



# Sanitation in Informal Settlements:

## Integrated local action towards meeting the Sustainable Development Goals (SDGs) in Campinas

### Summary

Evidence confirms that sanitation improvements generate multi-sectoral benefits not only for the achievement of Sustainable Development Goal (SDG) 6 on water and sanitation but for the entire 2030 Agenda. Yet, many urban dwellers in Brazil lack access to adequate sanitation and other basic services, most of which are concentrated in informal settlements. This policy brief results from a participatory research exploring the links between sanitation and the SDGs in Campinas with a focus on informal settlements given their disproportionate vulnerability to service provision inadequacies. Findings highlight multiple synergies between sanitation action and the achievement of targets across SDGs. They further point out that utility efforts need to be combined with multi-sectoral, participatory and context-specific policies, plans and interventions to overcome interconnected risks of inadequate sanitation. The intention is not to prescribe technical solutions but to present opportunities for integrated policies and action across key stakeholders, including the public utility company, educational institutions, Campinas Municipality and respective municipal departments.

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### Key takeaways

- **Sanitation as a cross-cutting principle** can drive integrated action in informal settlements with far-reaching benefits across the SDGs.
- **Knowledge co-production** between the government and communities strengthens the elaboration of policies, programmes and actions that are sensitive to the heterogeneity of informal settlements.
- **Inclusive community engagement** is key for policy and planning as well as the delivery and management of integrated sanitation solutions.

## Introduction

In 2010, access to clean water and sanitation was recognized by the United Nations (UN) as a fundamental human right. Five years later, UN member countries committed to the 2030 Agenda, a set of 169 targets across 17 goals for the promotion of sustainable development. SDG6 - the goal for water, sanitation and hygiene - specifically aims to achieve by 2030 "universal and equitable access to safe and affordable drinking water for all" (target 6.1) and "access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations" (target 6.2). At the national level, the right to basic sanitation has been embedded in the Brazilian Federal Constitution since 1988 making sanitation improvements a mandate for all levels of government (Barcellos, 2014).

Beyond its widely known public health benefits, sanitation contributes to several other aspects of sustainable development as evidenced by two recent studies examining the relationship between sanitation and the SDGs. A systematic global review of more than 500 scientific papers by a multidisciplinary team from University College London (UCL), identified 83 SDG targets that require action on sanitation and highlighted synergies<sup>1</sup> between sanitation and 130 of the 169 targets across all 17 goals (Parikh et al., 2021). When the researchers applied the same methodology to the context of Brazil, they evidenced 87 calls for action on sanitation and synergies with 124 targets (Diep et al., 2020).

In Brazil, an estimated 35 million people still lack access to drinking water supply services and 100 million to sewage collection (SNIS, 2021), with the deficit unevenly distributed. In urban areas, sanitation inadequacies are more pronounced in informal settlements and progress to enhance access has been challenging. The New Legal Framework for Basic Sanitation (Law 14026/2020), which defines informal settlements as areas that are "clandestine, irregular or where it has not been possible to carry out land titling for their occupants" fails to emphasise the need for sanitation improvements in these areas to achieve universal provision (Narzetti and Marques, 2021). These settlements are characterised by unplanned urbanisation and a concentration of low-income dwellers with reduced access to education and the formal labour market. The National Basic Sanitation Plan (PLANSAB) recognises that sanitation is about more than infrastructure, emphasising the quality of the service. However, while PLANSAB further acknowledges the role of socioeconomic and cultural aspects in sanitation deficits, these are not integrated into how access to services is monitored. Overall, informal settlements have historically not received any special consideration in Brazilian policies, including on sanitation.

In Campinas, sanitation deficits are a reality in many informal settlements. Research by FEAC Foundation revealed that 38% of community leaders consulted in informal settlements

consider access to sanitation as critical, precarious or worrisome, with recurrent lack of water and areas not covered by water supply and sewage services (FEAC, 2020).

