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Future Urban Sustainability: Lessons Learnt From the SDGs and Perspectives for a Post-2030 Agenda

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Abstract

Given the current challenges of global environmental change and other pressing issues, cities—along with other urban actors—must intensify and expand their efforts to operate within planetary boundaries and advance sustainability agendas. As we move toward the period beyond 2030, it will be crucial to establish and meet goals that reduce ecological impacts, advance social justice and inclusion, and avert further environmental degradation. The limitations of the existing Sustainable Development Goals (SDGs) should serve as a basis for deepening structural and conceptual discussions on what a future framework might entail. Against this backdrop, we, as editors of the thematic issue, invited articles that make three central contributions to highlighting the significance of cities and urban actors: First, by examining different global urban experiences, the articles explore how tensions, contradictions, and synergies of the SDGs unfold in urban contexts. Second, they shed light on the challenges and requirements urban actors encounter when translating the SDGs into local action. And third, they put forward ideas for overcoming existing barriers in shaping a post-2030 sustainable development agenda. This editorial categorizes some of the existing tensions in current SDG implementation and outlines ways to conceptualise a post-2030 agenda from an urban perspective.

Keywords

2030 Agenda; cities; municipalities; SDGs; sustainable cities; urban development

1. Introduction

When the 2030 Agenda with its 17 Sustainable Development Goals (SDGs) was launched in 2015, the United Nations (UN) presented it as a decisive political framework for achieving sustainable development on a global scale. The recognition of cities as key actors in the 2030 Agenda—particularly, but not only, through the inclusion of SDG 11—has been widely regarded as a significant milestone compared to previous global frameworks, such as the Millennium Development Goals. However, considering the ongoing dramatic global environmental change and increasing socio-spatial inequalities, among other urban challenges, cities and other urban actors need to broaden their efforts. Looking ahead to the post-2030 era, they must set and achieve targets for reducing their environmental impact, promoting justice and inclusion, and preventing further planetary harm (Bai et al., 2022; Rockström et al., 2023). It is therefore timely to critically analyse the lessons learnt from the SDGs and to develop perspectives for a post-2030 agenda from a distinct urban standpoint.

2. Current State of Global and Urban Sustainability and the SDGs

Developments such as the Covid-19 pandemic, the erosion of democratic norms in many countries, as well as growing scepticism toward multilateralism and supranational regulation, raise questions about the striking power of the SDGs and their underlying approach of “global governance by goal setting” (Biermann et al., 2017; Hickmann et al., 2024). Additionally, critiques of the 2030 Agenda have been voiced concerning the SDGs’ general lack of transformative impacts (Hickmann et al., 2024), their alignment with economic growth paradigms (Eisenmenger et al., 2020; Hickel, 2019), as well as their technocratic and managerial approaches to sustainability (Brand et al., 2021). These critiques are echoed in hard data: The 2025 UN progress report states that of the 135 measurable targets (of a total of 169), only 18% are on track, while the majority of targets show insufficient progress (31%), stagnation (17%), or even regression (18%) to levels below the baseline of 2015 (UN, 2025). The last years marked record-high global greenhouse gas emissions and continued biodiversity loss, an unmistakable signal that many efforts towards sustainability are falling short. The UN Secretary-General has responded with a call for accelerated action, stressing that “in a world of unprecedented wealth, knowledge and technologies, the denial of basic needs for so many is outrageous and inexcusable” (UN, 2024). The evaluation of SDG 11 demonstrates less regression compared to other goals; yet progress remains especially weak on housing affordability, access to basic municipal services, climate-resilient infrastructure, and civil society participation in urban planning (UN, 2025). At the same time, its urban emphasis has advanced SDG localization, fostered new coalitions and indicator systems, and in some cases influenced municipal budgeting and planning processes (Koch et al., 2023; Krellenberg et al., 2019; Valencia et al., 2019).

Even though these developments could raise the question of whether a post-2030 agenda is expedient at all, we argue that the current state of global environmental degradation, as well as increasing social conflicts, urgently calls for a global sustainability agenda that extends beyond 2030. The shortcomings of the SDGs should be learnt from to enrich broader structural and conceptual debates in this regard.

In this context, the thematic issue seeks to make three key contributions that foreground the role of cities and urban actors: First, drawing on experiences from cities in Argentina, Brazil, Chile, and Europe, the collection of articles assesses the tensions, contradictions, and synergies of the SDGs as they materialize in urban settings.

Second, the articles address the constraints and needs faced by urban actors in localizing the SDGs, and third, they offer suggestions for moving beyond current obstacles in the post-2030 period.

3. Key Tensions in Urban SDG Implementation

This thematic issue, along with existing literature, highlights four key tensions in local SDG implementation which hold critical relevance for a post-2030 agenda. By unpacking these tensions, the articles collectively shed light on the limitations of the current framework and the need for a more coherent as well as context-sensitive approach beyond 2030. The following thematic tensions structure the analytical core of this thematic issue.

3.1. *Municipal Agency vs. Structural Dependency*

The relationship between cities and nation states varies by context. Despite growing municipal engagement—visible, for instance, in the rise of voluntary local reviews (VLRs)—the capacities of cities to implement transformative change remain constrained by structural dependencies on national legal frameworks, funding mechanisms, and political dynamics (Krellenberg et al., 2019). As such, cities occupy a dual role: operating as subordinate levels of governance while simultaneously emerging as potential counter-powers capable of advancing conflictive or confrontational political agendas (Bullmann & Gitschmann, 1985). This tension crystallizes also in sustainability governance, where cities have, at times, positioned themselves in direct opposition to national policies.

In this context, Partzsch (2025), for instance, examines how VLRs can function as instruments of local environmental sustainability even if they are not a priority at other political levels such as the EU, nation states, and regions. Through applying a multi-level governance perspective on the “green goals” of the 2030 Agenda, the article shows how municipalities are occasionally leading the way in environmental action both horizontally, with site-specific measures, and vertically, with multi-level measures. Ferlicca (2025), on the other hand, explores the role of national urban policies (NUPs) in localizing the 2030 Agenda. Her analysis of Argentina’s NUP reveals significant limitations, including weak governance coordination, limited policy innovation despite international support, and high vulnerability to political transitions. Nevertheless, the study argues that when designed with attention to existing institutional arrangements and realistic implementation pathways, NUPs can serve as valuable vehicles for SDG localization.

3.2. *Standardizing Sustainability vs. Emphasizing Local Specificities*

The 2030 Agenda is underpinned by a strong belief in evidence-based governance, with global indicators serving as the primary means for monitoring progress toward the SDGs. At the local level, indicator-based assessments of SDG implementation are similarly considered an appropriate means to manage urban sustainability (Michalina et al., 2021). However, the selection and contextualization of sustainability indicators is a complex endeavour and nation states as well as municipalities struggle to adjust and use these global indicators as tools to measure sustainability on their respective levels. Therefore, a tension between standardized sustainability indicators, which help to achieve comparability on the progress of the SDGs, and specifically defined sustainability indicators, which monitor local sustainability measures and which align

with existing urban strategies, is visible (Klopp & Petretta, 2017). Practices such as “cherry-picking,” hence, prioritizing some SDGs while neglecting others (Forestier & Kim, 2020), stand against one-size-fits-all indicator sets, which overlook the contextual specifics of a city. Furthermore, indicators and data viewed in isolation make it difficult to assess the interrelationships between different SDGs.

The contributions in this thematic issue illustrate how local actors negotiate and adapt to these constraints. Busch et al. (2025) show how participatory approaches can generate neighbourhood-level SDG indicators and integrate them into socially oriented urban renewal programs. Hofmann et al. (2025) demonstrate how participatory approaches can not only support local monitoring, but also provide the baseline for identifying synergies and negotiating priorities between different targets. Furthermore, through mapping contextualised risks associated with unsafe sanitation, the authors demonstrate that it can be a strength to conceptualize SDG interconnectedness through the synergies and trade-offs between different dimensions. Moreover, Peters and Liedloff (2025) reflect on the long-term processes and multiple challenges of defining and adapting local SDG indicators to measure inputs, outputs, outcomes, and impacts within the German national framework.

3.3. Data Availability vs. Data Gaps

Closely linked to the question of localizing indicators are tensions around data availability and gaps, as well as emerging possibilities of using new kinds of data sources, which can provide useful tools for SDG implementation. While the 2030 Agenda places strong emphasis on quantification, the pitfalls of this approach are clearly visible. This is evident not only at the global level, where no data is yet available for 34 of the 169 targets, but also at the local level, where the lack of disaggregated data, varying standards of data generation, and the mismatch between data collected at local and national levels—including a lack of measuring externalizations and spillover effects—become visible (Engström et al., 2021). Here, Peters and Liedloff (2025) point out that the availability of data for cities is not only relevant in terms of timeframes and coverage but—given their limited resources—also in relation to cost issues.

In addition, advances in digital technologies and novel data sources offer potential for improving SDG monitoring (Kharrazi et al., 2016; Koch et al., 2023), yet they also introduce governance challenges, including risks related to privacy, surveillance, and corporate influence (Koch & Beyer, 2025). The close genealogy of the discourses of smart cities, sustainable cities, and climate-neutral cities and their relations has been described in the article by Beretta and Bracchi (2025), who subsequently argue for a stronger consideration of justice dimensions.

3.4. Transformation vs. Green Growth and Neoliberal Continuity

A fourth tension concerns the frequently mentioned critique of the SDGs and their hardly unfolding transformative approach due to their embeddedness within a pro-growth perspective, particularly visible in SDG 8 “Decent work and economic growth.” Proponents of green growth, who consider a decoupling of economic growth from environmental impacts possible, stand in opposition to advocates of post- and de-growth approaches (Lerpold & Sjöberg, 2023). While this contradiction does not stem from a specific urban perspective, it affects SDG implementation in cities. Kaika (2017) states that the New Urban Agenda, which is based on the SDGs, fosters techno-managerial solutions, and Weber (2017) points to the risk that the 2030 Agenda ultimately promotes a contested neoliberal model of capitalist development. While

acknowledging these critiques, others consider the SDGs as “important, if imperfect” and “an unprecedented global effort...to avert catastrophic and irreversible global warming” (Perry et al., 2021).

In this thematic issue, the tension between the SDGs with their neo-liberal tendencies and rather top-down approach in its development and application on the one hand, and the transformative potential of grassroots urbanism on the other hand, is described by Vergara-Perucich and Arias-Loyola (2025). Their analysis shows how community-led initiatives can foster economic autonomy, solidarity, and political advocacy, challenging the dominant development logic incorporated into the current 2030 Agenda. Furthermore, Beretta and Bracchi (2025) show how the sustainable city paradigm depicted in SDG 11 is increasingly coupled with neoliberal and smart city discourses and ultimately embedded in imaginaries of the climate-neutral city.

4. Conceptualizing a Post-2030 Agenda From an Urban Perspective

Discussions on a post-2030 agenda have started, with most authors favouring the reform and realignment of the SDGs over their outright rejection in a post-2030 world. These discussions are embedded in wider global developments which have not been directly part of this thematic issue but will have fundamental impacts on cities. They include the rapidly rising use of artificial intelligence (AI) for sustainability—contrasted with concerns about the sustainability of AI, and related debates on governance, safety, and the privacy of data and citizens, as well as vast natural resource consumption (Francisco & Linnér, 2023). Furthermore, recent studies highlight the impact of geopolitics on sustainable development (Nguyen et al., 2023), emphasizing the links between conflict and unsustainability that merit stronger engagement with approaches to peace-centered sustainable development through concepts such as the social and solidarity economy (Lopera-Arbeláez & Richter, 2024).

Ideas for SDG reform include a post-2030 agenda with fewer but clearer goals (e.g., Cernev & Fenner, 2024), a more systematic prioritization supported by SDG interaction analysis including their networks and underlying mechanisms, as well as the development of science-based targets (Pradhan, 2023). Zwitter et al. (2025) argue that non-material aspects of human flourishing, such as cultural, psychosocial, and community-based aspects, should be more strongly considered and specified through localized goals and indicators in the post-2030 agenda. To overcome the divide between green growth and post-growth approaches, Fioramonti et al. (2022) propose a so-called well-being economy that focuses on human and ecological well-being instead of material growth as the guiding principle for the post-2030 agenda.

Moreover, we consider it paramount to retain an explicit urban focus, as cities will play an increasingly decisive role in global sustainability. Specific post-2030 urban goals are, among others, considered by Fuso Nerini et al. (2024), who put forward that variable time horizons need to be defined. For SDG 11, they suggest, for example, by 2040 universal access to cooling services in housing and by 2050 green, digital, electric, sustainable cities in line with net-zero emission objectives. Bai (2024) argues for explicit global targets for cities and businesses, which would help empower cities to do more and avoid cherry-picking. While the UN member states need to address the failures of the SDGs in terms of insufficient funding, lack of accountability, and the gap between rhetoric and action when establishing a post-2030 agenda, it is indispensable to consider also the experiences and lessons learnt from urban science in implementing the SDGs (Bai, 2024).

The authors of the articles in this thematic issue contribute to these ongoing debates with different lessons learnt for the post-2030 agenda.

4.1. Anchoring Multi-Stakeholder Participation

Several articles of this thematic issue highlight that local perspectives on SDG implementation forefront the need to recognize the plurality of actors and actions at the core of sustainable development, and therefore, develop stronger mechanisms for anchoring participation and ownership in implementation processes. This includes a stronger focus on the multiple actors in informal settlements (Hofmann et al., 2025) and grassroots organizations and coalitions (Vergara-Perucich & Arias-Loyola, 2025) and aligns with the demand by Widerberg et al. (2023) for better networked multi-stakeholder partnerships. They also emphasize that any sustainable development agenda needs to place principles and practices of justice and equality at the core (Beretta & Bracchi, 2025; Hofmann et al., 2025; Vergara-Perucich & Arias-Loyola, 2025).

4.2. Understanding Localization as a Non-Linear Process

Furthermore, the articles in this thematic issue contribute to a more nuanced understanding of the meaning and requirements of localization. Hofmann et al. (2025) and Busch et al. (2025) propose innovative and grounded methodologies for understanding the relationality, interconnectedness, and procedural nature of SDG implementation, and for subsequently prioritizing actions considering specific urban contexts. The example of sanitation by Hofmann et al. (2025) highlights the necessity of intentionally foregrounding goals that are often non-prioritized (see also Barberà-Mariné et al. (2024) for the case of environmental goals). The long-term perspective by Peters and Liedloff (2025) argues that any monitoring and decision-making has to be carried out systematically and strategically integrated into broader national frameworks.

4.3. Offering Cities Capacities and Resources to Maneuver

The articles also unpack the need for further resourcing of local institutions as well as for holding them accountable (Partzsch, 2025). They emphasize that this resourcing should not only be understood in financial terms but also in terms of capacity building and technical support, while highlighting the role of collaborations with international agencies (Ferlicca, 2025). Any form of resourcing becomes particularly pertinent in the absence of political will. This matters especially in situations of conflicts between national governments, who act as signatories to the SDGs, and local urban actors, who are the implementors of most goals (Ferlicca, 2025), or in situations of structural neglect and marginalization of certain urban populations and their initiatives (Vergara-Perucich & Arias-Loyola, 2025).

5. Conclusion

In synthesis, the thematic issue contributes to efforts of accelerating urban SDG implementation and negotiating a post-2030 urban sustainability agenda by highlighting four inherent tensions and how they are being assessed and negotiated across different geographic contexts and by diverse actors. The articles emphasize the importance of adopting localized as well as justice-oriented perspectives and they provide lessons that contribute to streamlining monitoring processes, ensuring greater coherence and local adaptation of indicators in multi-stakeholder collaborations.

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Conflict of Interests

The authors declare no conflict of interests.

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“So Connected yet so Distant”: Integrated Sanitation Action in Campinas to Meet the SDGs

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Abstract

Research shows that improving sanitation brings wide-ranging benefits across multiple sectors, contributing not only to the success of UN Sustainable Development Goal (SDG) 6—focused on clean water and sanitation—but also to the broader objectives of the 2030 Agenda. However, many people living in Brazil’s urban areas still lack adequate sanitation and essential services, with these deficiencies being especially prevalent in informal settlements. This article is an output from a participatory research project that explored the links between sanitation and the SDGs, which focused on the municipality of Campinas in São Paulo state with an emphasis on informal settlements because they are disproportionately affected by service provision inadequacies. Findings highlight multiple synergies between sanitation action and the achievement of targets across SDGs, whereby residents are likely to experience wide-ranging benefits from adequate sanitation. They further point to the need for multi-sectoral, participatory, and context-specific policies, plans, and interventions to overcome interconnected risks associated with inadequate sanitation. The authors advocate for a transdisciplinary approach to dealing with complex societal problems and conclude by presenting opportunities for integrated policies and action across key stakeholders. The article further offers valuable reflections and lessons learned for how we approach development and engage with complex challenges post-2030.

Keywords

Brazil; informal settlements; participatory research; sanitation; São Paulo; sustainable development goals

1. Introduction

In 2010, access to clean water and sanitation was recognised by the UN as a fundamental human right. Five years later, sanitation became a distinct human right requiring separate treatment from water to address sanitation-specific challenges (Office of the United Nations High Commissioner for Human Rights, 2015), an important milestone that raises the profile of sanitation internationally. Also, 2015 marks the launch of the UN 2030 Sustainable Development Agenda which member states have committed to through an interrelated set of 17 Sustainable Development Goals (SDGs) with 169 targets. SDG6—the goal for water, sanitation, and hygiene—specifically aims to achieve by 2030 “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” (United Nations, 2015, SDG target 6.2).

While the benefits for public health are widely acknowledged (e.g., see Mara et al., 2010), adequate sanitation further plays a crucial role in relation to several other aspects of sustainable development. This is evidenced in a growing body of work examining the relationship between sanitation and the SDGs. A global study by a multidisciplinary team from University College London (UCL), identified numerous SDG targets that necessitate action on sanitation and further highlights synergistic linkages between sanitation and more than two-thirds of SDG targets, which implies that sanitation action can support the achievement of a target and vice versa (Parikh et al., 2021). Similar results emerged when the group of researchers applied the same methodology to the context of Brazil (Diep et al., 2020). Both studies clearly emphasise the need for more localised, context-specific explorations of linkages to develop integrated policy and action. Yet, siloed approaches prevail, and sanitation continues to be sidelined and under-funded despite its importance in the water supply, sanitation, and hygiene sector and the wider benefits of sanitation improvements for urban development and sustainability (Bobbins et al., 2023; Norman et al., 2021; Schertenleib et al., 2021; Scott et al., 2019). This goes hand in hand with a general persistence of siloed policy and planning approaches even though “almost every social or political problem has multiple components” that do not fall “clearly into any one discipline’s exclusive domain. Therefore, to gain a complete appreciation of the phenomenon, many relevant orientations must be utilized and integrated” (DeLeon & Vogenbeck, 2006, pp. 4–5). Cole and Low (2023) argue for a need to rethink how we address complex challenges to prevent unjust outcomes that perpetuate inequity and exclusion, in this case in reference to climate-related concerns. Both align with the principles of transdisciplinarity that aim to bridge academic and societal knowledge to address complex problems. Lang et al. (2012, pp. 26–27) define transdisciplinarity as a “reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge.” It is thus oriented towards solutions that are aimed at transformation. Policy sciences offer an approach that is based on such principles as it is grounded in problem-focused analysis and action, rather than guided by disciplinary theories and methods, and consequently relies on integrated inputs from multiple disciplines and sectors (Faria, 2018). Although Brazil has seen increasing legitimisation and institutionalisation of policy sciences across academic, governmental, and societal spheres, there remains a significant journey to transition fully from multidisciplinary approaches to transdisciplinarity in policy and practice (Faria, 2018). Facilitating and guaranteeing inputs from all communities of knowledge proves challenging. All too often, broadening participation in a way that enables active and meaningful engagement of all actors, particularly with regard to less powerful and more marginalised groups, remains difficult, including in the sanitation sector (Lang et al., 2012; Tippet & How, 2020).

Since 1988, the Brazilian Federal Constitution has recognised access to basic sanitation as a fundamental right, thereby requiring all levels of government to take responsibility for improving sanitation services and play a key role in delivering the SDGs, particularly at the local level (Bilsky et al., 2021; de Barcellos, 2014). Yet, according to the National Information System on Sanitation (Sistema Nacional de Informações sobre Saneamento) approximately 35 million people still lack access to drinking water supply services and 100 million to sewage collection, with significant challenges regarding treatment (Sistema Nacional de Informações sobre Saneamento, 2023). With deficits for both water supply and sanitation unevenly distributed, municipalities across Brazil tend to prioritise water supply networks over sanitation improvements (Marcon & Philippi, 2010). In urban areas, service shortfalls are especially severe in informal settlements, and progress to improve access has been slow. This is partly due to a constitutional tension between the right to property and the right to water supply and sanitation. Legally, formal service providers are only allowed to serve households with proof of ownership. While advances have been made for provisional water supply connections in the absence of formal tenure, sanitation provision is more complex and thus informal dwellers largely rely on local, and often inadequate, sanitation solutions (Hylton & Charles, 2018; Narzetti & Marques, 2021). Access to services in informal settlements is assumed to be below official statistics but disaggregated data to understand intra-urban disparities, particularly in informal settlements, is limited (Narzetti & Marques, 2021; Snyder et al., 2013). Informal settlements are characterised by unplanned urbanisation and a concentration of low-income dwellers with reduced access to education, the labour market, and financial credit, largely because they lack proof of residence. According to the 2022 census carried out by the Brazilian Institute of Geography and Statistics, there are more than 6,300 irregular settlements in the country, corresponding to around three million households and approximately 11 million residents; of these, around 88% are concentrated in metropolitan regions (Instituto Brasileiro de Geografia Estatística, 2022). These are defined as “clandestine, irregular or where it has not been possible to carry out land titling for their occupants” (Government of Brazil, 2020).

