary challenge in implementing a real-world laboratory in Torresmo was the lack of urban policy regulation during emergency infrastructure implementation, leading to sustainable development goals or co-designed solutions not being considered. However, despite this, Lab Itaim was able to capture the attention of the subprefecture and direct it to the needs of the place for which it aspired to propose solutions. Third, the emergency work in the Torresmo community is a material fact that demonstrates the executing company's disregard for construction quality, the contractor, and the residents, as well as the failure of supervision by the Secretariat of Urban Infrastructure, which allowed the delivery of incomplete and poorly executed work.

The contingencies surrounding the emergency work required continuous interaction among local actors, and this linkage was facilitated by the real-world laboratory approach, which aims to establish a co-design situation between the actors in the area. Inhabitants of Torresmo, the real-world laboratory of Lab Itaim, the Itaim Paulista subprefecture, and extra-local actors, in-

cluding the Municipal Secretariat of Urban Infrastructure and the company responsible for the works, had to interact constantly. The consequences of this interaction constitute a valuable social learning experiment for a number of actors involved in the process. The subprefecture and the Secretariat mediated the works, requiring the companies responsible to justify the result and consider the observations and technical reports made by Lab Itaim. The Secretariat of Urban Infrastructure began to demonstrate great concern with integrating emergency works into the infrastructure and urbanization planning system. Residents became aware of the technical problems affecting them, enabling them to negotiate effectively with the local government. They stopped using violent communication, formed a leadership group, and elected a community representative to the Itaim Paulista Participatory Council. For its part, the subprefecture approached the Torresmo community by establishing productive communication channels to address local demands.

The works of the Secretariat of Urban Infrastructure were no exception to the rule: Public policies are not prepared to function in informal territories such as the Torresmo community. The contingencies that arise in this situation further exacerbate the problems of an overexploited territory and population, leading to new management and maintenance issues. Informality was a starting point for Lab Itaim's work, an unavoidable reality of urbanization that manifested itself especially through the acceleration of urbanization of Latin American countries.

The great challenge in understanding the informal peripheries was to move away from the moral judgments implicit in the notion of order and modernity, to grasp in-depth the mechanisms that act in the reproduction and management of these political, technical, and social territories – mechanisms which ultimately become more evident when unplanned situations occur.

Conclusions to change the unsustainable urban future in São Paulo's peripheries

The unsuccessful experience of the emergency interventions carried out in the Lageado stream (Ribeirão do Lageado) demonstrates the limits of an emergency response designed without relation to an infrastructure and urbanization masterplan – because punctual intervention that does not consider its effects in the socioecological system in which it enacts. Furthermore, the lack of

community participation in the planning of these projects caused harm to all parties involved in the process.

In addition, there is a particular kind of informality in the way in which the emergency infrastructure was built in Torresmo, blurring the distinction between formal and informal. Its dimension of informality comes from the possibility of not following the rules of Brazilian urban legislation and not being part of a masterplan.

While the agency of Lab Itaim was limited by the culture of governance and corporate interests at the local level, its experience in the Torresmo community allowed for rethinking the integration of sustainability guidelines in São Paulo's urban planning efforts. In particular, the lessons learned from interaction with the inhabitants of Torresmo, the subprefecture, and the secretariat are now being formalized into a cooperation proposal aimed at other areas of informal urbanization in São Paulo. This programme, called Lab Sampa, was proposed in January 2025 to the Municipal Secretariat of Climate Change, aiming to address the major socio-environmental challenges in the city's urban peripheries by expanding infrastructure works. Moreover, building on the experience in Torresmo, the programme aims to facilitate and improve communication between local sectors, residents, and the subprefecture as a strategy to integrate maintenance and urban infrastructure works, thereby enhancing management and public policy services. The objective of opening up alternative paths was not achieved in the Torresmo context, but the lab's function as a third contingency changed governance practice in São Paulo's informal settlements on a broader scale.

Understanding the actors, culture, and local identity, strengthening the subprefecture and local technical capacity, and organizing meetings with local managers and residents were strategic elements for Lab Itaim's work in Itaim Paulista to help expand common visions on the causes of infrastructural problems. These same elements will now be tested through Lab Sampa in other peripheral informal areas of São Paulo. The experimental laboratory method, or real-world laboratory, conceived and tested primarily in contexts of the Global North, faced challenges in the case study discussed in this chapter, particularly in the context of Brazilian political culture and urban informality. And yet, it increased the scope of the method to better deal with non-European contexts and contributed to situate planning thoughts on the test ground of the Global South.

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