This policy brief is the outcome of a collaborative research between the Bartlett Development Planning Unit (DPU) - UCL and the Fundação Escola de Sociologia e Política de São Paulo (FESPSP). It provides a localised examination of the links between sanitation and the SDGs to advance safe and inclusive sanitation solutions in Campinas' informal settlements. Findings confirm multi-sectoral benefits of sanitation, including improved public health, enhanced resilience to climate change and disasters and reduced inequalities while also identifying context-specific risks associated with the current state of sanitation services. The aim is to support policy-makers and practitioners in the development of integrated policies, programmes and interventions to improve access to sanitation and advance sustainable development in the municipality. Considering the integrative nature of the SDGs and the far-reaching benefits of action on sanitation, the brief highlights opportunities for collaboration between various municipal departments and the public utility company.

## Methodology

The DPU-FESPSP collaboration builds on the series of work conducted by a multidisciplinary UCL team, including the above-mentioned studies emphasising the potential of sanitation improvements towards achieving the 2030 Agenda (Parikh et al. 2021 and Diep et al., 2020). The aim was to explore localised synergies between sanitation and the SDGs and identify contextual risks associated with inadequate sanitation systems (see Carbonell et al. (2023) for further details).

Building on the Brazil study, this policy brief focuses specifically on informal settlements where action on sanitation is most urgent (Diep et al., 2020; Lopes da Silva et al, 2020). The team selected Campinas due to ongoing efforts by the utility company to improve service provision in informal settlements and because of their interest in establishing linkages between service provision and the SDGs. Five priority SDGs were selected for in-depth examination: Health and Well-being (SDG 3), Clean Water and Sanitation (SDG6), Reduction of Inequalities (SDG 10),<sup>2</sup> Sustainable Cities and Communities (SDG 11) and Action Against Climate Change (SDG 13). Building on SDG 6, this research recognises that adequate and equitable access to sanitation for all requires more than infrastructure to deliver safely managed sanitation along the service chain. Although the basic sanitation definition in Brazil includes solid waste management services, the focus here is on the safe management of water and liquid waste (adopted from Diep et al. 2020).

1: The synergistic link between sanitation and an SDG target means that actions in sanitation can support the achievement of a target and vice versa.

2: Related to SDG10, the research further identified risks specific to SDG5 on Gender Equality.

The research was carried out between November 2022 and February 2023 comprising the collection and analysis of primary and secondary data. This involved reviewing scientific articles, non-governmental organisation reports, news articles, policy documents, municipal plans and legal documents to identify existing synergies between sanitation and the SDGs across policies, plans and interventions while also highlighting the implications of siloed approaches. Evidence from informal settlements was used specifically to illustrate the latter and explore contextualised risks. One informal settlement displaying a variety of sanitation solutions and practices (Sítio Paraíso (Fazenda Taubaté - Área Remanescente - Parte 1) was selected for primary data collection.<sup>3</sup>

## Context-setting

The municipality of Campinas, located in the state of São Paulo (see figure 1), is the capital of the Metropolitan Region of Campinas with a population of 1,170,247 inhabitants (IBGE, 2022). One-third of its territory is considered informal. According to the Municipal Housing Department (SEHAB) there are currently 418 informal settlements in the municipality, which have been registered and categorized on a visual platform.<sup>4</sup>

Since 1974, the public company Sociedade de Abastecimento de Água e Saneamento S/A (SANASA) has been responsible for drinking water supply and the collection, removal and treatment of sewage in Campinas' urban areas. According to SANASA, 99.81% of the city population is served with water supply and 96.42% of the (urban) population with collection and removal of sewage while sewage treatment is estimated at 90.04% (SANASA, 2022). These figures are above the average for the State of São Paulo and Brazil and put Campinas' sanitation performance in the top 25 of the 100 largest cities in Brazil (SNIS, 2021; Trata Brasil, 2022).

Based on the New Legal Framework for Basic Sanitation (Law 14026/2020), which stipulates universal access by December 2033 (measured as 99% of the population with access to water and 90% for sewage collection and treatment), Campinas has already achieved universalisation of basic sanitation services. While the Framework allows for a 10% deficit in access to sanitation, SANASA and the Municipality are more ambitious, aiming for 100% access and treatment by 2025 (SANASA, 2021).