The 2020 Legal Framework for Basic Sanitation (Law 14026/2020) has transformed Brazil's sanitation sector by promoting private sector participation to attract investments but without a clear pro-poor legal direction for universal access in low-income informal settlements (Narzetti & Marques, 2021). Historically, Brazilian policies, including those related to sanitation, have largely overlooked informal settlements and failed to address their specific needs (Ministério do Desenvolvimento Regional, 2019). Although the National Basic Sanitation Plan does not treat sanitation merely as infrastructure, placing emphasis on the quality of services and acknowledging the impact of socio-economic and cultural factors in sanitation shortcomings, Table 1 shows that these do not influence how access to services is categorised and monitored.

As will be elaborated below, inadequate sanitation in informal settlements has affected inhabitants negatively in multiple ways. At the same time, the provision of adequate sanitation has the potential to enhance different aspects of people's lives. This article offers a localised examination of the links between sanitation and the SDGs in a municipality of São Paulo state as a basis to advance safe and inclusive sanitation solutions through integrated action. Specifically, it focuses on the municipality of Campinas with particular emphasis on informal settlements where sanitation deficits and their implications are more pronounced. It seeks to promote the development of integrated strategies—encompassing policies, programmes, and initiatives—to enhance access to sanitation and advance sustainable urban development. Research findings highlight the wide-ranging benefits of improved sanitation, such as better public health, increased resilience to climate change and disasters, and a reduction in social inequalities. They further

Table 1. Characterisation of service provision deficits adopted by the National Basic Sanitation Plan.

Component	Adequate provision	Deficit	
		Inadequate provision	No provision
Drinking water supply	Uninterrupted supply from the network or by well, spring, or cistern	• Among the group with water supply connected to the network, or well, or spring, the proportion of households that: (a) have no internal plumbing; (b) receive water that does not meet drinking water standards; and (c) have intermittent supply • Use of cisterns for rainwater, which provides water that is detrimental to health, or in insufficient quantity to protect health • Use of a tank supplied by a water tanker	All situations that do not fall within the scope of the guidelines and that constitute practices considered inadequate
Sanitation	• Sewerage connection with treatment • Use of septic tank	• Sewerage connection without treatment • Use of unimproved pit latrines	

Source: Adapted from Ministério do Desenvolvimento Regional (2019, p. 35).

identify context-specific risks associated with the current provision of sanitation services that need addressing. Considering the integrative nature of the SDGs, and the extensive benefits of sanitation action, the article advocates for transdisciplinarity to foster collaborative policies and action between various stakeholders.

Section 2 presents the methodology adopted, followed by contextual information about the municipality of Campinas and the provision of services, with a specific focus on informal settlements. Section 3 discusses the identified synergies and risks between sanitation and the SDGs followed by a discussion on the potential for integrated sanitation action in informal settlements. Section 6 presents potential avenues to foster transdisciplinary approaches for integrated policies and action and offers valuable reflections and lessons learned for how we approach development and engage with complex challenges post-2030.

2. Methodology

This article is the outcome of a collaborative research between the Bartlett Development Planning Unit at UCL and the Fundação Escola de Sociologia e Política de São Paulo. It builds on the above-mentioned work at UCL exploring the linkages between sanitation and the SDGs (Diep et al., 2020; Parikh et al., 2021). The research directly responds to the need for localised case studies to aid the development of context-specific action. Methodologically, the SDGs form part of an analytical framework that is based on an approach developed by the UCL team in collaboration with eThekweni municipality for a study in Durban, South Africa, which constitutes the first localised mapping of linkages between sanitation and the SDGs. It adds the mapping of contextual risks associated with the provision of sanitation infrastructure and services to the original methodology, which focused on synergies and trade-offs between sanitation and the

SDGs (for further details, see Carbonell et al., 2023). The identification of risks helps to reveal the implications of inadequate sanitation systems that require attention in future sanitation interventions.

The research underpinning this article focused specifically on the context of informal settlements where sanitation action is most pressing. The municipality of Campinas was chosen as the case study due to ongoing efforts by the public utility company Sociedade de Abastecimento de Água e Saneamento S/A (SANASA) to enhance service provision in informal settlements and a keen interest to link their work to the SDGs. As discussed in more detail in Section 3.1 below, SANASA has put considerable effort into improving service provision in informal settlements, particularly water supply. Regarding the SDGs, as a signatory to the UN Global Compact since 2012 (an international corporate sustainability initiative geared towards advancing human rights and societal goals—<https://unglobalcompact.org>), the utility has issued yearly sustainability reports since 2012. The most recent report shows how SANASA uses the SDGs as a framework to monitor and communicate how their actions not only support the achievement of SDG6 but further contribute to meeting all 17 SDGs (see SANASA, 2025, pp. 136–137). The aim of the research was threefold: (a) to explore localised synergies between sanitation and the SDGs that can be harnessed through more integrated sanitation interventions; (b) to identify contextual risks associated with inadequate sanitation systems; and (c) to use the insights from (a) and (b) to reflect on the potential for more integrated policy and practice in Campinas and beyond. The team selected six priority SDGs for in-depth examination with relevance for informal settlements: health and well-being (SDG3), gender equality (SDG5), clean water and sanitation (SDG6), reduction of inequalities (SDG 10), sustainable cities and communities (SDG 11) and action against climate change (SDG 13). We adopted a definition of sanitation aligned with SDG 6.2 (see Section 1 above) acknowledging that ensuring adequate and equitable access for all goes beyond infrastructure alone and requires the safe management of sanitation across the entire service chain. While the basic definition of sanitation in Brazil encompasses water supply and solid waste management, this article adopts a more internationally recognised definition. We limit sanitation to the provision of facilities and services for the management and disposal of liquid waste, including human urine, faeces, sewage, and wastewater (see Diep et al., 2020). Thus, we further distinguish between water supply and sanitation. The article uses “sanitation” as an umbrella term to cover various aspects while referring to specific elements of sanitation when necessary.

The research was conducted between November 2022 and February 2023, involving the collection and analysis of both primary and secondary data. The secondary data review encompassed scientific literature, NGO publications, news articles, policy documents, municipal plans, and legal texts. This process aimed to identify existing synergies between sanitation and the SDGs across various policies, plans, and interventions, while also drawing attention to the consequences of disjointed or conflicting approaches. Evidence from informal settlements primarily served to examine contextualised risks associated with sanitation infrastructure and services. This was complemented by primary data collection involving: two meetings with the public utility company; a focus group discussion (FGD) with representatives of the utility, the Housing Department, the Health Department, and the Environmental Department; two visits to the informal settlement of Sítio Paraíso, including a transect walk; and a FGD with a mixed group of 20 residents and an interview with representatives of the Housing Department. Sítio Paraíso was selected for primary data collection as it displays a variety of sanitation solutions and practices. The article draws on a previously developed policy brief presenting research findings and evidence-based recommendations that is available in English and Portuguese.

3. Context-Setting

The municipality of Campinas is the capital of the metropolitan region of Campinas in the state of São Paulo with a population of 1,139,047 inhabitants (Instituto Brasileiro de Geografia Estatística, 2022). It is one of the wealthiest and most important cities in the country with a diversified economy and one of the most advanced technological centres. At the same time, the city is characterised by informal land and housing development in a state with the largest housing deficit in absolute terms, forcing low-income households to settle in environmentally sensitive areas with heightened exposure to multiple risks (da Silva & Samora, 2021). The 2022 census indicates that 140,784 inhabitants, equivalent to 12.4% of the population, live in informal settlements, significantly higher than the national percentage of 8.1 (Instituto Brasileiro de Geografia Estatística, 2022). The Municipal Housing Department (Secretaria Municipal de Habitação [SEHAB]) has registered and categorised 327 informal settlements on a visual platform (see Figure 1). Accordingly, 236 settlements are classified as areas of social interest, 72 settlements as areas of specific interest, and the rest are unclassified (Velloso, 2023). While both refer to informal urban centres, the former are occupied primarily by low-income dwellers for whom self-building and cohabitation with deficient

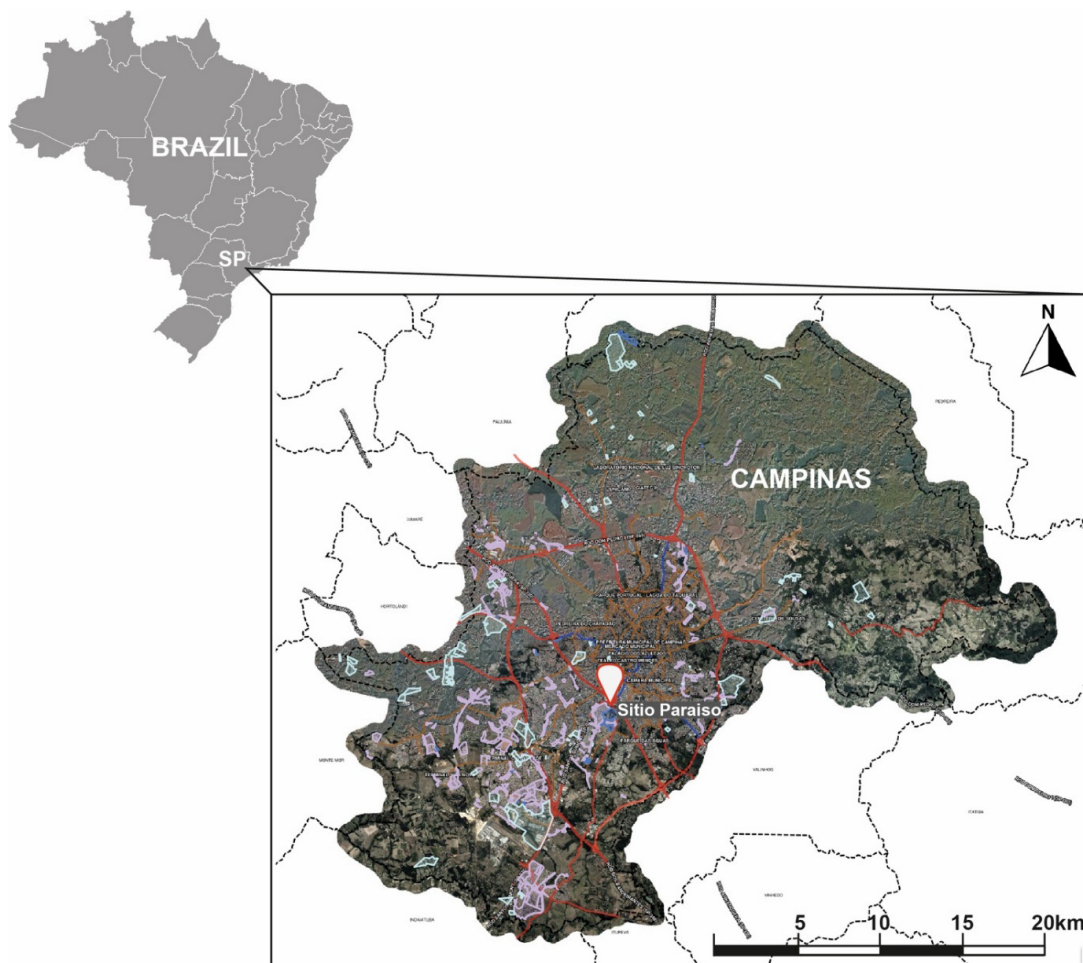


Figure 1. Map of informal settlements in Campinas and location of Sítio Paraíso. Notes: Purple signifies areas of social interest and turquoise areas of special interest; blue areas are not classified. While Sítio Paraíso is the commonly used name, the settlement is registered here as “Taubaté Farm, Remnant Area, Part 1.” There is also Part 2, which is another settlement located below Part 1. Source: SEHAB (2020).

infrastructure are a common reality (da Silva & Samora, 2021). Areas of specific interest house middle- to higher-income groups. Each settlement type is considered under separate modalities of the urban land regularisation programme (REURB), with the Programa de Regularização Fundiária de Interesse Social (REURB-S) focused on areas of social interest exempting residents from any fees associated with regularisation (Araujo & Silva, 2022). While SEHAB oversees this process, it is the Companhia de Habitação Popular de Campinas (COHAB), a public company that operates under the broader framework of SEHAB, that implements specific housing projects and programmes, including REURB.

Since 1974, SANASA has been responsible for drinking water supply and the collection, treatment, and disposal of sewage in Campinas. According to available statistics (see Table 2), service provision is well above the average for the state of São Paulo and Brazil and puts Campinas third among the 100 largest cities in the country (Trata Brasil, 2024).

Table 2. Water supply and sanitation services in Campinas, the State of São Paulo, and Brazil.

	Water supply	Sewage collection	Sewage treatment
Brazil	84.92%	56%	52.23%
State of São Paulo	95.21%	90.54%	71.44%
Campinas	99.69%	95.89%	80.32%

Source: Sistema Nacional de Informações sobre Saneamento (2023).

According to the New Legal Framework for Basic Sanitation, which stipulates universal access by December 2033 (measured as 99% for water and 90% for sewage collection and treatment; Government of Brazil, 2020), Campinas has reached its target for water supply and sewage collection but falls short regarding sewage treatment. While the framework allows a 10% deficit for sanitation, SANASA and the municipality aim for 100% access and treatment by 2026 (SANASA, 2024). Nevertheless, sanitation deficits remain a reality in many of Campinas' informal settlements. Research found that 38% of community leaders in informal settlements view access to sanitation as critical, unstable, or concerning, primarily due to inadequate water supply and sewerage services (FEAC, 2020).

3.1. Basic Service Provision in Informal Settlements

Although Brazilian law forecloses utility companies to provide services in settlements without legal land tenure (Narzetti & Marques, 2021), some utilities sought an informal municipal agreement to regularise water supply in informal settlements without changing land tenure status (see Hylton & Charles, 2018, on the Água Legal programme in the state of São Paulo). This includes an initiative by SANASA in unregularised settlements that connects multiple households to the closest public network through a shared meter. The collective water bill is evenly split among all households, regardless of the number of occupants or how much water each household uses. SANASA has implemented these since 2012 as a temporary improvement measure in settlements awaiting regularisation. They further aim to minimise clandestine connections and avoid water losses and contamination. This pro-poor mechanism applies a social tariff that is less than 25% of the standard water tariff. According to Resolution No. 473-2022 by the regulatory authority for the Piracicaba, Capivari, and Jundiaí river basins (Agência Reguladora dos Serviços de Saneamento das Bacias dos rios Piracicaba, Capivari e Jundiaí), the standard tariff for the first 10 m³ is BRL45.94 while the social tariff is BRL10.87 (£7.49 and £1.77 respectively; Agência Reguladora dos Serviços de Saneamento das

Bacias dos rios Piracicaba, Capivari e Jundiaí, 2022). In 2023, Campinas had installed 1,415 collective meters serving 13,202 families, which corresponds to 52,808 people (an average of 9.3 families per meter; SANASA, 2024). Although this accounts for only an estimated 5% of the municipal population, it constitutes a significant form of improved water supply in informal settlements. However, unauthorised connections made within these collective systems, which exist in some areas, are not included in the official figures. As part of the land regularisation process, SANASA has a programme to convert collective connections into individual ones for improved water access. By 2022, they established 2,660 individual connections with plans for another 2,000 in 2024 (SANASA, 2024).

Tensions between land tenure rights and the right to water and sanitation have significantly hindered the delivery of utility services in Brazil's informal settlements, particularly in relation to sanitation (Hylton & Charles, 2018; Narzetti & Marques, 2021). Consequently, the majority of residents in these areas rely on a range of alternative, often basic, sanitation solutions, as identified through fieldwork in Sítio Paraíso, including the following:

1. Informal household discharge of untreated wastewater into the environment;
2. Informal decentralised sewerage network connecting a group of houses, with untreated discharge into a stream;
3. Septic tanks of varying quality, sometimes shared by more than one household;
4. Simple pits with different construction techniques and of varying quality.

To support onsite sanitation in informal settlements, SANASA runs a complimentary septic tank emptying service for vulnerable or low-income households, provided their water bills are up to date.

4. Findings: Synergies and Interconnected Risks

As per the Brazil study, integrated sanitation action, especially in informal settlements, brings far-reaching benefits across all 17 SDGs (Diep et al., 2020). Yet, such synergistic links are often not realised and there are various risks associated with the current provision of sanitation infrastructure and services that need addressing. This section discusses in detail the (potential) synergies between sanitation and the SDGs in Campinas while also highlighting contextual risks identified in informal settlements. Figure 2 emphasises the interconnectedness of the risks identified between sanitation and the priority goals mentioned in Section 2. It is not exhaustive of all possible risks but rather aims to illustrate interlinkages that are frequently overlooked, as elaborated below.

4.1. Water, Sanitation, Health, and Beyond

Several municipal plans acknowledge the synergistic link between health and improved sanitation (e.g., Prefeitura Municipal de Campinas, 2013b, 2016; SANASA, 2024). Accordingly, SANASA's free septic tank emptying service is an attempt to support safe sanitation practices within legal limits but it does not support the full spectrum of sanitation arrangements in informal settlements. Fieldwork further confirmed that not all informal dwellers know about the service. In Sítio Paraíso, FGD participants never heard of or used it and mainly employ a range of individual and collective self-help initiatives to cope with sanitation inadequacies, many of which are characterised by considerable and interrelated risks. For instance, several households

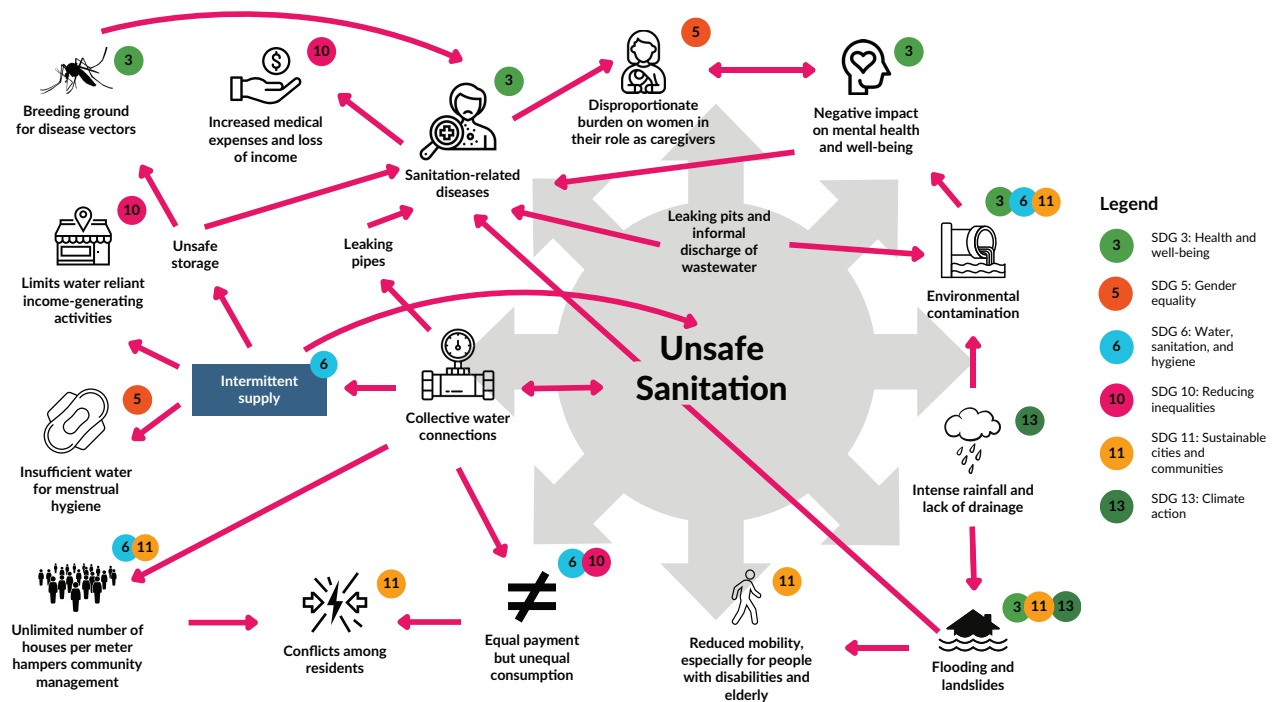


Figure 2. Mapping of contextualised risks associated with unsafe sanitation categorised in relation to SDGs.

constructed their own pits or septic tanks, and some joined forces to establish a local sewerage network that discharges into a nearby stream. Inadequate sanitation has led to a number of diseases, including arboviral diseases such as dengue, with implications beyond people's health. Specifically, residents in Sítio Paraíso explained how sanitation-related diseases impact household finances: "The boss does not care if you are sick. Getting sick due to lack of sanitation affects productivity at work, lost days, and extra costs for medicine" (SDG targets 3.3, 3.d, 10.1). This in turn weakens the capacity to invest in sanitation improvements and might put families in a vicious poverty cycle, particularly with the increasing number of single-headed households (da Silva & Samora, 2021). Inadequate sanitation is therefore both a contributing factor to, and a consequence of, persistent vulnerabilities, as previously highlighted by Diep et al. (2020).

In Campinas, sanitation-related diseases are connected to both inadequate sanitation infrastructure and unsafe sanitation practices. We found evidence of both improperly constructed sanitation facilities (e.g., un-lined, leaking pits) and unsafe management of sewage and wastewater (e.g., informal discharge of untreated faecal sludge and wastewater; SDG targets 3.3, 3.9, 6.3, 10.1, 10.2, 11.4). A FGD participant admitted that emptying pits informally into the environment is not uncommon. She resorted to such practice as she could not afford the service fee of BRL400 (£65.14), putting not only her family but also others in the neighbourhood at risk of exposure to faecal waste.

Impacts of inadequate sanitation are not felt equally within and across settlements, as it is to some extent shaped by where people live but also depends on intersecting identity characteristics and relations (Hofmann, 2022). For instance, uncontrolled discharge of sewage and wastewater in Sítio Paraíso predominantly affects households in lower-lying areas of the settlement who lack control over the practices of residents living higher up. Moreover, women and girls are disproportionately affected by sanitation inadequacies. The growing number of single-mother families in informal settlements, predominantly headed

by black women, are particularly vulnerable and overburdened as they juggle their productive and reproductive roles (da Silva & Samora, 2021; Moser, 1989). This demonstrates how gender, race, and class intersect and shape people's experiences of service inadequacies and their capacity to cope (Hofmann, 2022). Female residents in Sítio Paraíso shared specific concerns about menstrual hygiene in the absence of adequate toilet facilities, including insufficient water supply to meet menstrual hygiene needs. However, since menstrual hygiene continues to be a taboo topic, women and girls feel uncomfortable to elaborate and speak openly about it. Following intense mobilisation by civil society and women parliamentarians, efforts to tackle period poverty have progressed and led to a change in law for the enactment of the Programme for the Protection and Promotion of Menstrual Health, which provides free sanitary napkins and other basic menstrual health care to vulnerable and low-income women and girls (Government of Brazil, 2021). In Campinas, where synergies between sanitation and sexual and productive health are generally well established, the programme has led to municipal campaigns to improve access to sanitary products. Yet, health and sanitation-related municipal policies and plans fail to acknowledge gender-specific needs. Female residents raised concerns about the impact of poor sanitation on mental health and well-being but also on productivity given their naturalised role as caregivers (SDG targets 5.1, 5.4, 10.1, 10.2). Covid-19 demonstrated how disasters and crises exacerbate pre-existing gender inequalities and reinforce power hierarchies. The pandemic put an extra burden on women expected to look after the sick and support children and the elderly with their water and sanitation needs (da Silva & Samora, 2021). Women in Sítio Paraíso were acutely aware of gendered sanitation inequalities whereby men can easily use the bushes to relieve themselves when water for flushing is unavailable, while it is culturally unacceptable and potentially unsafe for women to do the same. Initiatives to address period poverty constitute significant achievements but do not tackle inadequate toilet facilities or the sustained stigma and taboos associated with sanitation, including menstruation (Bassoli & Ribeiro, 2021; "Pobreza menstrual atinge 19,7," 2023). Brazil overall lacks adequate awareness-raising and education for a broader shift in policy and practice towards gender equality (Maschette, 2021).

Sanitation is key to the provision of safe drinking water as much as access to sufficient water quantities is crucial to meet sanitation and hygiene needs. Collective water connections have evidently enhanced access to water and provided minimum citizenship guarantees (SANASA, 2018). Nevertheless, due to legal impediments collective connections are provisional and thus simple appendices to the public network that often lack sufficient water pressure, leading to intermittent supply. Where increasing demand leads to more households sharing a connection, this heightens the frequency of intermittent supply. While the minimum number of households per collective connection is five, in Sítio Paraíso, some connections serve up to 80 houses. Shared connections are further characterised by disparities in water consumption and payment across households, which is not surprising given the diversity within the settlement. Some households use their home as a workplace, either by carrying out informal activities or by establishing a small home-based business and income-earning opportunities that rely on water are not uncommon. Several residents feel disadvantaged and complain about the excessive water consumption of others. The lack of a shared user ethos combined with a uniform tariff pose a challenge to the management of these connections. Water availability further tends to decrease with the elevation of a house, and the distance to the water meter. The government encourages water storage practices to deal with intermittent supply, but there is varying capacity among residents to do this safely. In Sítio Paraíso, inhabitants cope by using buckets and tanks, but these practices are not always safe. Haphazard storage solutions have raised concerns in the Municipal Health Department as they offer a breeding ground for disease-transmitting insects and have led to

recurring dengue outbreaks in Campinas, most recently in April 2023 (SDG targets 3.3, 3.d). As articulated by the Head of the Municipal Health Department during a Focus Group Discussion (2023): “The more people are afraid of running out of water and the more they save water, the worse it is for us. The worst epidemics in the municipality occur at times of scarcity or fear of scarcity.” Yet, the municipal approach to tackling disease outbreaks does not include a specific focus on water and sanitation improvements (see Prefeitura Municipal de Campinas, 2022).

While data on service provision in Campinas is available, the lack of a dedicated baseline for sanitation in informal settlements makes it difficult to determine how sanitation is accessed and by whom (e.g., who uses simple pit latrines, how wastewater is managed, etc.). The Municipal Sanitation Plan (PMSB) does not provide a disaggregated analysis of service arrangements within or between settlements, limiting the understanding of varying levels of vulnerability. As a result, the Water Service Coverage Indicator used in PMSB does not distinguish between individual and shared water connections, treating both as adequate (Prefeitura Municipal de Campinas, 2013b). This approach obscures significant shortcomings and disparities within settlements and might explain a lack of specific sanitation strategies for informal settlements (SDG target 10.3).

4.2. Sanitation as a Prerequisite for Climate Change Adaptation and Resilient Settlements (SDG11 and SDG13)

According to the Brazilian Panel on Climate Change (Painel Brasileiro de Mudanças Climáticas, 2014), the Southeast region is expected to experience more frequent, intense, and unpredictable extreme weather events. These include heavy rainfall over short periods, which will heighten the risks of flooding, waterlogging, and landslides, especially in densely populated areas. In February 2023, a disaster on the Northern coast of São Paulo resulted in deaths, injuries, and displacement due to flooding and building collapse caused by heavy rainfall. This event highlights how informal settlements are especially vulnerable to the impacts of severe weather events, largely due to poor urban planning (Bozzi, 2023). Women are particularly vulnerable and, according to the UN, 14 times more likely to die during a disaster due to socio-economic and cultural factors related to various forms of gender violence, in relation to rights, access to resources, and cultural norms, which are often highly gendered (UN Office for Disaster Risk Reduction, 2012, as cited in da Silva & Samora, 2021). An increase in the intensity and frequency of rains in Campinas has augmented the damages to the water and sewerage network and shows the inadequacy of existing infrastructure to withstand disaster and climate change (Rosa & Morel, 2023). Clandestine rainwater discharge into the sewerage network, which is a separate system from the city’s stormwater drains, further exacerbates the problem. Separate sewer systems are common in over 50% of municipalities in Brazil as they are considered more suitable to deal with the country’s tropical and subtropical climates (Borges et al., 2022; Volschan, 2020). Concurrently, the Brazilian Panel on Climate Change warns about a possible intensification of water scarcity in the region that could aggravate events like the 2013–2015 regional water shortage which particularly affected poor racialised neighbourhoods and spiked cases of dengue and dysentery due to disproportionate rationing (Cohen, 2018). Such events show the entrenchment of social inequalities and further emphasise the significance of safe local storage solutions as vital coping mechanisms. In Sítio Paraíso, lack of access to adequate toilets and the improper management of faecal sludge, wastewater, and drainage have aggravated the impact of flooding contributing to the increased spread of diseases (and the related healthcare costs), restricting local mobility, and causing damage to property, particularly in low-lying areas. Nevertheless, issues related to water supply and sanitation remain insufficiently integrated into disaster risk

management plans (Prefeitura Municipal de Campinas, 2013a, 2017). A study by ICLEI – Local Governments for Sustainability, a global network of local and regional governments, demonstrates that conventional water supply and sanitation systems are less effective than natural infrastructure in managing the rise of extreme weather events and are more costly in terms of wastewater treatment (Tramontin et al., 2022).

Coping mechanisms of informal settlement dwellers tend to be insufficient to break the vicious cycle of risks and vulnerabilities. The state of São Paulo's *Climate Resilience and Adaptation Guide for Municipalities and Regions* acknowledges the cascade of consequences resulting from inadequate sanitation in informal settlements and consistently calls for actions to reduce these risks (Governo do Estado de São Paulo, 2021). The document particularly highlights water contamination during flooding in areas with inadequate toilets and improper faecal sludge management leading to an increase in diseases, particularly among children, loss of income, higher demand for health care, increased poverty, and food insecurity. The Municipal Policy for Coping with the Impacts of Climate Change and Air Pollution of Campinas (Law 16.022/2020) offers a useful framework emphasising the transversal and multidisciplinary nature of climate actions and promoting the integration of adaptation and mitigation into other sectoral policies, including sanitation (Prefeitura Municipal de Campinas, 2020). Moreover, the Campinas Resilience Plan considers the PMSB as crucial for promoting the design of resilient urban development. However, both fail to acknowledge challenges to adaptive risk management specific to informal settlements. For instance, they do not consider the limitations of collective connections and water rationing measures in times of scarcity. Campinas' upcoming Local Climate Action Plan provides scope to build on municipal guidance and integrate sanitation improvements along the sanitation service chain specific to the context of informal settlements.

SDG6 and SDG11 explicitly emphasise the need to enhance community participation. Public participation is anchored as a right of all citizens in the Federal Constitution and flagged in all of Campinas' policies and plans (Bazzaneze et al., 2022). Nevertheless, this right is often unfulfilled due to a lack of clear guidance on how to engage citizens, especially those living in informal settlements. Existing mechanisms include public hearings and virtual workshops, with the latter gaining popularity in a post-pandemic environment, but with little scope for informal settlement dwellers to engage. This is due to how information about these events is shared, along with factors such as their format, scheduling, and location. Events reliant on internet access or travelling to distant venues, combined with time and money constraints can prevent certain groups from exercising their right to participate. Local authorities therefore need to remove existing obstacles, e.g., push for technological advances to make virtual events more inclusive, and allow for effective public participation (Bazzaneze et al., 2022).

Evidence from Brazil demonstrates that involving low-income communities has enhanced both the implementation and sustainability of sanitation initiatives (Diep et al., 2020). During the Covid-19 pandemic, women-led grassroots efforts in two informal settlements in Campinas further highlight the power of collective action in responding to crises, as well as the pivotal role of women's leadership in local decision-making and community mobilisation (da Silva & Samora, 2021). Although the informal, decentralised sewer systems in Sítio Paraíso may not yet offer a fully safe sanitation solution, they reflect strong community-driven efforts to address localised challenges. These self-help initiatives further show that informal communities would benefit from government support to ensure that local infrastructure and services are safe. Although SANASA provides technical guidance on the conscious consumption of water (SANASA, 2022), limited community involvement and capacity development in managing collective water connections have led to the above-mentioned disparities and fuelled conflict among households.

4.3. Sanitation Inequalities and the Marginalisation of Informal Settlements (SDG10 and SDG11)

Municipal plans and supply indicators display a tendency to treat the city and its inhabitants in a standardised manner, overlooking the prevalence of alternative sanitation solutions and associated risks in informal settlements. No policy or plan considers the heterogeneity of the population and the diverse and context-specific needs of particular groups to address intersecting inequalities, despite the emphasis across SDGs (SDG targets 3.9, 6.2). While PMSB and the Municipal Water Resource Plan emphasise the need to combat pollution in all its forms for environmental protection, they disregard the challenges within and across informal settlements, e.g., links between sanitation and informal land tenure (Prefeitura Municipal de Campinas, 2013b, 2016). The only plan that acknowledges the importance of sanitation in informal settlements is the Municipal Housing Plan (Prefeitura Municipal de Campinas, 2011) through its REURB and social housing programme. The municipality regards informal land tenure as core obstacle to adequate sanitation provision, with unregularised settlements facing a greater deficit. REURB-S envisages essential infrastructure works, including drinking water supply and sewer systems alongside the process of land regularisation. To address the above-mentioned housing deficit, the Municipal Housing Plan aims to “regularise all irregular/ clandestine and precarious settlements and favelas or land occupations” (Prefeitura Municipal de Campinas, 2011, p. 390) but the programme faces several obstacles. Although Law 13.465/2017 permits infrastructure works to begin before, during, or after regularisation, sewerage connections, unlike individual water connections, tend to happen only at the end (Government of Brazil, 2017). Sewerage connections necessitate a multidisciplinary technical assessment, encompassing urban planning, environmental, and legal considerations. Additionally, a detailed plan is required to guide the installation of the public sewerage network and utilities are only prepared to proceed once regularisation is guaranteed. Recent collaboration between SANASA and COHAB is a welcome development, but these processes are time-consuming and constrained by limited institutional resources, further accentuated by the dire need for affordable and adequate housing and infrastructure. Sítio Paraíso is only at the beginning of the REURB-S process due to ongoing disputes over land, which are not uncommon (Walker & de Alarcón, 2018). Disputes partly arise out of opposing agendas between municipal departments that delay the process and consequently impede sanitation improvements. For example, to pursue its conservation agenda, the Environmental Department has earmarked certain settlements for relocation that are already being considered for regularisation. Tensions between the constitutional right to housing and the right to an ecologically balanced environment are thus stalling not only the regularisation process but further impeding sanitation improvements with significant implications for public and environmental health, and urban sustainability more broadly (Walker & de Alarcón, 2018). Informal settlements deemed as areas of risk, e.g., those near railway lines or with disputes over land, may remain in limbo for years. This situation can foreclose access to basic public services as doing so might be perceived as authorisation for permanent residency. Opportunities for relocation are significantly limited by Campinas’ social housing deficit. Therefore, tying sanitation improvements solely to REURB-S drastically reduces and prolongs the prospect of adequate access to sanitation for many informal settlement dwellers. However, broadening the scope of sanitation interventions beyond sewerage connections would require collaborative arrangements beyond SANASA and SEHAB and necessitate agreements with other municipal departments. At present, interactions with departments concerned with health, planning, public services, social assistance, and the environment are irregular and largely unplanned, posing a significant challenge to joined-up and integrated action. An FGD with representatives from different municipal departments and SANASA proves this point:

We are so connected, yet so distant. We did not even know each other....The challenge of communication is immense. One knows what the other is doing and knows how to seek partnerships, but everyone is working for themselves, and we find it difficult to share what is happening.

Insufficient opportunities to explore and articulate linkages between sanitation and other key issues across plans means that risks cannot be addressed systematically, and synergies are likely to remain untapped.

5. Towards Integrated Sanitation Action in Informal Settlements

The evidence presented demonstrates that adopting sanitation as a cross-cutting principle to drive action in informal settlements can maximise multi-sectoral benefits and foster equitable outcomes. At the same time, certain aspects require consideration (see Figure 3) to address multi-faceted risks associated with inadequate sanitation that span across the SDGs, which are most pronounced in informal settlement contexts.

In Campinas, SANASA has advanced service provision in the municipality through various initiatives. However, efforts to address inadequacies, specifically in informal settlements, have been insufficient, with legal impediments obstructing further improvements. Moreover, limited collaboration across departments has contributed to sanitation not featuring prominently across municipal policies and agendas beyond the utility. Nevertheless, the Housing Department, through REURB-S, has developed a direct relationship with

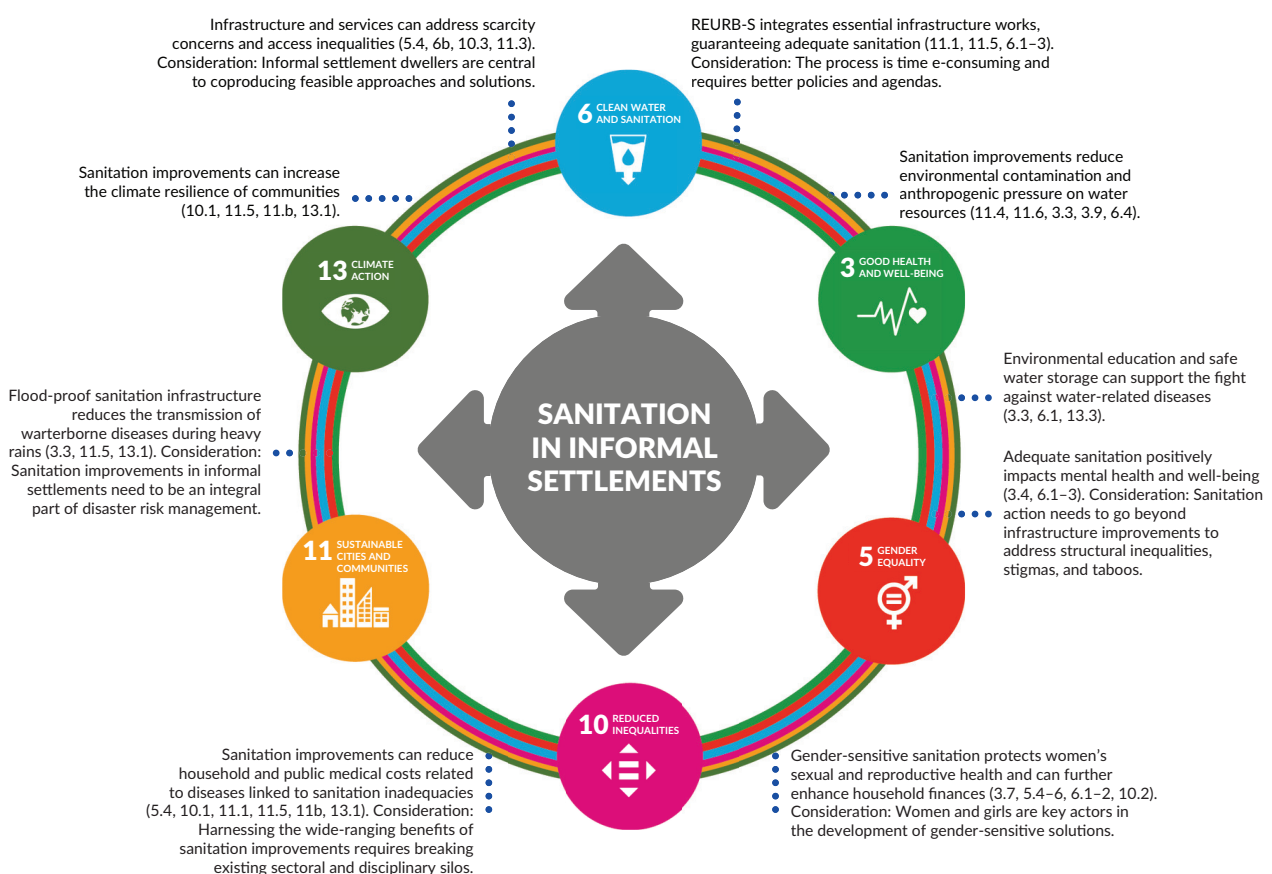


Figure 3. Potential benefits of integrated sanitation action and important considerations.

informal settlements and gained insights into their circumstances. The online platform mapping informal settlements (see Figure 1) could be an important tool for advancing integrated policies and action in those settings but requires going beyond sporadic interactions between various municipal departments and SANASA. With departmental representatives expressing an interest in more frequent exchanges, there might be a possibility to establish a dedicated informal settlements working group composed of multi-sector representatives. More systematic cross-departmental collaboration could further serve as an opportunity for pooling and leveraging limited resources for integrated action around land regularisation and service improvements to harness multi-sectoral benefits. Findings highlight the importance of delinking sanitation improvements from REURB-S and consideration of sanitation solutions beyond centralised sewers to mirror government efforts in water supply improvements. Some inspiration can be taken from the utility company Companhia de Saneamento Básico do Estado de São Paulo responsible for service provision in São Paulo state. Their *Se Liga na Rede* (Connect to the Network) programme aimed at improving sanitary conditions and cleaning up rivers connects households in informal settlements to the sewerage system using unconventional solutions (e.g., choosing a mixed rather than unitary system), community mobilisation, and subsidies. The company has developed their own social technology to ensure the participation of concerned communities, and the training of women community leaders as well as the strong commitment of the municipal authority is key (Associação Brasileira das Empresas Estaduais de Saneamento, 2020).

The development of Campinas' Local Climate Action Plan presents another opportunity to mitigate cross-cutting risks associated with inadequate sanitation in informal settlements. The findings demonstrate that progressive improvements in sanitary conditions are integral to risk management and climate action to deal with increasing droughts, heavy rains, and flood events. Such an approach requires programmatic alignment among stakeholders to generate greater policy coherence and resolve conflicting agendas that hinder adequate sanitation provision and vice versa. Furthermore, an integrated approach that maximises the use of limited resources and prevents failed interventions is reliant on collaboration and the formation of partnerships among SANASA and other municipal actors. City actors acknowledged the value of greater integration, highlighting a need to consolidate different types of knowledge to understand the correlation between sanitation and social development indicators. The consolidation of knowledge and an emphasis on interlinkages can, for instance, uncover how dengue outbreaks in informal settlements are linked to inconsistent water supply, or how sanitation access, land ownership, and environmental protection are interrelated. Since residents of informal settlements are both the most impacted by inadequate sanitation and possess direct knowledge of the challenges involved, their active engagement in problem diagnosis, planning, and decision-making about sanitation and related matters is essential. For contexts like informal settlements, where governments tend to be oblivious to service provision inadequacies and their impacts, coproducing a situational diagnosis with residents can feed into the development, implementation, and monitoring of more appropriate and inclusive policies, plans, and interventions and further support leveraging of resources.

Insights into sanitation inadequacies in Sítio Paraíso have revealed their impact on different spheres of social development, which can guide the development of contextualised strategies but would require understanding the diversity of situations in other informal settlements in Campinas. It is crucial to recognise the varied vulnerabilities and capacities that exist within and between informal settlements, shaped by gender and other intersecting categories and relations (Diep et al., 2020; Hofmann, 2022). Meaningful involvement of diverse informal dwellers can challenge the dichotomy in existing approaches that clearly

differentiate between so-called experts and citizens, technical and community knowledge, and foster more inclusive practices (da Silva & Samora, 2021). Findings further show the value of building on existing grassroots mechanisms and initiatives to cope with infrastructure and service inadequacies, such as shared septic tanks or decentralised sewerage networks, but also other forms of collective action with strong women leadership and gender-sensitive approaches. Campinas' master plan and all sectoral policies underline participation in policy and decision-making but require specific emphasis on informal settlements and a commitment to addressing gendered service provision inequalities. Existing community structures such as neighbourhood associations and community leaders can help facilitate this, provided attention is paid to existing power relations and inequalities regarding gender and other intersecting characteristics and relations. Participatory processes require effective and inclusive ways to allow informal settlement dwellers to engage in a meaningful way and involve considering the location and timing of events but also the format and the support some might require. Moreover, the active involvement of communities is essential for the management and maintenance of services. Findings regarding collective water connections identified a need for communities to receive training and guidance on how to manage these connections to foster fair and inclusive access.