Figure 1: Location of Campinas and Sítio Paraíso.

## Basic service provision in informal settlements

Many inhabitants in unregularised settlements rely on collective connections for water supply. This is characterised by several households connecting to the nearest public network through a shared meter. The collective water bill is divided equally among the households irrespective of household size or level of consumption. Collective connections have been implemented by SANASA since 2012 as a temporary solution to improve access to water in settlements awaiting regularisation, including Sítio Paraíso. They are further aimed at minimising clandestine connections, avoiding water losses and contamination of the network. Because collective connections are provisional appendices to the public network, insufficient water pressure can lead to intermittent supply. In October 2022, Campinas had 1,436 collective meters serving 13,882 families/58,808 people (an average of 9.7 families per meter), which represents approximately 5% of the municipal population but constitutes a significant form of water supply in informal settlements (SANASA, 2022).

3: Primary data collection involved the following: 2 meetings with the public utility company; a focus group discussion (FGD) with representatives of SANASA, Housing Department, Health Department and Environmental Department; two visits to Sítio Paraíso, including a transect walk; a FGD with 20 residents from Sítio Paraíso and an interview with representatives of the Housing Department.

4: The platform can be accessed here: <https://zoneamento.campinas.sp.gov.br/sehab.php>. It classifies 317 settlements as areas of Social Interest and 91 as areas of Specific Interest. The former houses predominantly people of low-income while the latter does not. 10 settlements are without classification and there are 20 settlements with disputes over land.



These figures exclude the number of clandestine connections within collective connections, which exist in some settlements. SANASA has an active program to turn collective connections into individual ones to enhance access to water as part of the regularisation process. In 2022, they established 1,942 individual connections with plans for another 3,500 in 2023/24 (SANASA, 2022).

Tensions between land tenure rights and the right to water supply and sanitation in Brazil have hampered utility provision in informal settlements, particularly regarding sanitation (Hylton and Charles, 2018). As a consequence, most informal settlement dwellers rely on a range of alternative sanitation solutions including the following (as identified in Sítio Paraíso):

- 1) Informal discharge of untreated wastewater into the environment by households (Fig 2);
- 2) Informal decentralised sewage network, with untreated discharge into the environment;
- 3) Septic tanks of varying quality;
- 4) Simple pits with different construction techniques.