6. Conclusions

We are currently at an important crossroads with only five years to achieve the SDGs and a need to start thinking about a post-2030 agenda (Ghosh & Sharma, 2024). The research undertaken offers an opportunity to draw invaluable lessons in that regard and a renewed commitment to a more sustainable and equitable future. It is essential to consider both local dynamics and interlinkages across central concerns as currently addressed through the SDGs, with the potential to identify key entry points that can foster integrated and strategic action. This means adopting a transdisciplinary approach to identify synergistic but also challenging interconnections and ensure that actions in one area support rather than hamper progress in others. Efforts towards a global agenda and agreement cannot undermine the importance of context specificity and this involves understanding particular challenges and opportunities within different communities and regions. Moving forward, more efforts are needed for a localised perspective on global agendas to ensure that strategies are relevant and effective.

The research in Campinas validates the importance of transdisciplinary approaches and knowledge bases with contributions from academia, policy, practice, and inhabitants themselves to promote integrated sanitation action in informal settlements. Strengthening partnerships with research institutions in Campinas, including the Universidade Estadual de Campinas, the Pontifícia Universidade Católica de Campinas and FEAC Foundation, can further foster interdisciplinary and innovative approaches. The SDGs provide an important methodological framework for understanding how people perceive and experience the impacts of public policies, including their success, precariousness, or absence. For them, these issues do not exist in isolation but interact with each other, for better or for worse. In our specific case, precarious access to water and sanitation has raised issues that cut across the SDGs, including land, health disparities, gender inequalities, among others. However, thus far they are rarely tackled in an integrated manner. Knowledge coproduced with multiple stakeholders, including informal dwellers, can form the basis to support a revision of municipal plans, help establish specific targets, and guide the elaboration of policies, programmes, and actions that are appropriate for the context of informal settlements and their diverse inhabitants. Unless the limiting factors for adequate service provision specific to informal settlements are considered in the

development of strategies, current interconnected risks cannot be mitigated and the benefits of sanitation across SDGs will not be harnessed. This research employed the SDGs as part of an analytical framework but there is scope for municipalities to use the methodology for the development of an integrated urban strategy.

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Conflict of Interests

The authors declare no conflict of interests.

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Local Implementation of the 2030 Agenda in Europe

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Abstract

While some scholars see the Sustainable Development Goals (SDGs) as an example of environmentally friendly development approaches that reconnect development with biospheric preconditions, others argue that they mask ongoing contestation. This article begins with a multi-level governance perspective on the “green goals” of the 2030 Agenda and the importance of local action for their implementation. The focus is on Europe, where municipal sustainability governance was found to be concentrated and where the environment is most likely prioritized. Against this backdrop, I analyze which policy measures the European Union, nation states, regions, and municipalities in Europe name in the reviews submitted to the UN High-Level Political Forum to achieve environmental targets. I show that although the environment is not a priority of SDG implementation at any policy level, municipalities are occasionally leading the way in environmental action both horizontally, with site-specific measures, and vertically, with multi-level measures.

Keywords

2030 Agenda; biodiversity; environmental sustainability; implementation; municipalities; Sustainable Development Goals; voluntary local reviews

1. Introduction

A “popular leitmotif” has emerged according to which “cities, not states, are best equipped to deal with complex problems such as climate change” (Bansard et al., 2017, p. 230). The 2030 Agenda not only includes Sustainable Development Goal (SDG) 11 on “Sustainable cities and communities,” but local and regional governments play an important role in achieving implementation of the entire agenda (Kosovac & Pejic, 2023). While there is a broad body of literature on the role of cities and local governments with regard to climate action (SDG 13; see e.g., Bansard et al., 2017; Cilliers, 2021), this article aims to extend this debate

to other “green goals,” which address the protection of water (SDG 6), oceans (SDG 14), and biodiversity (SDG 15). The aim is to provide a list of measures that are “concrete and feasible” (Elder, 2024, p. 8). At the same time, the article highlights the ongoing contestation of compliance across multiple levels of governance. Are municipalities really leading the way in implementing the “green” SDGs?

With the High-Level Political Forum, UN member states have created a body that is mandated to orchestrate the SDGs’ implementation. Each nation-state government committed to submitting so-called Voluntary National Reviews (VNRs) for this. In addition, the European Union (EU) submitted a review, and also several regions and municipalities are publishing Voluntary Local Reviews (VLRs), where they report their progress on the SDGs’ implementation (UN, 2025). Municipalities in Europe are over-represented in municipal sustainability networks and are expected to most likely prioritize the environment (Bansard et al., 2017; Elder, 2024). The analysis of the reviews and semi-structured interviews with experts involved in the writing process serves to identify the policy actions taken and hence the importance given to the environmental targets at the municipal level compared to the regional, national, and EU levels. The next section introduces a multi-level governance perspective on the 2030 Agenda and the importance of local action for its implementation. After a more detailed explanation of the methodological approach, the results of my analysis of the reviews submitted by all municipalities in Europe and the policy units above them are presented (total: 50 reviews). In addition, interviews with municipal representatives, consultants, and researchers on the importance of “green goals” for the VLRs were conducted (total: 10 interviews).

I show that there are a number of policy measures that municipalities can take. The more local, the more precise policy measures are. Although the environment is not a priority at any level, municipalities occasionally lead the way in environmental action both horizontally, with site-specific measures, such as green spaces and the renaturation of water bodies, and vertically, with multi-level measures, such as sustainability criteria for public procurement and fair trade.

2. A Multi-Level Governance Perspective on the “Green Goals” of the 2030 Agenda

The SDGs were formulated in an international arena; however, they must be implemented within domestic boundaries. The environment is a central point of contestation in this process (Partzsch, 2023; Randers et al., 2019). The 2030 Agenda takes up the Brundtland Commission’s three pillars concept: The preamble states that the SDGs are “integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental” (UN, 2025). In the implementation process, however, the bigger picture is being overlooked, namely that “environmental sustainability needs to be prioritized because it is a precondition for economic and social sustainability” (Elder, 2024, p. 8). In this vein, Sachs (2017, p. 2576) calls for a “mental rupture” in the sense that a new prioritization should overcome an understanding of development as economic industrialization.

SDG 6 “Clean water and sanitation,” SDG 13 “Climate action,” SDG 14 “Life below water,” and SDG 15 “Life on land” are commonly defined as the “green goals” (Rockström, 2021). Each of these goals is directly connected to SDG 11 “Sustainable cities and communities” through the sub-targets (see Tables 2–5). Target 11.1 includes access to basic services, which comprise clean water and sanitation. Target 11.6 aims to generally reduce the adverse per capita environmental impact of cities, including air quality and waste management, and target 11.4 attempts to protect and safeguard the world’s natural heritage. Access to open

and green spaces for all, the aim of target 11.7, concerns diverse green goals. Target 11.5 mentions “water-related disasters,” and target 11.b refers to the Sendai Framework for Disaster Risk Reduction. Further environmental areas include sustainable transport (target 11.2), and sustainable urbanization and sustainable human settlement planning and management (target 11.3; UN, 2025).

Municipalities are increasingly recognized as key actors in global sustainability governance and key sites of implementation. They have the ability to implement sustainability measures more directly, as their remit often covers areas of responsibility such as housing, water management, and urban planning, to name a few (Clement et al., 2023; Kosovac & Pejic, 2023). Local and regional governments are responsible for almost 60% of total public investment in Europe (OECD, 2020, p. 19). Against this backdrop, Barber (2014) most prominently argued that local (city) leaders should replace national leaders as key international interlocutors and decision-makers. Many transnational municipal and regional networks demonstrate what he defines as “glocality” by connecting cities and regions globally, especially in their fight against climate change. The C40 Cities Climate Leadership Group and the Covenant of Mayors are well-known examples (Kosovac & Pejic, 2023).

Scholars argue that the often progressive policies of cities offer a dynamic and pragmatic alternative to the morass of international politics and geopolitical struggle in countries of the global North, like in Europe, where municipal sustainability governance is concentrated (Bansard et al., 2017; Hickmann, 2021). At the same time, localizing the SDGs is a complex process that requires effective municipal governance (Krellenberg et al., 2019). For the national level, scholars observe a tendency of “cherry-picking” (Forestier & Kim, 2020). Similarly, instead of prioritizing the green SDGs, smart city strategies are found to be most relevant for SDG 7 (energy access), SDG 8 (economic growth), and SDG 9 (infrastructure), along with SDG 11 (Clement et al., 2023). In contrast to the euphoria expressed towards the local level, municipalities themselves have been found to generally lack the capacity, legal authority, and competence to implement many of the changes needed to promote sustainable development (Kosovac & Pejic, 2023).

A new form of municipal reporting, the VLRs, has gained considerable prominence in recent years (Ciambra, 2021). In contrast to the VNRs, for which nation-state governments committed to submitting at least two versions before 2030, VLRs are completely voluntary, have no official status, and follow no guidelines. However, the UN publishes these reviews on a special website. In addition, several projects collect data on the local implementation of the SDGs, by asking communities to provide data on the indicators originally defined for nation-states (for example, Bertelsmann Foundation provides a portal for Germany, see <https://sdg-portal.de/en>). So far, in this and other contexts, there are mostly isolated debates for each policy field (Partzsch, 2023). The local level provides a solid foundation for comparing the prioritization of the environment in the implementation processes between levels, as the interconnectedness of goals and targets becomes most visible at the local level (see also Clement et al., 2023; Stockmann & Graf, 2022). Local governments may use VLRs mostly symbolically to justify business as usual, or they may indeed lead the way in implementing the SDGs in a manner that prioritizes the green goals and hence accepts that environmental sustainability is a precondition for economic and social sustainability.

3. Methods

My analysis focuses on Europe, as scholars found municipalities in countries that are the “historic emitters” to be well represented among pioneers for climate action (Bansard et al., 2017, p. 242), and environmental

sustainability policies are perceived to be more concrete here than elsewhere (Elder, 2024, p. 9). Thus, as European municipalities provide the best cases in the sense of being the most likely to prioritize the environment and to take crucial policy measures, I used the full sample of VLRs submitted to the High-Level Political Forum by European municipalities for my study. The UN database includes a total of 52 VLRs from 39 municipalities in Europe, which submitted VLRs at irregular intervals between 2019 and 2023 (<https://sdgs.un.org/topics/voluntary-local-reviews>). Twenty-six municipalities published one VLR, five municipalities two VLRs, and four municipalities three VLRs. Only Ghent submitted four VLRs (status: June 2024). In order to obtain a representative sample, only the most recent VLRs for each municipality and those in English were included, resulting in a total of 36 VLRs.

Once the VLRs were identified, the relevant reports from the higher levels were downloaded. Three of the sampled municipalities are located in the region of North Rhine-Westphalia, which was the only relevant region that had submitted a VLR. In addition, the most recent VNRs of the nation states to which the sampled municipalities belong were considered, i.e., nine EU member states, Norway, the UK, and Ukraine, as well as the EU review. All VNRs and the EU review are in English, except for the most recent Spanish VNR, for which the penultimate review was selected instead. In total, the sample consisted of 50 reviews from 36 municipalities, one region, 12 nation states, and the EU (see Table 1).

Table 1. The sample.

Policy level	Relevant voluntary reviews
Supra-national	EU
National	Belgium, Denmark, Finland, Germany, Greece, Netherlands, Norway, Portugal, Spain, Sweden, UK, Ukraine
Regional	North-Rhine Westphalia (DE)
Local	Agios Dimitrios (EL), Amsterdam (NL), Asker (NO), Bad Köstritz (DE), Barcelona (ES), Bonn (DE), Braga (PT), Bristol (UK), Cascais (PT), Dortmund (DE), Düsseldorf (DE), Espoo (FI), Freiburg (DE), Ghent (BE), Gladsaxe (DK), Hamburg (DE), Hanover (DE), Helsingborg (SE), Helsinki (FI), Kiel (DE), London (UK), Lviv (UA), Mafra (PT), Malmö (SE), Mannheim (DE), Matosinhos (PT), Oslo (NO), Rottenburg (DE), Skiathos (EL), Stockholm (SE), Stuttgart (DE), Tampere (FI), Turku (FI), Utrecht (NL), Vantaa (FI), Viken (NO)

With the help of MAXQDA software, the segments in the VLRs with the green goals and other environmental actions were identified. The sub-targets were then used for deductive (sub-)codes. While sorting the coded segments, additional sub-codes were defined inductively for policies mentioned in the reviews at the four policy levels (EU, national, regional, local). Both implemented and planned policy measures were considered, not mere commitments or reiterations of targets. This analysis differentiates between two types of measures: first, site-specific measures typically found at the local level, and municipalities that pioneer them for other municipalities (horizontal diffusion). Second, policy measures that could also be implemented at a higher level, in which case municipalities are multi-level pioneers (vertical diffusion; see Table 2).

The entire reviews were coded. I assigned segments that list a specific measure in relation to a green target to the corresponding (sub-)code/target, and those that do not to the most appropriate (sub-)code/target based on the measure's content. Each measure was assigned only once, except for when the reviews allocate the same policy measures to different goals; for example, most municipalities announce more green

spaces under SDG 15, while Agios Dimitrios and Ghent mention them under both SDG 6 and 15 (see below). I discussed the results of the document analysis in seven semi-structured interviews in October 2024 with sustainability managers from the municipalities most often shown in the results. Four additional interviewees included three consultants and a researcher who prepared first drafts for the VLRs (two consultants were interviewed together). The interviews were conducted virtually and lasted between 30 and 60 minutes. The interviewees reside in Belgium, Denmark, Germany, Sweden, and the Netherlands. It is necessary to maintain their anonymity amidst ongoing controversies over the SDGs' implementation.

The reviews at all levels refer to the targets and indicators of the 2030 Agenda, making them well-suited for comparison, but their limits should be noted. The interviews made clear that the experts who prepared the VLRs were not always aware of all policy measures taken by the respective municipality. Moreover, the reviews do not provide information about the impact of the measures listed. More in-depth research would likely have revealed more policy action and therefore more impact at all levels, but would have encountered new limitations in terms of classification and comparability.

4. Results: Environmental Policy Measures in Voluntary Reviews

The structure of the results' presentation is based on the numeric order of the SDGs and their respective sub-targets. In each subsection, I first present the measures that were mentioned most frequently across all policy levels, or at the highest level. This means that, while I mention measures exclusively listed at higher policy levels, the focus of the analysis is on the local level and those measures for which municipalities are pioneering SDG implementation (see Tables 2–5). After the results of the document analysis, the results of the interview analysis are presented. No significant differences between municipalities in the EU and non-EU member states were found. As with the UN database, the references indicate the policy unit of the review (e.g., Agios Dimitrios). This makes it clear which unit is being referenced instead of listing the individuals who prepared the reviews.

4.1. Policy Measures to Implement SDG 6 “Clean Water and Sanitation”

Regarding drinking water for all (target 6.1), the results show that, in addition to measures at the EU (2023, p. 80) and national level, such as the prohibition of cut-offs to non-paying users (Government of Belgium, 2023, p. 51), there are measures named by both national and local governments, such as the installation of drinking water stations (e.g., City of Freiburg, 2023, p. 41; City of Ghent, 2023, p. 11). Regarding sanitation and hygiene (target 6.2), only municipalities name measures, such as increasing public sanitary facilities, including barrier-free toilets (e.g., City of Freiburg, 2023, p. 45), and compensating tradespeople for allowing the public use of their facilities (Stadt Rottenburg, 2023, p. 39; see Table 2 in the current article).

Most reviews address water issues from an environmental perspective, aiming to reduce pollution (target 6.3). Several reviews mention stricter regulation for pollutant concentrations (EU, 2023, p. 82; Ukraine Department of Economic Strategy and Macroeconomic Forecasting, 2020, p. 50), new plants and upgraded technologies (e.g., Municipality of Bad Köstritz, 2023, p. 37; UK Government, 2019, p. 89, p. 91), but only VLRs include the expansion of the sewer network through the connection of discharge points to the existing public network (City of Ghent, 2023, p. 11) and the laying of wastewater drainage pipes (Lviv City Council, 2023, p. 45). Moreover, the EU (2023, p. 82), the UK, and, at the local level, Düsseldorf name soil management as a policy

measure to address water pollution and ecosystem protection (target 6.3; Landeshauptstadt Düsseldorf, 2022, p. 53; UK Government, 2019, p. 89). In addition, Belgium and Hanover highlight informing and educating residents about water quality under target 6.3 (City of Hanover, 2020, p. 162; Government of Belgium, 2023, p. 51), and Agios Dimitrios also mentions such communicative action about water ecosystems under target 6.6 (Municipality of Agios Dimitrios, 2023, p. 102). To improve water use efficiency (target 6.4), the UK and Bristol mention business cooperation (Bristol City Council, 2022, p. 22; UK Government, 2019, p. 89).

None of the reviews lists explicit measures on integrated water resources management (target 6.5). In order to protect ecosystems (target 6.6), VNRs and VLRs emphasize the restoration and maintenance of water bodies (e.g., Gobierno de Espana, 2018, p. 51; Municipality of Bad Köstritz, 2023, pp. 38–39), fish access to spawning grounds (UK Government, 2019, p. 92; Vantaa, 2023, p. 47), and, at the local level, the connection of water networks and green spaces (City of Ghent, 2023, p. 12; Municipality of Agios Dimitrios, 2023, p. 102).

Regarding international cooperation and capacity-building for developing countries (target 6.a), the EU (2023, p. 84) and a few VNRs name measures, such as official development aid with a focus on water topics (e.g., Government of Belgium, 2023, p. 51). At the local level, Hanover highlights the consideration of water protection in public procurement and fair trade (City of Hanover, 2020, p. 162). In addition, to strengthen local community participation (target 6.b), only the UK names community-led approaches and stakeholder consultation in its VNR (UK Government, 2019, pp. 89, 92).

To summarize, the measures named for SDG 6 are unevenly distributed across the sub-targets, with a preference for measures on less pollution and ecosystems, especially in the VLRs. While access to safe and affordable drinking water is addressed at all levels (target 6.1), sanitation is an issue of municipal action only (target 6.2). Additionally, there are specific measures taken merely at the local level for the protection and restoration of water-related ecosystems (target 6.6) and regarding international cooperation (target 6.a; see Table 2).

Table 2. Pioneering water measures at the local level.

SDG 6 and SDG 11	Site-specific local measures (VLR)	Multi-level measures (VLR)
Target 6.2 (and target 11.1)	Barrier-free toilet facilities (Freiburg, Ghent, Stuttgart) Compensating tradespeople for allowing the public use of their facilities (Rottenburg)	
Target 6.3 (and target 11.6)	Expansion of sewer network through connection of discharge points to existing public network (Ghent) and laying of wastewater drainage pipes (Lviv)	
Target 6.6 (and targets 11.4–5, 11.7)	Connecting water networks and green spaces (Agios Dimitrios, Ghent)	Citizen information and education about water ecosystems (Agios Dimitrios)
Target 6.a (and targets 11.b–c)		Sustainable public procurement in combination with fair trade (Hanover)

4.2. Policy Measures to Implement SDG 13 “Climate Action”

Regarding climate-related hazards and natural disasters (target 13.1), the EU (2023, p. 154) names guidelines on how to climate-proof future infrastructure projects, and two VLRs include the adaptation of their urban development to become more flood resilient (City of Amsterdam, 2022, p. 111; Landeshauptstadt Düsseldorf, 2022, p. 46). Several VNRs highlight plans for an integrated climate adaptation management (e.g., The Danish Government, 2021, p. 118; also Ministry for Climate Protection, Environment, Agriculture, Nature and Consumer Protection of the State of North Rhine-Westphalia, 2016, p. 15), but only a municipality, Düsseldorf, mentions a heavy rain hazard map (Landeshauptstadt Düsseldorf, 2022, p. 46). Belgium lists the creation of cool zones to counteract heat islands (Government of Belgium, 2023, p. 79), but only VLRs mention greening roofs and facades and more vegetation in urban space as measures against extreme heat (e.g., Barcelona City Council, 2022, p. 111; see Table 3 in the current article).

Regarding the integration of climate change measures into other policies (target 13.2), all levels, except for the regional, emphasize city networks in the context of international cooperation on climate change (e.g., City of Ghent, 2023, p. 29; EU, 2023, pp. 155–156, pp. 158–160; The German Federal Government, 2021, pp. 97–99). Moreover, all levels aim to strengthen or create new institutions. At the local level, Bonn describes a participatory process involving climate action days (Federal City of Bonn, 2022, p. 34).

The support of renewable energies is most salient across policy levels (e.g., Government of Belgium, 2023, p. 80; EU, 2023, p. 160; Municipality of Agios Dimitrios, 2023, p. 90, p. 105). Belgium and the UK at the national and Amsterdam and Oslo at the local level highlight carbon capture storage processes (in which a relatively pure stream of carbon dioxide from industrial sources is separated, treated, and transported to a long-term storage location; City of Amsterdam, 2022, p. 113; Government of Belgium, 2023, p. 79; Oslo Kommune, 2023, p. 40; UK Government, 2019, p. 160). The reviews of Ukraine (Ukraine Department of Economic Strategy and Macroeconomic Forecasting 2020, p. 88) and several municipalities mention energy-efficient and environmentally friendly housing (e.g., City of Amsterdam, 2022, p. 112). Only VLRs list climate action through energy-improving heating systems; for example, the decarbonization of district heating (e.g., City of Amsterdam, 2022, p. 112).

Climate action is integrated into transport policy through the expansion of public transport (bus and rail infrastructure; e.g., EU, 2023, p. 160; Gobierno de Espana, 2018, p. 80; The City of Hamburg & BUKEA, 2023, p. 191), electric vehicles (e.g., City of Amsterdam, 2022, p. 113; Government of Belgium, 2023, p. 80; EU, 2023, p. 154), and sustainable fuels in aviation and maritime transport (EU, 2023, p. 154). While Germany lists fuel emissions trading (The German Federal Government, 2021, p. 98), several VLRs mention afforestation to compensate for greenhouse gas emissions (e.g., Landeshauptstadt Düsseldorf, 2022, p. 45). Amsterdam offers a public service for removing tiles (City of Amsterdam, 2022, p. 111), and Hanover highlights public gardens (City of Hanover, 2020, p. 27). Cycling infrastructure is listed in several VLRs exclusively at the local level (e.g., City of Amsterdam, 2022, p. 112), while Gladsaxe and Mannheim mention car-free days (City of Mannheim, 2019, p. 64; Gladsaxe Municipality, 2023, p. 22).

The EU (2023, p. 154) and VNRs highlight fostering innovation (e.g., The Danish Government, 2021, pp. 118–119). In this line, the EU (2023, p. 130), Finland, Norway, and a few municipal pioneers mention green budgeting (e.g., Finish Prime Minister’s Office, 2020, p. 130; Landeshauptstadt Düsseldorf, 2022,

p. 45; Norwegian Ministry of Local Government and Modernisation, 2021, p. 81), but only VLRs list sustainable public procurement (e.g., City of Amsterdam, 2022, p. 113). National and local reviews mention business cooperation for the sake of companies becoming more environmentally friendly (e.g., Federal City of Bonn, 2022, p. 33; Finish Prime Minister's Office, 2020, p. 131). Again, only VLRs recognize regional production and circular economy in their VLRs (e.g., London Sustainable Development Commission, 2021, p. 12). Only the EU (2023, p. 160) mentions the integration of climate change measures into agriculture, in particular carbon removal certification, and into trade policy. It also highlights its new Sustainability Reporting Directive in this context (EU, 2023, p. 152).

To improve education, raise awareness, and increase capacity for climate action (target 13.3), national and local reviews emphasize the need for citizen information and education, including climate action campaigns (e.g., Federal City of Bonn, 2022, p. 33; Gobierno de Espana, 2018, p. 70). National and local reviews suggest carrying out school projects (e.g., Finish Prime Minister's Office, 2020, p. 130; The City of Hamburg & BUKEA, 2023, p. 191). Further, at the local level, Barcelona (Barcelona City Council, 2022, p. 113) lists a Climate Emergency Roundtable. Bristol promotes more diverse climate action leadership through a special program (Bristol City Council, 2022, p. 36), and Mannheim acknowledges citizens with an environmental award under SDG 13 (City of Mannheim, 2019, p. 64). Barcelona provides educational equipment for its districts (Barcelona City Council, 2022, p. 113), and Hanover highlights a campaign to promote cycling (City of Hanover, 2020, p. 38).

Table 3. Pioneering climate measures at the local level.

SDG 13 and SDG 11	Site-specific local measures (VLR)	Multi-level measures (VLR)
Target 13.1 (and targets 11.4–5)	Greening roofs and facades, and more vegetation against heat (Barcelona, Düsseldorf, Utrecht) Heavy rain hazard map (Düsseldorf)	
Target 13.2 (and targets 11.2–7, 11.b)	Climate action day (Bonn) and car-free days (Gladsaxe and Mannheim) Cycling infrastructure (Amsterdam, Gladsaxe, Kiel, Oslo) Decarbonization of district heating (Amsterdam, Bonn, Espoo, Gladsaxe, Hamburg, Mannheim, Vantaa) Removing tiles (Amsterdam) Public gardens (Hanover)	Sustainable public procurement (Amsterdam, Asker, Stuttgart, Vantaa; Hanover in combination with fair trade for target 6.a)
Target 13.3. (and targets 11.1–6, 11.b)	Free advisory service about the use of solar energy (Düsseldorf) Soil-cooling capacity map (Düsseldorf) Climate Emergency Roundtable (Barcelona) Provision of education equipment about climate change (Barcelona)	Cycling campaign (Hanover) Environmental awards (Mannheim; Düsseldorf for target 15.5) Black and Green Ambassadors Programme (Bristol) Obligatory meetings with contractual partners about electromobility, energy efficiency, climate adaptation, and flood risks (Düsseldorf)

Moreover, for the local level, only Düsseldorf mentions a free advisory service about the use of solar energy and obliges contractual partners to meetings about electromobility, energy efficiency, climate adaptation, and flood risks. To provide information about the impact of climate change on soil, the city also publishes a soil-cooling capacity map (Landeshauptstadt Düsseldorf, 2022, pp. 36–37, p. 46).

In terms of the financial commitment undertaken by developed-country parties (target 13.a) and raising capacities in least developed countries (target 13.b), the EU (2023, p. 152) and several VNRs mention transfers to the global South (e.g., Government of Belgium, 2023, p. 80). VLRs do not mention a particular commitment in these regards.

To summarize, some measures for SDG 13 are taken exclusively at the local level (see Table 3). With regard to climate-related hazards and natural disasters (target 13.1), a site-specific measure merely taken at the local level is the greening of roofs and facades, and the creation of a heavy rain hazard map. In terms of climate policy integration (target 13.2), only VLRs include a range of both site-specific measures, such as climate action days in the municipality, and multi-level measures, such as sustainable criteria for public procurement. Likewise, regarding educational measures (target 13.3), VLRs list measures that are different for each site, for example, a city's soil-cooling capacity map and a local roundtable. Other measures are not site-specific at all; in particular, public information and education measures (although measures such as cycling campaigns can be more targeted at the local level).

4.3. Policy Measures to Implement SDG 14 “Life Below Water”

Regarding SDG 14 and marine pollution (target 14.1), while the EU (2023, p. 170) and Germany pledge further restrictions on the use of fertilizers in agriculture (The German Federal Government, 2021, p. 120), only Hamburg, at the local level, announces riparian buffers to limit phosphorus pollution (The City of Hamburg & BUKEA, 2023, p. 79). Moreover, VNRs and VLRs consider citizen information and education as crucial to reducing marine debris (e.g., Barcelona City Council, 2022, p. 117; Gobierno de Espana, 2018, pp. 71–72). The UK, Kiel, and Oslo highlight business cooperation; for example, collecting litter from the coastline (City of Kiel, 2022, pp. 4, 38; Oslo Kommune, 2023, p. 43; UK Government, 2019, p. 169). Bristol mentions river clean-ups (Bristol City Council, 2022, p. 38), and a number of municipalities are announcing improvements to their sewage systems (e.g., Barcelona City Council, 2022, p. 117).

In terms of sustainably managing and protecting marine and coastal ecosystems (target 14.2), the EU (2023, p. 170) mentions its new Nature Restoration Law. In addition, its review and two VLRs highlight greater citizen information (EU, 2023, p. 168; e.g., City of Kiel, 2022, pp. 34–37, 41). Asker announces a new center on marine pollution (Asker Kommune, 2021, p. 43). Again, reviews mention international cooperation (e.g., EU, 2023, p. 167; The German Federal Government, 2021, pp. 102–103); for example, through city networks mentioned in other reviews relevant for SDG 13 (City of Kiel, 2022, p. 41), and greater cooperation with other subnational units (The City of Hamburg & BUKEA, 2023, p. 199).

At the local level, Kiel announces more sustainable tourism and an “ocean budget” that provides funding for ocean-friendly initiatives (City of Kiel, 2022, pp. 33–34). Oslo reopens enclosed rivers and streams, a measure that the city also mentions under SDG 15 (Oslo Kommune, 2023, p. 43). Stuttgart and Utrecht list measures for the general protection of water ecosystems under SDG 14, such as fish ladders and doorbells (Gemeente Utrecht, 2023, p. 108; State Capital Stuttgart, 2023, p. 199).

Regarding ocean acidification (target 14.3) and the prevention of overfishing (target 14.4), the EU (2023, p. 168) and several VNRs list measures such as management plans (e.g., The German Federal Government, 2021, p. 102), but VLRs do not. Although the international community already failed to conserve at least 10% of coastal and marine areas by 2020 (target 14.5), the EU (2023, p. 162) review and VNRs underline this target by proclaiming additional conservation areas (e.g., The German Federal Government, 2021, pp. 102–103). Fishing subsidies are set to be eliminated in the EU (2023, p. 167) and Germany (The German Federal Government, 2021, p. 103; target 14.6). The UK (UK Government, 2019, p. 177) mentions the development of sustainable tourism in Fiji and increasing the economic benefits from the sustainable use of marine resources (target 14.7). In addition, at the national and local levels, reviews mention the development of research capacity and knowledge transfer (target 14.a; e.g., Barcelona City Council, 2022, p. 119; Norwegian Ministry of Local Government and Modernisation, 2021, pp. 82–83). However, no review includes measures to provide small-scale artisanal fishers access to marine resources and markets (target 14.b). Only the EU (2023, p. 166) and Germany highlight their commitment to the UN Convention on the Law of the Sea (target 14.c; The German Federal Government, 2021, p. 102).

To summarize, as with SDG 6, the measures for SDG 14 focus on reducing pollution and protecting ecosystems. The VLRs similarly include a variety of site-specific measures, such as reopening closed rivers and streams (see Table 4). Another parallel between these SDGs is that sanitation is only considered in the VLRs, making it a local responsibility under targets 6.2 and 14.1. In addition, municipalities are again pioneering measures relevant to other levels, for example, an ocean budget and a marine center (which could also be funded by higher policy levels).

Table 4. Pioneering ocean measures at the local level.

SDG 14 and SDG 11	Site-specific local measures (VLR)	Multi-level measures (VLR)
Target 14.1 (and targets 11.1, 11.6)	Riparian buffers (Hamburg) Improving sewage facilities (Barcelona, Kiel, Lviv, Oslo, Tampere; Ghent and Lviv also for target 6.3, and Düsseldorf for target 15.1)	
Target 14.2 (and target 11.4)	Reopening closed rivers and streams (Oslo, also for 15.2) Water protection measures, such as fish ladders and doorbells (Utrecht, Stuttgart)	Marine centre (Asker) City networks (Kiel; at all levels for target 13.2) and greater cooperation with other subnational units (Hamburg) Ocean budget (Kiel)

4.4. Policy Measures to Implement SDG 15 “Life on Land”

Regarding SDG 15 and terrestrial and inland freshwater ecosystems (target 15.1), most reviews at all levels highlight the need for additional conservation areas (e.g., EU, 2023, pp. 172, 176; Federal City of Bonn, 2022, p. 48; Government of Belgium, 2023, p. 86). Moreover, the EU (2023, p. 178) supports sustainable land use, while Finland and Norway mention that it has been enshrined in legislation (Finish Prime Minister’s Office, 2020, p. 134; Norwegian Ministry of Local Government and Modernisation, 2021, p. 84). At the local level, Düsseldorf focuses on efficient land use (Landeshauptstadt Düsseldorf, 2022, p. 51; see Table 5).

Regarding land restoration, the EU (2023, p. 172) sets binding time targets with its new Nature Restoration Law. Germany mentions the restoration of rivers and adjacent meadows (The German Federal Government, 2021, p. 107), while the UK and Oslo list the restoration of moorlands, and Oslo additionally develops flower meadows by harvesting hay (similar to Kiel, see below for target 15.5; Oslo Kommune, 2023, p. 46; UK Government, 2019, pp. 183, 187). Moreover, at the local level, Stuttgart mentions the renaturation of watercourses (State Capital Stuttgart, 2023, p. 203), and Düsseldorf conducts projects to develop groundwater remediation technology (Landeshauptstadt Düsseldorf, 2022, p. 45S).

In a similar context to the policy integration of climate action (target 13.2), and addressing marine pollution (target 14.1), again, the EU (2023, p. 174) points to agriculture, while VNRs and VLRs highlight the need for sustainability in this sector to accomplish SDG 15 (e.g., Government of Belgium, 2023, p. 86; Landeshauptstadt Düsseldorf, 2022, p. 22). In a similar vein, while other VLRs recognize the need for improved sewage facilities under SDG 14, Düsseldorf mentions the improvement under SDG 15 (Landeshauptstadt Düsseldorf, 2022, p. 45).

To halt deforestation (target 15.2), reviews at all levels include the protection and restoration of woodland area (e.g., Bristol City Council, 2022, p. 40; EU, 2023, pp. 174–175; Government of Belgium, 2023, p. 86). In addition, VNRs and VLRs highlight planting trees and hedges (e.g., Barcelona City Council, 2022, p. 124; UK Government, 2019, p. 186), which includes subsidies for citizens and businesses (Government of Belgium, 2023, p. 86). In addition, the EU (2023, p. 176), Germany, and Denmark, but no VLRs, mention regulation on deforestation-free supply chains and emphasize that international trade should not lead to deforestation in exporting countries (The Danish Government, 2021, p. 122; The German Federal Government, 2021, p. 109).

To combat desertification and restore degraded land and soil (target 15.3), the EU (2023, 76, p. 178, p. 180) reports on its legislation and initiatives to restore degraded land in African countries, a measure similar to Portugal's mention of official development aid for the prevention of desertification and soil degradation (Republica Portuguesa, 2023, p. 160). Germany develops a new indicator to record changes in land and soil use (The German Federal Government, 2021, p. 109). Denmark, Düsseldorf, and Utrecht announce the remediation of contaminated sites (Gemeente Utrecht, 2023, p. 111; Landeshauptstadt Düsseldorf, 2022, p. 45; The Danish Government, 2021, p. 122). Moreover, merely at the local level, Stuttgart mentions reducing land use to protect multifunctional soils, and Barcelona mentions safety strips in the form of pastureland to prevent the spread of fires (Barcelona City Council, 2022, p. 124; State Capital Stuttgart, 2023, p. 205). For the conservation of mountain ecosystems (target 15.4), the EU (2023, p. 179) supports sustainable mountain tourism, and Greece announces a special protection status for mountains (Presidency of the Hellenic Government, 2022, pp. 156–157). No VLRs list policy measures on this sub-target.

While most reviews highlight citizen information and education with regard to all aspects of SDG 15, such measures are mostly categorized as actions to reduce the degradation of natural habitats, and halt the loss of biodiversity and the extinction of threatened species (target 15.5; e.g., Barcelona City Council, 2022, p. 125; EU, 2023, p. 175; Finish Prime Minister's Office, 2020, p. 135). At the local level, Kiel (City of Kiel, 2022, p. 45) organizes a seed exchange festival, and Düsseldorf (Landeshauptstadt Düsseldorf, 2022, p. 78) names an environmental award to increase awareness of biodiversity issues. Moreover, reviews list scientific projects (e.g., Câmara Municipal de Cascais, 2022, p. 24; EU, 2023, p. 175; Government of Belgium, 2023, p. 87) and international cooperation with regards to biodiversity conservation (EU, 2023, pp. 178–179; e.g., Finish Prime

Minister's Office, 2020, p. 134). The EU (2023, p. 174), the Netherlands, and Sweden mention the need for a circular economy (which London lists under target 13.2; Government Offices of Sweden, 2021, p. 121; Kingdom of the Netherlands, 2022, p. 11, p. 22, p. 32).

Several VLRs announce more green spaces, for which Agios Dimitrios and Ghent emphasize their versatile applications, such as recreational effects, flood prevention, and cooling effects under both SDG 6 and 15 (City of Ghent, 2023, p. 12, p. 36; Municipality of Agios Dimitrios, 2023, pp. 93–95, 102). Kiel highlights planting flower meadows for bees (similar to Oslo, see above; City of Kiel, 2022, pp. 5, 44). Utrecht lists measures for species protection when constructing municipal buildings (Gemeente Utrecht, 2023, pp. 111, 113), and Düsseldorf takes action by breeding endangered species. Regarding access to green spaces (Landeshauptstadt Düsseldorf, 2022, p. 23), Kiel announces the protection of the respective zones against the interest of private owners (City of Kiel, 2022, p. 43).

Central issues concerning the international dimension of biodiversity are access to genetic resources (target 15.6) and trafficking of protected species (target 15.7), which are concerns of only the EU and the VNRs (e.g., The Danish Government, 2021, p. 122). By contrast, all policy levels recognize the impact of invasive species (target 15.8). The EU (2023, p. 180), VNRs, and VLRs plan to implement relevant laws (e.g., Government of Belgium, 2023, pp. 86–87; Oslo Kommune, 2023, p. 46). Utrecht lists the manual removal of invasive weed species (Gemeente Utrecht, 2023, pp. 111–112), and Matosinhos focuses on raising awareness about the Velutina wasp to identify and subsequently eliminate this invasive species (Matosinhos City Hall, 2023, p. 63).

Table 5. Pioneering biodiversity measures at the local level.

SDG 15 and SDG 11	Site-specific local measures (VLR)	Multi-level measures (VLR)
Target 15.1 (and targets 11.1, 11.4)	Efficient land use (Düsseldorf) Renaturation of watercourses (Stuttgart) Improving sewage system (Düsseldorf; Ghent and Lviv for target 6.3, and Barcelona, Kiel, Lviv, Oslo, and Tampere for 14.1)	Groundwater remediation technology (Düsseldorf)
Target 15.3 (and target 11.5–6)	Reducing land use (Stuttgart) Safety strips to prevent spread of fires (Barcelona)	
Target 15.5 (and target 11.6–7)	Green spaces (Agios Dimitrios, Düsseldorf, Ghent, Kiel, Hamburg, Oslo; Agios Dimitrios and Ghent also for target 6.6) Flower meadows (Kiel)	Environmental award (Düsseldorf; Mannheim for target 13.3) Seed exchange festival (Kiel) Breeding endangered species (Düsseldorf) Species protection in municipal buildings construction (Utrecht)
Target 15.8 (and target 11.4)	Manual removal of invasive species (Utrecht)	Raising awareness about Velutina wasp (Matosinhos)
Target 15.a (and target 11.1)	Funding for greening buildings (Düsseldorf) Biodiversity plans for zoo (Barcelona)	

With regard to the integration of biodiversity issues into planning (target 15.9), the EU (2023, p. 180), VNRs, and Helsinki announce new principles and methods (e.g., City of Helsinki, 2023, p. 26; The Danish Government, 2021, p. 122). The EU (2023, p. 174), Belgium, and the UK mention the mobilization of financial resources for biodiversity and ecosystems (target 15.a); Government of Belgium, 2023, p. 86; UK Government, 2019, p. 189). At the local level, Düsseldorf highlights a funding program for greening buildings (Landeshauptstadt Düsseldorf, 2022, p. 49, p. 78), and Barcelona describes plans for its new zoo (Barcelona City Council, 2022, p. 125).

Similarly, with regard to the mobilization of resources for forest management (target 15.b), the EU (2023, p. 179), VNRs, and, at the local level, Ghent mention projects (City of Ghent, 2023, p. 67; e.g., Government of Belgium, 2023, p. 87). Kiel highlights funding for a tree nursery in Tanzania. This project could be seen as an approach to increase the capacity of local communities in pursuit of sustainable livelihood opportunities (City of Kiel, 2022, p. 5). None of the reviews mention measures to combat the poaching and trafficking of protected species (target 15.c).

To summarize, VLRs are most innovative with regard to SDG 15. As for targets 6.2 and 14.1, sewage systems are considered a local responsibility in relation to SDG 15. Municipalities emphasize site-specific and thus essentially local measures, such as green spaces and flower meadows, under SDG 15. In parallel, municipalities demonstrate measures of a pioneering character for other policy levels; for example, breeding endangered species (see Table 5).

4.5. Interviews on Policy Measures in the VLRs

The interviews revealed that the rationale for the prioritization of specific SDGs and policy measures in the individual VLRs is different for each municipality (confirming Stockmann & Graf, 2022 on local peculiarities). For example, Ghent started by following the numerical order of the 2030 Agenda. Other municipalities (e.g., Kiel, Malmö) chose the goals that the High-Level Political Forum focused on in the year of publication (interviews #3, 8, and 10, with municipal representatives). In the case of Kiel, SDG 14 happened to be a UN focus goal in 2022, which was in line with marketing the city as a “sailing city” on the Baltic Sea. Malmö, also on the Baltic Sea, missed this opportunity by publishing its VLR a year earlier.

Some municipalities focus on goals that the authors consider to be particularly relevant to the local context (e.g., Amsterdam, Freiburg). Interviewees described site-specific environmental measures as more controversial, especially given the existing competition for space between more green areas and more land allotments reserved for new housing and car parking (e.g., interviews #1, 3, and 8, with municipal representatives). Other municipalities use the VLRs to put pressure on higher policy levels to become more environmentally sustainable (interviews #1, 4, and 5, with municipal representatives). Interviewees said that individual colleagues showed particular commitment to measures that are not site-specific and could also be implemented at a higher policy level; for example, sustainable criteria in public procurement (e.g., interview #2, with a municipal representative).

Representatives of cities that see their VLRs as a means of advocacy argued that they should be made mandatory rather than voluntary (e.g., interviews #1 and 8, with municipal representatives). In this context, the consultants emphasized the lack of standards and the resulting lack of comparability: “I also tell them

[municipal representatives]: If you don't have any data on SDG 14...then leave it out. That's okay for a VLR. You don't even have to explain why you're leaving it out!" (interview #9, with a consultant; confirming Krellenberg et al., 2019). The interviews revealed that local representatives are particularly relieved when they realize that they do not have to report on green targets (interviews #7 and 9, with consultants). However, the consultants considered the option of mandatory local reviews—providing data for the indicators of all SDGs—to be “unrealistic,” mainly due to the “resources that would have to be invested” (interview #9, with a consultant).