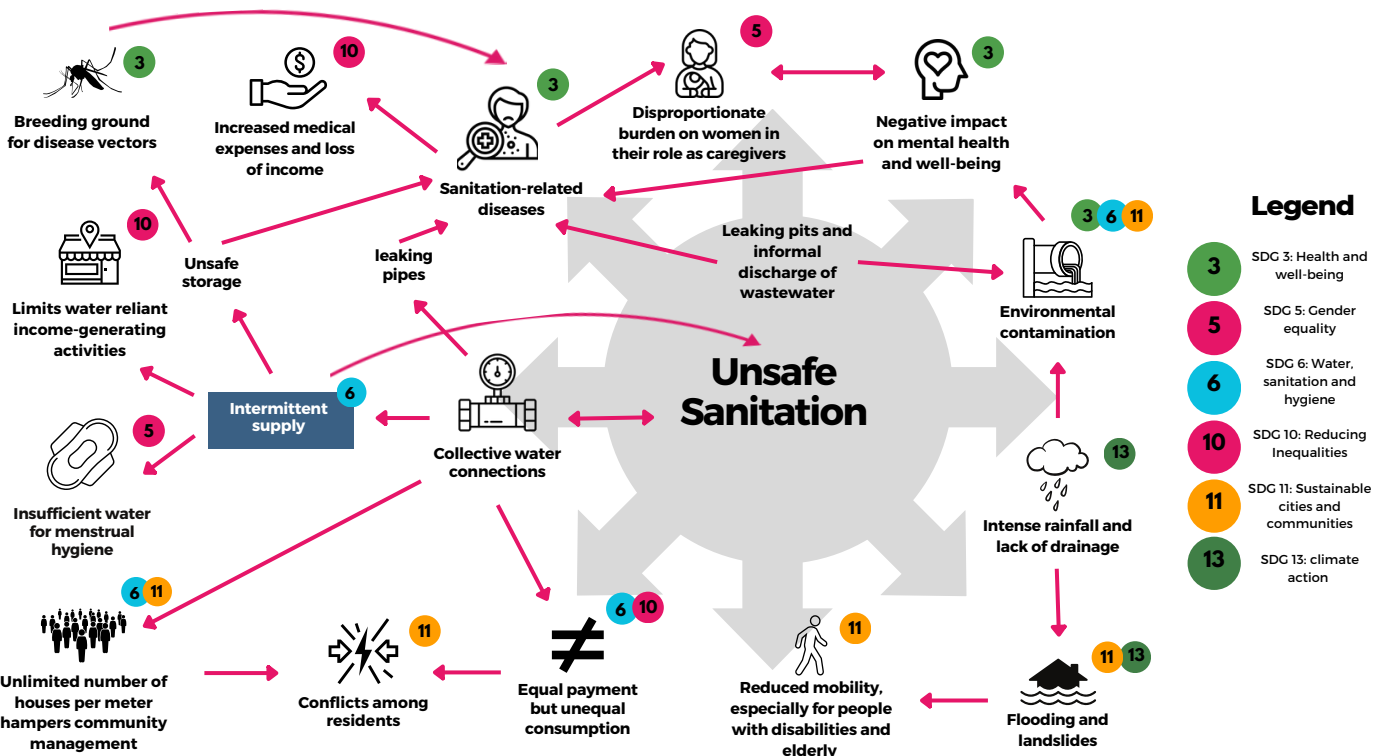


Figure 2: Local stream contaminated with liquid and solid waste.

To support onsite sanitation in informal settlements, SANASA offers a free septic tank emptying service (SAN.C.IN.NC 22 standard) to vulnerable families with an up-to-date water bill.

### Risk Map

The map below highlights the interconnectedness of the risks observed that need addressing to realise synergies between sanitation and the above-mentioned priority goals.<sup>5</sup> While this is not an exhaustive map of risks it illustrates interlinkages that are often overlooked. The following sections provide a more detailed elaboration of risks.



5: Although the sanitation solutions adopted in Sítio Paraíso are similar to those adopted in other settlements, context-specific risk assessments are required for particular settlements to explore similarities and differences. **4**

## Water, sanitation and health

The multiple impacts of sanitation-related diseases, that in turn compromise the ability of low-income households to improve sanitation, highlighted in the Brazil study, were corroborated by residents in Sítio Paraíso. Poor sanitation is thus both a causal agent and a result of recurring vulnerabilities (Diep et al. 2020). Several municipal plans recognise the synergistic link between health and improved sanitation (targets [3.1-3](#); [3.9](#), [3d](#)) (SANASA Sustainability Report, 2021; Municipal Sanitation Plan, 2013; Water Resources Municipal Plan; 2016, etc). Accordingly, given utilities' legal impediments for service provision in informal areas, the free septic tank emptying service is a way to support safe sanitation practices. However, it does not offer a solution for all sanitation arrangements in informal settlements. Moreover, not all informal dwellers know the service exists. In Sítio Paraíso, residents engage in a range of individual and collective self-help initiatives to deal with everyday sanitation deficits. However, these practices are associated with significant interconnected risks. Sanitation-related diseases are connected to both unsafe sanitation infrastructure (e.g. leaking pits) and inadequate sanitation practices (e.g. informal wastewater discharge) but do not affect everyone equally (targets [3.3](#); [3.9](#); [6.3](#); [10.1-2](#); [11.4](#)). Moreover, female residents reported how poor sanitation further affects their mental health and productivity due to their role as caregivers (targets [5.1](#); [5.4](#); [10.1-2](#)).