5. Discussion and Conclusions for the Post-2030 Agenda

Municipalities are leading the way in implementing SDGs, but they demonstrate a “glocality” (Barber, 2014) that is only periodically and selectively applied to specific areas (confirming Clement et al., 2023, also for the green goals). VLRs list very few “concrete and feasible” environmental measures (Elder, 2024, p. 8) that contribute to the realization of SDG 11 “Sustainable cities and communities” (see Tables 2–5). Local governments, like other policy levels (Elder, 2024; Partzsch, 2023), are far behind in prioritizing the environment in sustainability governance. VLRs do not show a “mental rupture” (Sachs, 2017, p. 2576).

The distinction between the two types of local policy measures proved to be useful (see Tables 2–5). Municipalities are often the only policy level at which action can be taken. In this vein, the VLRs include site-specific measures designed for a particular location to accomplish the environmental sub-targets of SDG 11, such as cycling infrastructure, green spaces, and restoring watercourses. Other measures are not necessarily a municipal responsibility and would be more appropriate at a higher policy level, such as sustainability criteria for public procurement and fair trade. These multi-level measures should fall under (supra-)national responsibility. While the first type of measures allows municipalities to pioneer horizontal diffusion, i.e., uptake by other municipalities at the same policy level, the second type also provides the opportunity for vertical diffusion “from the bottom up” to higher policy levels.

Conflicts over necessary prioritization, for example, regarding competing land uses or limited budgets, cannot be resolved solely through reporting, but VLRs provide a basis for further decision-making. Moreover, compelling the data for the reviews can help communities internally to move beyond “thinking in silos” to truly integrate (environmental) sustainability into everyday decisions. This requires local ownership, which tends to be less likely if reviews are prepared by outside consultants (although municipal representatives emphasized that consultants were helpful in facilitating collaborative processes; interviews #1 and 3). In the future, while external standards pose a risk to internal ownership, the standardization of data could be used to compare the performance of municipalities in terms of impact.

A post-2030 Agenda should hold municipalities accountable for site-specific actions that can only be taken at the local level (based on judicial action for misconduct rather than reporting). Responsibilities for multi-level measures need to be more clearly assigned. For instance, it is unconvincing that the drinking water supply is addressed at all levels, but issues regarding wastewater are not. Integrating sustainability in trade and procurement policies is another example of a measure more relevant to higher policy levels, at least in Europe, where municipalities have relatively small budgets and insignificant responsibility in these areas (see also Kosovac & Pejic, 2023).

While a clear vertical distribution of tasks is necessary, greater efforts are also needed regarding horizontal interrelations. The fact that the same measures are assigned to different goals in different VLRs highlights that their cross-cutting potential has not yet been realized. More research is needed regarding synergies and trade-offs. There are initial approaches to cooperation between municipalities (e.g., interview #3, with a municipal representative). Cycle lanes, for example, are clearly a local responsibility, but are less useful if they end at the municipal boundary. The post-2030 Agenda should thus take an even more integrated approach.

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Data Availability

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Integrating the SDGs Into Urban Renewal Practices: Recommendations From Participatory SDG Monitoring in Stuttgart-Münster

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Abstract

Implementing the Sustainable Development Goals (SDGs) presents a unique opportunity for collective action across various spatial scales. At the local level, programs to revitalize vulnerable neighborhoods offer significant potential to contribute to the SDGs. In Germany, the “Soziale Stadt/Sozialer Zusammenhalt” (Social City/Social Cohesion) funding program supports municipalities in promoting sustainable development in these areas. However, there is currently no direct linkage between this funding program and the SDGs. This raises questions as to how the instruments of the Social City/Social Cohesion program could support the SDGs and their monitoring processes and vice versa and what adjustments could be recommended to enhance this relationship. The research presented in this article is based on a case study conducted in the urban renewal district of Stuttgart-Münster, Germany. Students and scholars from the University of Stuttgart collaborated with municipal staff and civil society members to explore the funding program’s instruments and assess their potential for monitoring the SDGs. Based on the municipal indicator set developed with the assistance of SDG coordinators at the City of Stuttgart—Germany’s first city to pilot this indicator set in 2019—the transdisciplinary team adapted specific indicators to the neighborhood level. They also investigated the inclusion of qualitative indicators for assessing SDGs and tested a collaborative approach to gathering data for these localized indicators with input from residents. Based on the findings of this case study, this contribution reflects on recommendations for integrating the SDGs into the initial stages of urban renewal practices and related instruments.

Keywords

co-production; participation; SDG monitoring; Soziale Stadt; transdisciplinarity; urban renewal

1. Introduction—Localizing SDGs Through Urban Regeneration Practice

The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, provide a global framework for addressing critical social, economic, and environmental challenges. While the importance of these goals at the global and national levels, as well as the progress (or lack thereof) in achieving them is well documented, there is a growing recognition of the need to implement the SDGs at the local level—in communities and neighborhoods. A study by Misselwitz et al. (2015) proved that 65 percent of all SDG targets require the active involvement of local urban stakeholders to ensure their success. This emphasizes the necessity of translating global goals into actionable strategies that are tailored to the specific contexts and challenges faced by local communities, alongside suitable monitoring frameworks to assess the effectiveness of these strategies (Benito et al., 2023; Deutsche Gesellschaft für Internationale Zusammenarbeit, 2019; Ley et al., 2022).

Municipal governments and their administrative departments are key players in implementing strategies that have a direct impact on people's lives. They are essential in addressing inequalities, improving living standards, and promoting environmental sustainability. By monitoring progress towards achieving the SDGs, municipalities are equipped with tools to assess their sustainability strategies, identify gaps and inequalities, and allocate resources effectively. This approach is vital to ensure that marginalized communities, whose needs are often overlooked in aggregated national SDG assessments, are not left behind (Sustainable Development Solutions Network, 2015).

To effectively address the needs of marginalized communities, which are frequently unevenly distributed across urban environments, it is essential to implement sustainability monitoring that extends beyond the municipal level and encompasses smaller spatial and social units (see also Sawicki & Flynn, 1996). In this context, integrating the neighborhood level into sustainability monitoring provides an opportunity to collect disaggregated information that can serve as a vital foundation for responding to developmental needs. However, cities and municipalities dedicated to assessing development needs and evaluating their progress toward achieving the SDGs encounter considerable challenges in their efforts (see e.g., Jossin & Peters, 2022; Ley et al., 2022; Lucci et al., 2018; Simon et al., 2016; Valencia et al., 2019). Many of the targets and indicators established for the SDGs address issues that cannot be effectively measured at the municipal level, let alone the neighborhood level. Additionally, the existing SDG targets and indicators often do not adequately capture important aspects of sustainable development within municipalities and neighborhoods.

This situation reflects some of the more general shortcomings of the indicator-based monitoring methodology implemented alongside SDGs. Critics have raised various concerns about the general logic of monitoring sustainability using a predefined set of indicators (see e.g., Fukuda-Parr & McNeill, 2019; Goonesekera & Olazabal, 2022; Kaika, 2017; Lami et al., 2023; Lyytimäki et al., 2023). These concerns center around applying a generic, top-down framework for measurement on complex local conditions, which may not capture the root causes that require sustainable transformation in the first place (Kaika, 2017). Furthermore, by establishing mainly quantitative targets to be achieved within a specific timeframe and using an indicator-based monitoring tool to assess progress, there is a risk that the focus on numerical data will overshadow the pursuit of shared social norms represented by the SDGs—or even alter their intended meaning (Fukuda-Parr & McNeill, 2019). In this context, Lami et al. (2023) emphasize the importance of appropriately conceptualizing localized indicators, considering their implicit ethical or cognitive values when

constructing and selecting these indicators. With regard to the construction of the indicators, it is critically discussed that the prevailing focus on siloed indicators can lead to a lack of systemic and holistic reporting, neglecting interlinkages across issues (Lyytimäki et al., 2023). Moreover, it is important to recognize that the interpretation of indicator-based information in reporting may depend on the specific perspectives and interests of those interpreting it. This reliance on interpreters' viewpoints can introduce subjectivity, potentially marginalizing certain knowledge, ideas, and communities and perpetuating power inequalities (Gooneseckera & Olazabal, 2022).

These critical aspects must be considered in translating global sustainability monitoring frameworks to the local level, aiming for a more precise alignment of global agendas with the unique contextual characteristics of local environments. It is widely acknowledged that the global monitoring framework of SDGs also needs to be translated to the local level of cities and communities (Jossin & Peters, 2022; Mair et al., 2018; Valencia et al., 2019), and attempts to do so have produced several notable results. The applicability of SDG targets and indicators at the urban level has been tested (see, e.g., Simon et al., 2016), guidelines on SDG indicators for municipalities have been developed (see e.g., Bertelsmann Stiftung et al., 2020) and pilot cities have published voluntary reviews detailing their progress in implementing SDGs (see, for instance, Barcelona City Council, 2023; OECD, 2020; State Capital Stuttgart et al., 2023). While these contributions to SDG monitoring at the local level have provided valuable insights, they primarily focus on aggregated quantitative data for the entire urban area. Efforts to adapt the SDG monitoring framework to smaller scales—such as city districts or neighborhoods—are still in the early stages and are hindered by a lack of data at these levels.

Moreover, the existing guidelines for a localized indicator system inadequately consider qualitative factors, such as the quality of green and recreational spaces, beyond merely measuring their area in square meters. This limitation has been critically addressed in discussions on developing a localized monitoring system (see e.g., Jossin & Peters, 2022; Lyytimäki et al., 2023; Ulbrich et al., 2019). Furthermore, it has been emphasized that incorporating qualitative aspects cannot be accomplished through existing data sets alone, as statistical offices lack this information. Instead, it necessitates innovative ideas and participatory approaches to co-create knowledge for qualitative SDG assessment (Bonsu et al., 2020; Szetey et al., 2021). These approaches not only aim to fill existing data gaps but also seek to establish a knowledge base on sustainability aspects at the neighborhood level. This contributes to shifting the emphasis away from strictly numerical monitoring, allowing for discussions about the underlying values that are important to the community. Additionally, they could become an empowering mobilizing factor for engaging in further activities, such as, e.g., in the participatory budgeting process (Bürgerhaushalt). Experiences gained from bottom-up, participatory assessments of SDGs could build upon earlier efforts for localizing sustainability agendas (Agenda 21) and could be shared through emerging global networks of local actors, such as ICLEI–Local Governments for Sustainability and the Global Covenant of Mayors (Reuter, 2023). This would contribute to the advancement of sustainability monitoring methods.

Alongside the need for methodological advancements, local actors encounter practical challenges. Limited resources are often barely sufficient to maintain day-to-day operations. This hampers additional efforts to implement the SDGs, let alone the voluntary collection of data for SDG monitoring (Reuter, 2023). As a result, a critical discussion has emerged about the need for “bridging the gap between monitoring and local action” (Jossin & Peters, 2022, p. 9). In this context, it becomes clear that there is an urgent demand to create synergies between the strategic instruments and programs that cities employ to address their urban

development challenges and the processes required to implement and monitor SDGs. However, there has been limited research on how to best create these synergies and which instruments and programs might be particularly suitable in this regard.

This contribution aims to draw attention to the existing gaps in knowledge and co-production, and to encourage discussion on how current urban development programs and instruments can be leveraged to create synergies with the implementation and monitoring of the SDGs. Additionally, it explores how—conversely—urban development programs and instruments could benefit from a stronger alignment with the SDGs. By examining a specific urban development program designed to upgrade disadvantaged neighborhoods through inclusive urban regeneration and by engaging in the participatory process entailed in this program, this contribution seeks to answer the following research questions:

- (1) How is the program currently aligned with SDGs?
- (2) What modifications to the program's instruments may be necessary to strengthen this alignment?
- (3) How can a more participatory and qualitative approach to SDG monitoring be tested, building on the instruments of the program?

The examination of these research questions is based on a study conducted in 2022–23 by the Institute of Urban Planning and Design at the University of Stuttgart, together with representatives of the Office for Urban Planning and Housing of the City of Stuttgart, the city's International Sustainability and Development Coordinator, the head of the district Stuttgart-Münster, and local community actors. For this study, two projects were analyzed that were being carried out in two districts in Stuttgart at the time of the investigation as part of the so-called "Social City" urban regeneration funding program. The analysis was conducted during a transdisciplinary academic course that involved students from the University of Stuttgart, aiming to promote research-based teaching and learning while introducing future urban practitioners to integrative methods of urban regeneration.

The following Section 2 of this contribution offers a brief overview of the Social City program, its instruments, and assessment mechanisms and outlines the potentials of aligning these components with SDG implementation and monitoring processes at the neighborhood level. Section 3 then introduces the framework and methods used during the case study research process. Based on this, Section 4 summarizes and discusses the findings of the study, focusing on (A) exploring the current alignment of the instruments used in the case studies with the SDGs and (B) investigating options for localized, participatory SDG monitoring in Social City projects. The article concludes with recommendations for modifying the Social City instruments to support SDG alignment and for fostering localized SDG monitoring, which are presented in Section 5. This research aims to advance an approach that integrates local implementation strategies with the assessment of sustainable transformation through synergistic methods—an approach that will also be relevant for future policies related to a post-2030 agenda.

2. Background—Urban Regeneration and SDGs in the Context of the German Social City Program

The German Social City program (1999–2019), formally referred to as "Soziale Stadt," was initiated with the objective of addressing issues of urban deprivation and promoting social integration (Häussermann, 2011).

This program played a significant role in advancing sustainability goals at the local level, as outlined during the Local Agenda 21 process initiated in the mid-1990s. The program employed a multifaceted approach aimed at revitalizing disadvantaged urban areas by addressing various socio-economic and cultural dimensions. It has been implemented in over 400 municipalities across the country (Güntner, 2022). Since 2020, the Social City program has been transferred into a program called “Social Cohesion” with slight modifications to the previous Social City program.

The focus of the Social City Program and its successor, Social Cohesion, includes physical, economic, social, and cultural improvements, such as renovating buildings and infrastructures and enhancing public spaces. It aims to strengthen local economies and create employment opportunities. Additionally, the program seeks to revitalize local culture, contributing to a vibrant urban environment. By facilitating community engagement through local participation processes, the program aims to address community needs, mobilize community members to become active stakeholders in the urban revitalization processes and combat social isolation (Zabel & Kwon, 2021).

2.1. The Social City and Social Cohesion Programs—Processes and Instruments

At the operational level, the programs are designed as incentive frameworks to promote comprehensive cooperation and networking among various stakeholders across all levels of the political and administrative system (Häussermann, 2011). The goal is to modernize administrative actions and transform governance models towards project-related, transdisciplinary networking that facilitates the involvement of non-public actors (Walther & Güntner, 2007). The program is funded in three equal parts from the federal government, state, and municipal budgets, whereby municipalities apply for urban regeneration projects at the neighborhood level (BMI, 2020). Once a project receives approval, the relevant municipality establishes a working group within the municipal administration. This group oversees the process and supports the implementation of various urban regeneration measures in collaboration with affected stakeholders.

The processes and instruments of the urban regeneration programs consist of several key components.

2.1.1. Strategic Level: Preliminary Study (VU)

To participate in the Social City/Social Cohesion program, the first step for municipalities is to conduct a preliminary study (in German: vorbereitende Untersuchung or VU). This study serves as a foundation for applying for funding for a specific urban regeneration project within the Social City/Social Cohesion program. The VU involves on-site investigations, including resident surveys, expert discussions, and secondary analyses of social data, all aimed at gaining a better understanding of local needs (Friedrich Ebert Stiftung, 2010). The findings from these investigations help outline the spatial scope and necessary measures that the project should address once funding is approved. On a strategic level, the VU serves as a vital strategic instrument that establishes a foundation for the urban regeneration process. However, there are no specific guidelines defining the topics the VU should address or the exact procedures it should follow.

2.1.2. Operational Level: Integrated Urban Development Concepts (IEK)

To participate in the Social City funding program, a municipality must, as a next step, develop an Integrated Urban Development Concept (IEK) that incorporates input from affected citizens. The IEK is a crucial

instrument at the operational level that defines clear targets and measures for the funding area. It is accompanied by an integrated urban development plan that provides guidelines for detailing, decision-making, and implementing measures that are closely tailored to the local context. Both the IEK and its integrated urban development plan must align with or connect to an existing city-wide urban development strategy. By being grounded in this existing strategy and utilizing a high degree of participatory processes, these documents are intended to ensure long-term effectiveness (BMI, 2020).

2.1.3. Governance Level: Interdisciplinary Project Group (IPG) Including Neighborhood Management

The Social City/Social Cohesion program is designed to take a bottom-up approach, emphasizing the need for extensive citizen participation in the implementation and updating of the IEK. This process involves encouraging residents of the district to develop ideas and take responsibility for their community. At the governance level, this approach is supported by an Interdisciplinary Project Group (IPG) made up of municipal employees and an institutionalized neighborhood management. The neighborhood management, which is usually organized by a commissioned external agency that operates an office on site, plays a crucial role by being physically present in the neighborhood and acting as a low-threshold contact point for residents (Friedrich Ebert Stiftung, 2010). The IPG acts as an essential link between the residents, the district management and the municipality in the sense of integrated governance structures. In addition, the IPG ensures the networking of various municipal administrative units and integrates site-specific topics into the local political discourse (BMUB, 2016).

2.2. Monitoring the Success of Social City/Social Cohesion Projects

All municipalities conducting urban regeneration in the context of the Social City/Social Cohesion program are required to assess the progress of their projects using evaluation reports. These assessments of the projects involve evaluating both the intermediate and final results using a set of indicators related to the process and the outcomes of each project (BMI, 2020). Process indicators track the implementation of various program activities and initiatives, providing insights into how effectively the program is being executed and whether it is achieving its intended objectives as defined in the IEK. This includes monitoring the progress of specific projects as well as the involvement of different stakeholders. Outcome indicators, on the other hand, measure the actual impacts of the program on the community. They assess changes in spatial and social conditions, such as reductions in crime rates or improvements in educational outcomes. The ultimate goal is to determine if the program has led to meaningful improvements in the quality of life for residents.

2.3. The Social City/Social Cohesion Program and the SDGs—Mutual Objectives, Untapped Opportunities for Collaborative Assessment

Through the aforementioned instruments and processes, the Social City/Social Cohesion program demonstrates a localized approach to promoting social inclusivity and sustainable urban regeneration, closely aligning—though still implicitly—with the principles of the SDGs. Its primary objectives include reducing urban inequalities, encouraging inclusive participation, and revitalizing disadvantaged neighborhoods (BMUB, 2016), which directly relate to SDG 10 (Reduced Inequalities) and SDG 11 (Sustainable Cities and Communities). The program also emphasizes modernizing urban infrastructure and enhancing energy efficiency, contributing to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 7

(Affordable and Clean Energy). Furthermore, as the program transitions into the Social Cohesion program, it integrates funding mechanisms for climate adaptation measures which align with SDG 13 (Climate Action). Efforts to regenerate green spaces and improve urban biodiversity also address SDG 15 (Life on Land), and by involving stakeholders across various levels of governance and promoting participatory decision-making, the program embodies the essence of SDG 17 (Partnerships for the Goals).

Organizers of Social City projects are often keenly aware of the connections between their program goals and the SDGs, particularly if the city already engages in reporting on sustainable transformation through voluntary local reviews (VLR). The city of Stuttgart serves as a noteworthy example in this context. As early as 2019, Stuttgart piloted a VLR in collaboration with the Bertelsmann Foundation and the German Institute of Urban Affairs (State Capital Stuttgart et al., 2019). Furthermore, Stuttgart's SDG coordinator participated in the working group that developed and tested guidelines for monitoring SDGs at the municipal level, and in 2023, the city released its third VLR, which put forward proposals for improving the monitoring methodology (State Capital Stuttgart et al., 2023).

Both the VLR and the Social City/Social Cohesion projects aim to promote sustainable urban development. They both include monitoring processes designed to collect relevant data and contribute to actionable strategies. However, the potential synergies between these two instruments are yet to be harnessed. Typically, in the context of Social City/Social Cohesion projects, the evaluation of progress toward the targets defined in the IEK focuses on individual measures at the neighborhood level and incorporates qualitative aspects. In contrast, localized SDG monitoring uses aggregated quantitative data collected at the city-wide level. Despite these differences, there is significant potential for these monitoring processes to benefit from one another. By combining qualitative and quantitative measurement approaches, as well as process- and outcome-oriented indicators, a more comprehensive assessment could be created and SDG monitoring could move beyond the municipal level to the smaller scale of a neighborhood.

The IPG staff members at the Office for Urban Planning and Housing in the City of Stuttgart, along with the city's coordinator for SDGs, have been collaborating for some time to highlight the connection between the SDGs and the Social City projects across spatial levels. Their efforts include presenting qualitative case studies in the VLR and labeling existing Social City projects with the corresponding SDGs. Building on this internal municipal cooperation and maintaining close contacts with the Institute of Urban Planning and Design at the University of Stuttgart, a joint study was launched. This study aims to further investigate and explore synergies between these two frameworks, examining how the Social City program can align with and support the localization and monitoring of SDGs at the neighborhood level.

3. Research Design—Exploring Synergies Between SDG Monitoring and Social City/Social Cohesion Projects

The present study employs an inductive research approach in conjunction with a case study strategy (e.g., Saunders et al., 2023). In addition to its goal of generating scientific knowledge, the study seeks to provide practical insights that support existing practices. To achieve this, the study concept was developed through a transdisciplinary collaboration between academic and municipal partners, incorporating various forms of knowledge (e.g., Arnold & Piontek, 2018; Regeer et al., 2024) while engaging with the city's existing initiatives related to the SDGs. Throughout the study, both the framing of the research and reflections on

each phase were conducted in partnership with local experts, municipal staff members, and representatives from neighborhood management and civil society.