While collective connections have considerably enhanced access to water, reducing risks and losses, technical limitations can lead to low pressure and intermittent supply (see fig. 3). Where more households are added to existing connections to deal with increasing demand, this heightens the frequency of intermittent supply. The impact is not felt equally across inhabitants and depends on the number of households sharing, the elevation of the house, and the distance to the water meter. As a coping strategy, many households revert to haphazard storage solutions, which has raised concerns in the Municipal Health Department as they offer a breeding ground for disease-transmitting insects and led to dengue outbreaks in Campinas (targets [3.3](#); [3d](#)). The government encourages safe water storage practices to deal with intermittent supply, but there is varying capacity among residents to implement them. Generally, Campinas' approach to tackling disease outbreaks does not specify action in sanitation improvements (Municipal Contingency Plan for Combatting Urban Arbovirolosis 2023/2024, 2022). SANASA's individual connections programme is a positive way forward but depends on land regularisation.

Lack of a baseline for sanitation access in informal settlements means that it is unclear how sanitation is accessed and by whom (e.g. who relies on simple pit latrines, how many unsafely discharge wastewater and where, etc.). The Municipal Sanitation Plan (PMSB) does not offer a disaggregated diagnosis of service provision arrangements across settlements to understand degrees of vulnerability. Accordingly, the Water Service Coverage Indicator adopted in the PMSB does not differentiate individual and collective

water connections and considers both as adequate access. This masks significant inadequacies and intra-settlement variations observed during fieldwork. Together with the fact that service provision is dependent on land regularisation, which SANASA lacks influence over, this might explain why specific (and diverse) sanitation strategies for the context of informal settlements are lacking (targets [6.1-3](#), [10.2-3](#), [11.7](#), [11.b](#)).



Figure 3: Collective water connection pipes prone to leakage and contamination.

## Sanitation for climate change adaptation and resilient settlements

The Brazilian Panel on Climate Change (PBMC, 2014) predicts a greater frequency, unpredictability, and intensity of extreme events for the Southeast region, with large volumes of rainfall in short periods, worsening the risk of flooding, inundation, and landslides. The recent disaster on the Northern coast of São Paulo, associated with heavy rains, demonstrated that due to poor urban planning, informal settlements are disproportionately affected by extreme weather events (Bozzi, 2023). The panel further warns about the intensification of water scarcity. This would aggravate events like the 2013-15 water crisis in the region that predominantly affected informal settlement dwellers and emphasises the importance of safe local storage solutions. Various coping mechanisms in informal settlements are not sufficient to break the cycle of vulnerabilities illustrated in the Risk Map. In Sítio Paraíso, lack of access to adequate sanitation and drainage is an aggravating factor and has worsened the impact of flooding, increasing the spread of diseases (and associated health costs), reducing mobility and damaging people's properties, particularly in lower-lying areas (targets [3.3](#); [11.1](#); [11.5](#)) (see fig. 4). Yet, water supply and sanitation concerns are not fully integrated into disaster risk management plans (Plano de Resiliência de Campinas, 2017).

The Climate Resilience and Adaptation Guide for Municipalities and Regions of São Paulo State (ESP, 2021) recognises the chain of impacts generated by the lack of



adequate sanitation in informal settlements and advocates for measures to mitigate these risks. The document specifically emphasises the issue of water contamination during flooding in areas without sanitation and the multiple impacts on health, poverty and food security (SDGs 1; 2; 3).

Accordingly, the Municipal Policy for Coping with the Impacts of Climate Change and Air Pollution (Law 16.022/2020) emphasises the transversal nature of climate actions and advocates for integrated policies and plans, but without specific guidelines for sanitation as an adaptive strategy. Moreover, the Campinas Resilience Plan 2017-2020 considers PMSB essential to promote the design of resilient urban development, but both lack emphasis on informal settlements. Campinas is developing a Local Climate Action Plan, which provides an opportunity to integrate sanitation improvements that focus specifically on informal settlements and builds on existing policies and plans.

Public participation is flagged as an important aspect in all of Campinas' policies and plans but how the government involves the city's diverse population to ensure a voice for more marginalised groups is unclear. Existing mechanisms like public hearings and virtual workshops offer limited opportunities for informal settlement dwellers to engage due to how information about these events is disseminated as well as where and how they take place. Similarly, limited community involvement and capacity in the management of collective water connections has fostered uncontrolled water use and led to conflict among sharing households. SDG 6 and SDG 11 specifically emphasise the need to enhance community participation with evidence from Brazil where participation of low-income communities has strengthened the implementation and maintenance of sanitation interventions (Diep et al. 2020). Women-led grassroots initiatives in two of Campinas' informal settlements during the COVID pandemic further show the potential of collective action to deal with disasters (Lopes da Silva and Rodrigues Samora, 2021). While the informal decentralised sewer systems in Sítio Paraíso do not provide a safe sanitation solution, they demonstrate how community initiative can help tackle context-specific problems.

## Sanitation inequalities and the marginalisation of informal settlements

Municipal plans and supply indicators tend to treat the city and its inhabitants in a homogenous way disregarding the heterogeneity of informal settlements and the prevalence of alternative sanitation solutions. Lack of a disaggregated exploration and articulation of linkages between sanitation and other key issues means that risks cannot be systematically addressed and synergies are likely to remain untapped. Previous research highlights the importance of gender and intersectional considerations to understand differential vulnerabilities so as not to exacerbate



Figure 4: coping strategy to avoid flooding inside the house (left) and street in precarious situation after heavy rain (right).

multi-dimensional vulnerabilities and inequalities (targets 5.1-2; 5.4; 5.c; 6.2; 10.2) (Diep et al. 2020; Lopes da Silva and Rodrigues Samora, 2021) but policies and plans in Campinas currently lack specific gender and diversity considerations.

The municipality considers informal land tenure as the main obstacle to adequate sanitation provision in informal settlements (targets 10.3; 11.2). Hence, Campinas' urban land regularisation programme for areas of social interest (Reurb-S) encompasses essential infrastructure works, including drinking water supply and sewer systems. While the Municipal Housing Plan aims to "regularise all irregular/ clandestine and precarious settlements and favelas or land occupations" (p. 390), Reurb-S faces several obstacles. Even though Law 13.465/2017 allows infrastructure works to commence before, during or after regularisation, sewerage connections tend to happen at the end as the process requires multidisciplinary assessments and a detailed layout plan for public sewer connections. Recent collaborations between SANASA and SEHAB are a positive development but these processes take time and are hampered by institutional limitations<sup>6</sup>. Sítio Paraíso has started the Reurb-S process but faces ongoing disputes over land. A number of conflicting agendas between municipal departments can further delay regularisation and sanitation improvements. For example, the Environmental Department's conservation agenda can clash with SEHAB's regularisation plans. Lack of coordination between land use planning and environmental protection is stalling sanitation improvements and poor sanitation not only impacts people's health but further compromises ecological conservation.

Opportunities for relocation are significantly limited by Campinas' social housing deficit. Informal settlements identified as risk areas, close to railway lines, or with land disputes may remain in limbo for years and foreclose better access to basic public services, as this could be seen as authorisation for permanent residency. At the same time, tying sanitation improvements solely to Reurb-S is limiting and prolonging the prospect of adequate access to sanitation for many informal settlement dwellers with far-reaching consequences.

6: There is currently a regularisation waiting list due to the high number of informal settlements in Campinas. The order is not defined by the level of need but priority is given to settlements that already have the technical assessment started. **6**



## Recommendations

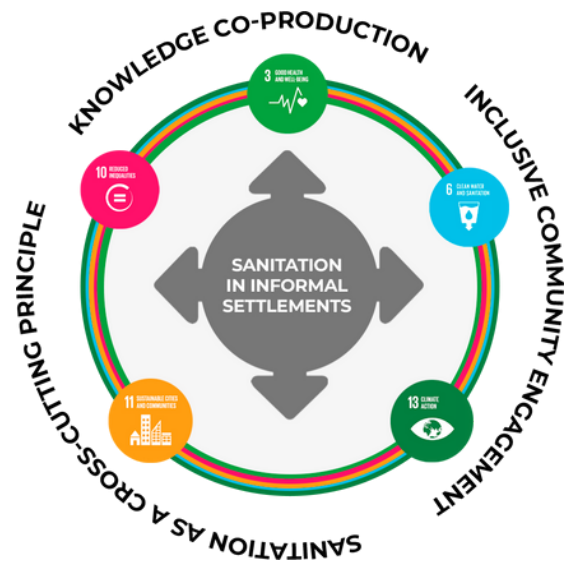
### Sanitation as a cross-cutting principle