Two projects were selected as case studies due to the availability of crucial first-hand knowledge and their location in neighboring districts of Stuttgart, which feature comparable governance structures. However, the projects were at different stages of implementation. The first project, situated in Stuttgart-Hallschlag, was an urban regeneration project supported both financially and organizationally by the Social City program. The project's objectives included renovating existing buildings and public spaces, creating new housing, and developing social infrastructure and activities, as well as educational and economic opportunities. Spanning an area of 77 hectares and affecting 3,294 households, the project began in 2006 and was largely completed at the time of this study (2022–2023), providing access to valuable data regarding its main elements and processes. In contrast, the second project, situated in Stuttgart-Münster and launched in 2016, was still in the implementation phase during this study. Similar to the Stuttgart-Hallschlag project, the urban regeneration project in Stuttgart-Münster aimed to enhance social cohesion, improve education, and strengthen the economic foundation while also upgrading the existing buildings and public spaces. However, the project covered a spatial area of only 32 hectares, which is less than half the size of Stuttgart-Hallschlag, resulting in a smaller number of affected households—2,308 in total. The Stuttgart-Münster case study was selected as the focal point of this study and article because it offered opportunities to engage in events that were part of the implementation phase. This was especially relevant for the study's transdisciplinary approach, in which civil society actors collaborate actively with academic and municipal partners to generate knowledge regarding the implementation and monitoring of SDGs.

The study was conducted in the context of a seminar course at the University of Stuttgart titled “Participatory SDG monitoring at the local level,” organized from September 2022 to April 2023. The research process during the course was based on three phases (see Figure 1).

3.1. Phase 1—Exploring Instruments

During the initial phase, students, along with academic and municipal staff members, explored three key instruments through document analysis:

- In relation to the Social City program, they examined (1) the preparatory studies (VU) and (2) the Integrated Development Concepts (IEK) in the case studies from both Stuttgart-Hallschlag and Stuttgart-Münster to assess their alignment with the SDGs. For the VUs, the team analyzed the existing questionnaires used in the VU's survey processes in terms of their conceptualization and identified how many items in the questionnaires were directly related to SDGs. For the IEKs, the team investigated which SDG targets are reflected in the targets defined in the IEKs.
- In relation to localized SDG monitoring, the team evaluated (3) Stuttgart's VLR focusing specifically on SDGs 7, 11, 13, and 15 in terms of the relevance of the targets addressed in the VLR for the neighborhood level in Stuttgart-Münster. This focus on Stuttgart-Münster is significant because the district is still in the early stages of implementing the Social City program, which presents an opportunity to monitor its progress toward sustainable transformation over the next years. In consultation with the district manager, district representatives and municipal staff members, the team from the University of Stuttgart discussed whether any adjustments to existing targets from the VLR

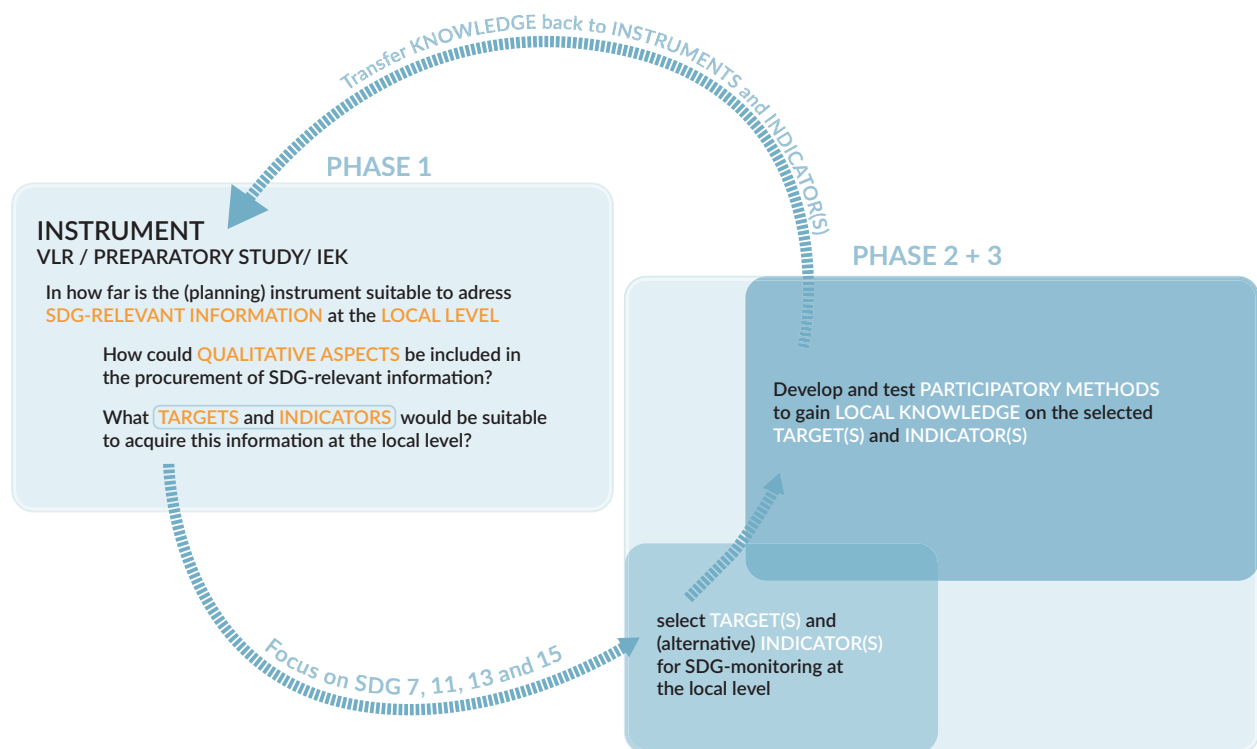


Figure 1. Structure of the research process.

or additional targets were necessary to translate the municipal SDG monitoring to the neighborhood level. Exemplified by SDG 13, Figure 2 illustrates how target 13.3, which was not assessed in Stuttgart's VLR, was deemed relevant for the neighborhood. However, in deviation from the guidelines of the SDG indicators for municipalities, which suggest assessing "full-time equivalent positions in municipal climate protection per 1,000 inhabitants" (Bertelsmann Stiftung et al., 2020, p. 135) as a quantitative indicator for target 13.3, the team proposed to develop alternative qualitative indicators at the neighborhood level for this target. These qualitative indicators aim to assess the residents' awareness and knowledge about climate change issues and their local capacities to adapt to and mitigate climate change.

3.2. Phase 2—Developing Indicators

Building on phase one, the second phase of the research process focused on how to increase the proportion of qualitative indicators used to collect information at the neighborhood level for selected targets related to SDGs 7, 11, 13, and 15. The selection of these targets was based on their relevance to the Stuttgart-Münster district, which would facilitate synergies between the SDG monitoring process and the activities of the Social City project. Figure 3 exemplifies the proposed indicators for target 13.3.

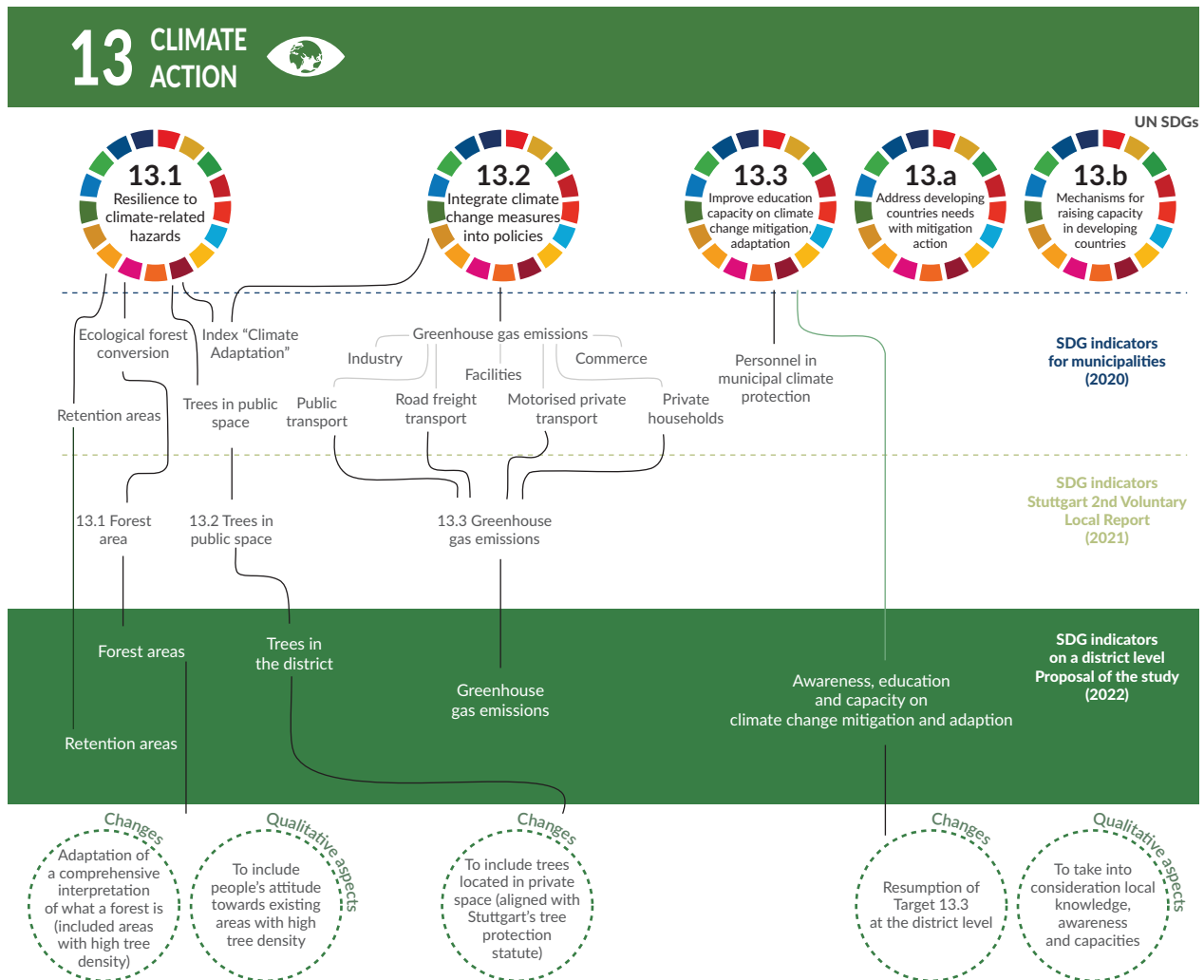


Figure 2. Proposed translation of SDG targets and indicators to the district level of Stuttgart-Münster.

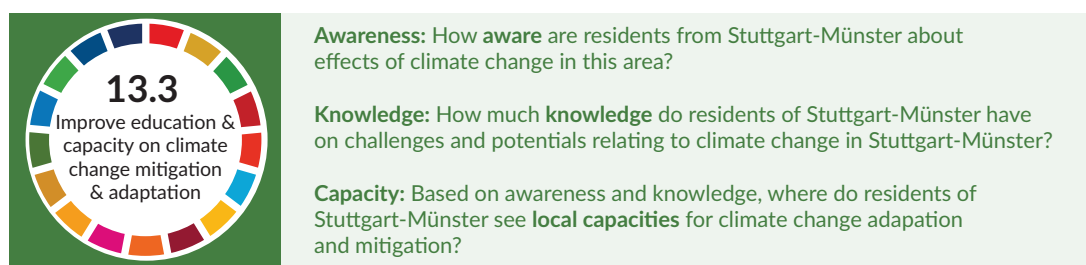


Figure 3. Proposed qualitative indicators for target 13.3 at the district level of Stuttgart-Münster.

3.3. Phase 3—Testing Participatory Data Collection

In the third phase of the research process, students developed and tested low-threshold participatory formats to gather information on the selected and locally adapted SDG targets and indicators. This experimental phase was conducted as part of the Social City citizen involvement strategy in Stuttgart-Münster during December 2022. The theme of the citizen involvement strategy "Lebendiger

Adventskalender” (Living Advent Calendar) makes use of the German tradition of counting down the 24 days of Advent until Christmas by giving associations, local businesses or private households from the district the opportunity to create a sociable evening for each day. The hosts can introduce themselves and their offerings, organize a small cultural program or simply invite people to exchange ideas and enjoy a relaxed get-together in the neighborhood. In line with this participatory event, the students explored various methods, combining qualitative interviews, open-ended questionnaires, mapping techniques and photo voices through playful events.

Participants for the events were selected using a non-probability, convenience sampling method (Rivera, 2019), which included all residents who accepted the publicly distributed invitation to attend. Additionally, passers-by were invited to participate. This non-selective approach was chosen because the main objective was not to obtain generalizable results regarding the content of the questions, but rather to test the data collection methods during the participatory formats. Figure 4 exemplifies three of the participatory formats implemented during one of these events, presenting data collection for target 13.3 and its proposed indicators.

In this example, each of the three indicators proposed for target 13.3 was connected to one method of qualitative data collection. For the indicator “awareness about climate change in Stuttgart-Münster,” residents were asked to participate in a photo voice contest, documenting evidence of climate change in Stuttgart-Münster. For the indicator “knowledge on challenges and potentials relating to climate change in Stuttgart-Münster,” people were asked to note down climate resolutions for their neighborhood based on open-ended questions, which were then analyzed through thematic analyzes. The same participants were

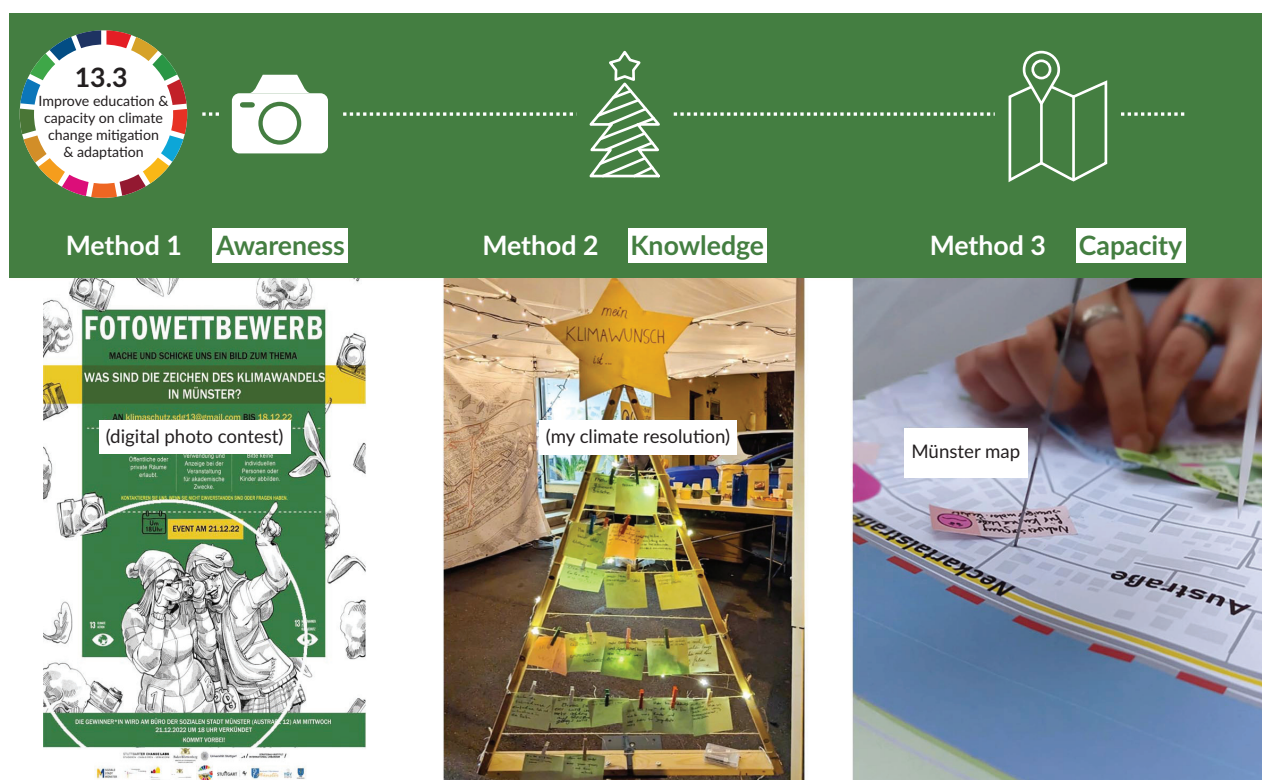


Figure 4. Participatory events for data collection related to target 13.3 at the neighborhood level of Stuttgart-Münster.

asked to contribute to a method for collecting information on the third indicator, which focuses on “local capacities for climate change adaptation and mitigation.” In this context, they created a map-based inventory of locations in Stuttgart-Münster that could support climate adaptation efforts. Additionally, participants were invited to suggest ways to implement these contributions, considering both individual and collective capacities.

Following the development and testing of indicators and participatory data collection methods, the team collaborated with the district manager, district representatives, and municipal staff to assess the suitability and feasibility of the proposed indicators and data collection methods. These action learning spirals (Betten et al., 2013) are fundamental for further knowledge production and the applicability of gained results (Regeer et al., 2024).

In a last step of the research process, the knowledge gained during phase 1–3 was linked back to the municipal SDG indicator system and the instruments of the Social City program. This feedback loop, conducted through transdisciplinary reflection rounds, resulted in final conclusions and recommendations for the further development of participatory SDG monitoring at the neighborhood level, with the aim of complementing and optimizing the indicator system and enhancing the instruments of the Social City program.

4. Research Findings—Alignment of SDG Monitoring and Social City/Social Cohesion Projects

The study’s three-phase research design has produced findings that explore the synergies between SDG monitoring and the Social City approach from various perspectives. In Phase 1, the focus was on the alignment between the components of the Social City (VU and IEK) and SDG monitoring from an instrumental standpoint. Phases 2 and 3 then examined alignment options concerning the methods used. Following the structure of the research design, the findings are presented and discussed for each of the subsequent phases, focusing on the case study of Stuttgart-Münster.

4.1. Findings From Phase 1—Alignment of the Instruments

During the VU of Stuttgart-Münster, surveys were conducted to collect information on the need for redevelopment, as well as the socio-economic, structural, and environmental conditions and contexts. These surveys also aimed to identify the key objectives that should be pursued during the redevelopment. A retrospective comparison of survey questions for Stuttgart-Münster with SDGs revealed a strong connection, with over 40% of the questions relating to information relevant to the SDGs, particularly concerning SDG 11 (Sustainable Cities and Communities). This is significant because the survey questions were not designed with explicit consideration of SDGs or linkages to SDGs. Some of the questions in the Stuttgart-Münster survey were open-ended qualitative inquiries, making it difficult to define exact SDG references with certainty. However, these open-ended questions allowed for a deeper understanding of the diverse perspectives and development needs within the population, enabling respondents to address relevant concerns in a more flexible manner. As a result, the analysis of the VU surveys revealed that, although there are significant quantitative overlaps of the survey questions with SDGs, *the VU surveys did not sufficiently address key thematic sustainability objectives*. For instance, SDG 13 and 15 were not explicitly

included; instead, these goals could only be indirectly addressed through open-ended questions in the VU surveys for Stuttgart-Münster.

Regarding the instrument of the IEK, a detailed analysis of the Stuttgart-Münster case study reveals that many SDGs are reflected within the IEK targets, which is significant because the development of these targets was based only on the VU, with no direct reference to SDGs. However, upon reviewing the alignment between these targets and the SDGs, it becomes clear that not all SDGs are equally represented. Similar to the VU, this analysis highlights the *underrepresentation of certain SDGs within the IEK* (see Figure 5).

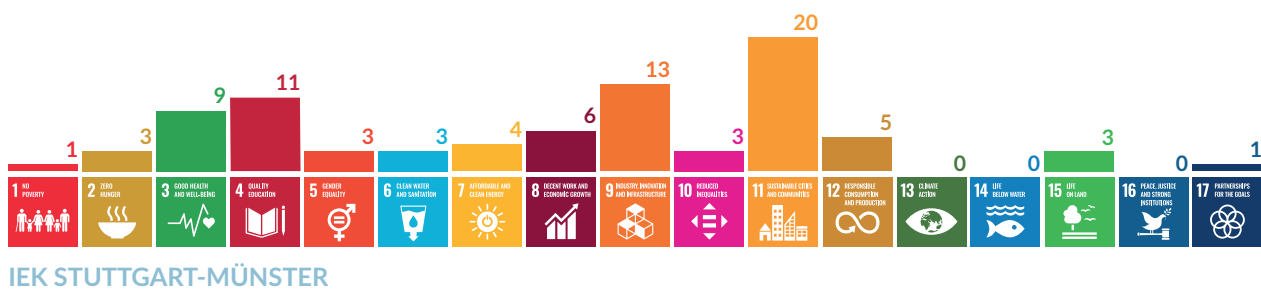


Figure 5. Alignment of targets mentioned in the IEK of Stuttgart-Münster with SDGs. The numbers above the bars indicate how many SDG targets are reflected in the IEK targets.

An in-depth examination of the content of the IEK targets for Stuttgart-Münster reveals that all qualitatively described targets in the IEK relate to multiple SDG targets, demonstrating a highly multidimensional approach. This multidimensional approach illustrates an integrated perspective on sustainable transformation and offers a valuable alternative to the frequently criticized isolated assessment of SDGs (e.g., Biermann et al., 2022; Lyytimäki et al., 2023).

Table 1 illustrates this multidimensional relationship in detail and exemplifies how the IEK targets align with several SDG targets. The first target under the action field “Habitation, Residential Environment, and Public Space,” for instance, focuses on transforming underutilized areas in Stuttgart-Münster to benefit the community. This goal is closely aligned with SDG target 11.7, which aims to ensure universal access to safe, inclusive, and accessible green and public spaces, as well as SDG target 8.9, which seeks to promote local culture.