Adopting sanitation as a cross-cutting principle can drive integrated action in informal settlements and address multi-faceted risks across the SDGs associated with inadequate sanitation. In Campinas, SEHAB already has an in-depth understanding and direct relationship with informal settlements through Reurb-S. Extending SANASA’s collaboration with SEHAB to other departments (including Health, Planning, Public Services, Social Assistance and the Environment) strengthens the partnership with the municipality and raises the profile of sanitation. The creation of an informal settlements group composed of multi-sector representatives can advance an integrated approach in informal settlements and resolve conflicting agendas. SEHAB’s visual platform is an important tool to support this. For instance, pooling of resources to speed up the land regularisation process advances sanitation improvements to harness multi-sectoral benefits. However, it is equally important to support the improvement of alternative sanitation solutions independent of Reurb-S (i.e. decoupling from land tenure status) as is the case for SANASA’s collective water connections and free pit emptying service. Similarly, elsewhere in Sao Paulo the state utility company SABESP, as part of the Novo Rio Pinheiros project, has improved sanitation in informal settlements and reduced river pollution (São Paulo State Government, 2021).

The upcoming development of Campinas’ Local Climate Action Plan offers an opportunity to mitigate cross-cutting risks in informal settlements by incorporating sanitation as an adaptive strategy. Integrating progressive sanitation improvements into risk management and climate action enhances the resilience to droughts and flooding. At the same time, PMSB can be strengthened by acknowledging particular challenges in informal settlements related to managing risks and climate action (e.g. risk associated with water storage solutions in times of scarcity and the disproportionate burden on women to deal with disasters).

### Knowledge co-production

The combination of existing data from SANASA with municipal databases creates a transdisciplinary knowledge base that forms the basis for integrated sanitation solutions. This helps, for instance, to elucidate the relationship between dengue outbreaks and intermittent water supply, or between access to sanitation, land tenure and environmental conservation. Building on existing partnerships with research institutions in Campinas, such as UNICAMP, PUC Campinas and FEAC Foundation, can further promote interdisciplinary and innovative approaches. For informal settlements in particular, where governments lack detailed insights, co-producing a situational diagnosis with



informal settlement dwellers can reveal the limiting factors for adequate service provision specific to their context and guide the development of strategies to mitigate current interconnected risks and harness benefits of sanitation across SDGs. Importantly, there is a need to understand diverse vulnerabilities within and across informal settlements according to gender and other social categories and relations (Diep et al. 2020). Dialogue between scientific and community knowledge strengthens the elaboration of policies, programmes and actions that are sensitive to the heterogeneity of informal settlements. There is an opportunity to build upon the Community Risk Mapping under Campinas’ Resilience Plan.

### Inclusive community engagement

Being the most affected by the sanitation deficit while also the most knowledgeable about the challenges faced, it is fundamental for informal settlement dwellers to participate in planning and decision-making processes regarding sanitation and beyond. Campina’s Master Plan (2018) and all sectoral policies flag the importance of participation but necessitate specific emphasis on informal settlements. Enabling diverse informal settlement dwellers to participate requires careful consideration in the planning and delivery of participatory processes and events to address existing power imbalances and inequalities regarding gender and other social characteristics and relations. Community engagement is further key for the management and maintenance of services but requires government leadership. Findings identified a need to enhance community training and guidance to manage collective connections in a way that fosters fair and inclusive access as well as support with safe storage solutions. There is scope to build on existing initiatives such as SANASA’s training for communities as well as collective action evident through informal sewage networks and women-led initiatives during COVID in other informal settlements.

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