With reference to the SDG monitoring instrument of the VLR, findings of the study demonstrate that *municipal SDG targets can be effectively adapted to the local level of a neighborhood*. This supports the argument made by various scholars, such as Mair et al. (2018), Valencia et al. (2019), and Jossin and Peters (2022), for the need to advance localized SDG monitoring. Using SDG 13 as an example, the study provides initial insights into how this adaptation can be achieved. Focusing on Target 13.3, it was demonstrated that an indicator based on numerical data—personnel in municipal climate adaptation—can be altered to indicators that have transformative potential at the neighborhood level and resonate with local people. This people-centered approach was also central to Phase 2 and 3 of the research process, the findings of which are presented in the following section.

Table 1. Relation between the IEK Stuttgart-Münster and SDG targets.

SDG-Targets	Field of action 1: Habitation, residential environment, and public space
8.9/11.7	Spaces in Stuttgart-Münster are transformed for use for the common good of the community
11.3/11.7/12.8/15.5/15.8/15.9	Public space in Stuttgart-Münster appears welcoming and invites people
2.3/2.4/2.5/8.3/8.a/9.3/11.3/11.7	Retail and gastronomy in Stuttgart-Münster are being secured and strengthened
3.8/7.1/11.1/11.2/12.1/12.7	Housing in Stuttgart-Münster is attractive for people of all life situations
1.4/3.8/6.1/6.3/6.4/9.c/11.1/11.2/11.4/11.6/12.4/17.1	Environment and infrastructure in Münster contribute to livability
Field of action 2: Cohabitation of generations	
4.2/4.5/5.c/8.5/10.3/10.4	Stuttgart-Münster offers cross-generational activities
4.2/4.5/11.2	Stuttgart-Münster offers age group-specific activities
Field of action 3: Mobility for everyone	
9.1/9.4/11.2/11.6	Stuttgart-Münster has an improved network of pedestrian paths
9.1/11.2	Stuttgart-Münster receives safe infrastructure for motorized individual transport
9.1/9.4/11.2/11.6	Stuttgart-Münster is well-connected to public transportation
9.1/9.4/11.2	Stuttgart-Münster enables mobility by bike
9.1/9.4/11.2	Infrastructure in Stuttgart-Münster is safe for all traffic participants
7.1/7.2/7.3/9.1/9.4/11.2	E-mobility in Stuttgart-Münster is strengthened
Field of action 4: Education, culture, and health	
8.3/8.6/8.9/10.2/12.b	In Stuttgart-Münster offers educational activities for all population groups
3.7/4.1/4.2/4.3/4.4/4.a/4.6/4.7	Stuttgart-Münster offers a diverse cultural program
3.4/3.a/3.c/3.d/3.7/3.8/5.4/ 5.6	Stuttgart-Münster supports health offers

4.2. Findings From Phase 2 and 3—Alignment of Methods

The experiences gained from Phases 2 and 3 highlighted *methodological opportunities to link localized SDG monitoring with transdisciplinary and participatory elements of the Social City projects*.

The development of localized, neighborhood-level indicators using a qualitative approach was facilitated through transdisciplinary reflection rounds within the context of the Social City project in Stuttgart-Münster. For example, the replacement of the indicator for Target 13.3 with qualitative indicators measuring awareness, knowledge, and capacity (as shown in Figure 3) was discussed and refined in collaboration with three IPG representatives from Stuttgart-Münster, the head of the district, one representatives of the district council, three representatives from the City of Stuttgart, two external experts, and three employees from the Institute of Urban Planning and Design at the University of Stuttgart, together with the student group. This process aimed to address the gap identified in the analysis of the VU and IEK concerning

SDG 13, as well as to gather suggestions for incorporating urban climate aspects into future implementations of the Social City project.

However, it is important to note that the indicators developed in this study were proposed and tested only within the framework of four participatory events in Stuttgart-Münster. Each event had between 25 and 38 active participants, totaling 127 individuals across all four events. Consequently, extending implementation beyond this limited testing environment and the non-representative sample of participants is still pending, and the indicators cannot be used to draw generalizable conclusions. Furthermore, it has to be acknowledged that the information collected with these types of qualitative indicators have limited utility for comparative assessments, as they are highly context-specific. Nonetheless, if this information is used thoughtfully by interpreters, it can help incorporate local knowledge into processes for sustainable transformation and ensure that affected communities are not marginalized (see e.g., Goonesekera & Olazabal, 2022).

The development of participatory methods for SDG monitoring also benefited from the transdisciplinary reflection sessions within the context of the Social City project, in which interim results of student ideas were critically discussed. Conversely, there is a chance that the Social City project will benefit from the SDG monitoring tests conducted at the neighborhood level. For instance, two of the participatory methods employed in relation to SDG 13.3 (an open-ended questionnaire related to climate resolutions and participative mapping) proved that climate change adaptation was considered relevant for the district, and the inventory of locations for climate adaptation efforts, collaboratively created through participative mapping, might inform future IEK measures.

However, it has to be mentioned that not all participatory formats employed during this study were equally successful. Formats which did not engage residents through direct, face-to-face interaction were particularly prone to failure. This was, for instance, noted with the photo voice contest, aimed at collecting data for the indicator on awareness of climate change effects, which ultimately failed to gain traction. Furthermore, it is important to note that the participatory methods tested in this study were limited to single events conducted in a small area of Stuttgart-Münster. Additionally, the application of these methods did not involve a well-balanced population sample. If these methods were to be applied at the neighborhood level on a larger scale, it would be essential to ensure balanced participation over extended periods in order to achieve meaningful results for SDG monitoring. Given the study's research design, which was not intended to produce generalizable results regarding the indicators, but rather to test the feasibility of incorporating qualitative elements into SDG monitoring at the neighborhood level, this lack of generalizability was considered acceptable.

A key finding from these tests was that residents were open to sharing information about the qualitative aspects related to the selected SDGs. Furthermore, the discussions facilitated by the *participatory methods effectively promoted knowledge dissemination concerning the SDGs and helped address the knowledge gaps* that many residents still had regarding SDGs. The willingness to participate in localized SDG monitoring, as demonstrated during the tests, can be attributed to the active support of the IPG team from the Social City Stuttgart-Münster. The members of the IPG team, who are locally known to serve as intermediaries between the community and the municipal administration, effectively facilitated participatory actions. The IPG team was therefore essential in managing participatory methods, and they also played a significant role in raising awareness of SDGs, also outside of the scope of the participatory events of this study.

Right from the start of the Soziale Stadt Stuttgart-Münster project, the IPG team emphasized the connection between the targets of the IEK and the SDGs through various projects, and they effectively leveraged these projects and their participatory events to advocate for SDGs. The immersive experience with *the Social City neighborhood management* in Stuttgart-Münster has shown that it *is a powerful tool for promoting SDGs, serving as a catalyst for progress in achieving SDGs at the neighborhood level*. Additionally, it acts as a testing ground for innovative participatory practices designed to capture citizens' perceptions and preferences on sustainable transformation. During the VU, all residents, home and property owners and business people in the neighborhood were included in surveys, and the objectives of the IEK were developed through procedures that were open to all stakeholders. In this respect, the Social City project is in line with the call for greater inclusion of residents' local realities and agency into sustainable development efforts (Bonsu et al., 2020). Furthermore, the practices aimed at implementing IEK targets significantly benefit from the inclusive governance framework established by the IPG team, which is essential for making progress toward achieving localized SDGs.

5. Key Insights and Recommendations—Leveraging Synergies Between SDG Monitoring and Social City/Social Cohesion Projects

The translation of SDGs and their monitoring practice to the local level requires the allocation of additional resources and innovative practices. Such resources and practices can only be secured through the meaningful integration of the SDG implementation and monitoring process into existing urban development and regeneration activities and programs. The primary objective should be to foster maximum synergies. This can be achieved by leveraging existing procedures, frameworks, and participatory activities, as well as by identifying suitable modifications in existing urban development instruments to support SDG implementation and monitoring. The study shows that—regarding the instruments of the Social City/Social Cohesion program—there is significant potential to integrate SDGs. Based on this premise, the study offers the following recommendations:

- (1) Explicit inclusion of SDGs in Social Cohesion projects, and extending this requirement to all Urban Development Support programs, to encourage local authorities to take meaningful actions toward achieving SDGs at the local level.
- (2) Integrating SDGs into both project proposals and evaluations of Social Cohesion projects. For project proposals, developing a guide would be highly beneficial. This guide could outline SDG-relevant aspects for preparatory studies and assist in interim and final evaluations to track progress toward SDG achievement.
- (3) Ensuring comprehensive representation of all SDGs relevant to the local context, thereby supporting a balanced approach and avoiding an overemphasis on—or a neglect of—individual SDGs. This balanced approach will enhance the effectiveness and impact of municipal urban development activities.
- (4) Incorporating innovative methods from monitoring practices of urban regeneration projects, such as the assessment of qualitative data and data relating to process achievements, into localized SDG monitoring. This integration will enhance the methodological diversity of SDG monitoring at the local level and significantly improve the overall quality and relevance of the data.

These recommendations are further detailed in two strands: First, detailed recommendations focused on modifying the instruments of the Social Cohesion Program to improve alignment with SDGs, and second, recommendations aimed at supporting the localization of SDG monitoring beyond the scope of the Social Cohesion program.

5.1. Recommendations for Modifying the Social Cohesion Instruments to Support SDG Alignment

5.1.1. Integrating SDGs Into VU Surveys

The VU is designed to gather extensive foundational information for future urban renewal areas, shaping the future development of the involved neighborhoods. However, there are currently no binding standards for these preparatory studies, nor is there an assessment of whether relevant SDGs are adequately represented in the surveys. Therefore, the establishment of a framework—perhaps in the form of a matrix—is recommended that incorporates the SDGs in VU surveys and ensures their balanced consideration from the outset of a Social City/Social Cohesion project. This framework could also work as a blueprint for other urban redevelopment programs and instruments, promoting the consideration of SDGs at the local level.

5.1.2. Making SDG Relation Transparent in the IEK

The comparison of the IEK targets with SDG targets in the case of the IEK Stuttgart-Münster has highlighted the potential for synergies between the two concepts. Understanding these synergies is essential for effectively leveraging them. For instance, analyzing how SDGs are represented in the IEK can help identify strategic gaps. In the cases of the IEK in Stuttgart-Münster, it is evident that SDG 13—climate action—although relevant to the district, is not prominently featured in the explicit formulation of the IEK goals. This retrospective analysis can help inform recommendations for addressing strategic gaps, such as the underrepresentation of SDG 13, and support necessary corrections while the IEK is still being implemented. Therefore, it is advisable to conduct and present a comparison between IEK targets and SDG targets in future Social Cohesion projects at regular intervals. To facilitate this process, providing clear instructions and documented examples will assist the relevant IPG teams in the planning offices with this task.

5.1.3. Enhancing SDG Communication Through Neighborhood Management's Participatory Formats

The activities in Stuttgart-Münster, which were designed to raise awareness of the SDGs, were driven by the personal commitment of the IPG coordinators involved. In order to harness the significant potential to make the SDGs more tangible through citizen engagement in neighborhood management in upcoming Social Cohesion projects, it is recommended to develop and implement guidelines for a communication strategy that incorporates the SDGs. Simultaneously, it is advised to maintain the district management even after the funding project has concluded, with a view to ensuring the ongoing sustainability of the initiated change processes and preserving their impact. To achieve this, formats would need to be developed that are firmly anchored in the commitment of civil society yet are also recognized by public institutions.

5.1.4. Creating Synergies Between SDG Monitoring and Social Cohesion Project Assessment

To effectively use the instruments of the Social City/Social Cohesion program for sustainability monitoring, it is crucial to consider not only the progress towards project's specific targets, but also assess how these

targets contribute to SDGs at the level of the affected neighborhood. A key requirement for this is to establish an alignment between SDG monitoring and IEK monitoring in advance. This alignment would facilitate to track progress toward IEK targets while also contributing to monitoring achievements related to SDGs. This alignment would also offer a key benefit: Monitoring progress towards SDGs would closely follow the framework of IEK monitoring, during which both process and outcome indicators are collected. This could improve the methodological diversity of localized SDG monitoring, which—until now—primarily focuses on output-oriented metrics at the municipal scale. At the local level, particularly the level of neighborhoods, SDG monitoring has the opportunity to expand beyond established metrics by adjusting indicator types to the context. Connecting SDG indicators with IEK targets could thereby catalyze the advancement and testing of specific district-related indicators.

5.2. Recommendations for Supporting Localized SDG Monitoring

5.2.1. Fostering Political Commitment for Integrating the SDGs Into Urban Renewal Practices

Integrating the SDGs into urban regeneration programs and instruments requires strong political commitment at the city-wide level. This commitment should also extend to higher levels of governance to ensure a cohesive overall vision and strategic plan for the city, aligned with working towards SDG achievements. Such an approach will subsequently filter down and influence district and neighborhood levels as well. An example of this in practice is Mannheim, Germany, which has developed a guiding framework (“Leitbild”) that incorporates SDGs (Stadt Mannheim, 2022). In Stuttgart, current initiatives to update the existing strategic development plan (“Perspektive Stuttgart”) would have significant potential for ensuring alignment with SDGs.

5.2.2. Enhancing Coordination Among Municipal Departments

To effectively support this political commitment, strong coordination among various municipal departments is essential. This requires fostering cross-departmental cooperation and communication to break down the sectoral silos often present in larger municipalities. Furthermore, it is important for politics and administration to work closely together, ensuring that their coordination efforts extend to municipal budgeting that aligns with the achievement of SDGs (e.g., Manes-Rossi, 2024). An example of this approach is the City of Malmö, Sweden, which has taken the lead in aligning its budget with coordinated efforts aimed at achieving SDGs (City of Malmö, 2021).

5.2.3. Improving Communication of SDG Progress and Shortcomings

Additionally, ensuring information and transparency is crucial for communicating both the existing progress and shortcomings in achieving SDGs. To support targeted actions for localizing SDGs, digital tools like municipal SDG dashboards are essential (German Council for Sustainable Development & Deutsche Gesellschaft für Internationale Zusammenarbeit, 2023). For instance, the City of Stuttgart has initiated efforts through digital scorecards available on its web-based SDG portal. This platform allows local politicians, municipal staff members, and citizens to stay informed about the city’s performance concerning its municipal SDG indicators. The next step should be to adapt this information to smaller scales, such as districts and neighborhoods. This would create a knowledge base that residents can relate to in their

immediate living environments. Engaging with the SDGs at the neighborhood level also enhances awareness and empowerment, particularly if it includes the co-production of knowledge. Incorporating this collaboration as a key aspect of SDG initiatives will not only foster stronger community buy-in but also foster other participatory processes essential for SDG implementation, particularly in areas facing significant social and spatial disadvantages, like those targeted by the Social City/Social Cohesion program.

6. Conclusion and Outlook to a Post-2030 Agenda

Our research highlights the significant need to translate global sustainability agendas into actionable initiatives at the neighborhood level. Cities and communities are essential catalysts for meaningful, real-world change. When global agendas are aligned with the lived experiences of local populations, they can transition from a perspective sometimes criticized as abstract and primarily discourse-oriented (see e.g., Biermann et al., 2022) to one that effectively addresses the actual needs of communities. Establishing this connection to individuals' living environments—specifically, neighborhoods—and to the administrative entities that facilitate transformation in daily life, such as cities and their neighborhood-level projects, may serve as a catalyst for achieving sustainability goals. Consequently, it is imperative that the post-2030 agenda prioritizes the applicability of development practices at the local scales of cities as well as neighborhoods and supports synergies with existing programs and processes to ensure impactful results.

Equally important at these local levels is the provision of reliable, context-specific data and information, which is crucial for informed decision-making, monitoring progress and adapting strategies to local realities. In this context, a post-2030 agenda should provide even greater support for the collection of local data and its transparent communication. In this regard, the siloed approach of the current SDG assessment, which has been widely criticized, should evolve towards an integrated assessment of interconnected sustainability aspects (see also Bai, 2024; Cernev & Fenner, 2024). Beyond this, it is imperative that the quantitative assessment of sustainability aspects is integrated with qualitative information derived from the relevant context (Yamin, 2019). This integration helps mitigate the risk of neglecting complex structural causes, which are often difficult to assess, by focusing solely on selected measurable indicators. An integrated monitoring framework for the post-2030 agenda should also consider what puts sustainability at risk and what actors and processes contribute to the root causes of that risk (Kaika, 2017). In this regard, the neighborhood level provides a concise framework for an in-depth exploration of the causes that drive the need for change. At this level, it should be possible to assess not only progress towards more sustainable conditions, but also monitor local practices that actively address deviations from sustainable conditions through “dissensus practices” (Kaika, 2017, p. 89), and to recognize their transformative and indicative potential.

Furthermore, it is imperative for a post-2030 agenda to consider financing and budgeting mechanisms tailored to facilitating SDG implementation at multiple scales, including the local scales of cities and communities (see also Cernev & Fenner, 2024). These mechanisms, which are currently still in their early stages, need to be expanded to support needs and capacities of local projects. Without adequate and sustained financial support, even the most aligned sustainability initiatives risk falling short of their potential.

Moreover, capitalizing on multi-level governance structures and promoting active stakeholder involvement can significantly enhance sustainability efforts in a post-2030 agenda. Engaging a broad spectrum of actors at the local level—including local governments, civil society, private sector entities, and citizens—could foster shared

ownership, agency, and accountability, while also enabling the alignment of objectives across governance levels (see also Bonsu et al., 2020).

Finally, the neighborhood level might be conducive to balance the technical aspect of selecting suitable indicators and matching data with the more overall need to open SDG knowledge production to citizens as part of a “democratic governance of SDG indicators” (Fukuda-Parr & McNeill, 2019, p. 5). In this context, introducing options for co-producing knowledge about transformation needs, co-decision making with regard to development goals, and co-creation of on-site transformation could help bridge the often-cited gap between assessment and implementation (Jossin & Peters, 2022).

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Conflict of Interests

The authors declare no conflict of interests.

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Is Climate-Neutral the New Smart and Sustainable City? A Review Towards Urban Climate Neutrality

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Abstract

The role of cities in sustainable development has gained increasing importance since the adoption of the Rio Declaration and Agenda 21, culminating in SDG 11 of the 2015 UN 2030 Agenda. Among the challenges of urban sustainable development, climate change has been recognized as a central one, positioning cities as fundamental actors in mitigation and adaptation efforts. In parallel with discourse on sustainable cities, the concept of smart cities has been presented as a tool aimed at improving urban resilience through technology and data-driven decision-making. The article investigates whether climate neutrality is becoming the new imaginary of sustainable cities, by analysing the emergence, development, and future perspectives of the dominant sustainable and smart city imaginary in the governance of sustainable development, both at the international and European levels. We review the main scholarly literature and policy documents by tracing the evolution of ideas, practices, and policies that have shaped the modern concept of the sustainable city. We then examine how this concept has expanded to include concerns about climate change adaptation and mitigation through smartness, often overlooking the issue of social inclusion for the most vulnerable.

Keywords

climate neutrality; climate urbanism; SDG 11; smart cities; sustainable cities

1. Introduction

At least since the publication of the Brundtland Report in 1987 and the adoption of Agenda 21—the action plan drafted during the 1992 Earth Summit—the central role of cities and municipalities in attaining sustainable development was made explicit. It has since become accepted knowledge that decisions taken at

the local level are critical to tackle environmental degradation and climate change (Beretta, 2018; Bulkeley et al., 2015). Recent influential global initiatives reaffirm the role of cities in responding to environmental degradation, particularly climate change. 2015 has been, in this regard, a defining year for global climate action and sustainable development. While Pope Francis was presenting his global call to action to respond to the socio-environmental crisis with a warning against the technocratic paradigm (Francis, 2015), international organizations were laying the groundwork for the global governance of sustainability and climate change for the following decades. The United Nations (UN) 2030 Agenda for Sustainable Development (UN, 2015) and the Paris Agreement signed at the UN Framework Convention on Climate Change COP21 (UNFCCC, 2015) have helped lay the pathway for tackling global environmental concerns, building on the long-standing discourse of sustainable development. To meet the targets set by both documents, the role played by cities and urban areas for sustainable development and climate action has become even more fundamental than before, especially considering that 55% of the global population lives in urban settlements—a percentage that is projected to increase up to 68% by 2050 (UN DESA, 2019). Furthermore, while cities cover less than 2% of the Earth's surface, the last IPCC Report highlights that 70% of global GHG emissions are being produced at the urban level (IPCC, 2022). Within this framework, the role of cities for the global governance of sustainable development and climate change becomes central.

Cities not only contribute to environmental harms but are also significantly impacted by the effects of climate change (Bulkeley et al., 2015). The last IPCC Report is clear in this instance: “In all cities and urban areas, the risk faced by people and assets from hazards associated with climate change has increased (high confidence)...Evidence from urban and rural settlements is unequivocal; climate impacts are felt disproportionately in urban communities, with the most economically and socially marginalized being most affected (high confidence)” (IPCC, 2022, p. 909). This statement is central to legitimizing the adaptation efforts promoted by the resilient city model (Hatuka et al., 2018). However, cities are also moving strongly and rapidly towards mitigation efforts, on the road to climate neutrality. Seto et al. (2021), for instance, highlight that by 2020, there were already more than 800 cities worldwide that had made commitments for net-zero pathways. We have reached a point of global scientific consensus on the link between climate change impacts at the urban level and questions of environmental and climate justice. However, while this consensus has gained greater traction in local adaptation policies (Hughes & Hoffmann, 2020), the connection between inequalities and mitigation policies has remained less explored. More specifically, although fairness issues in mitigation have been strongly advocated at the global level and in North-South relations—particularly within the framework of the UNFCCC (Adger et al., 2006)—questions of a just transition to net zero still require great attention at the local and urban levels.

To support this premise, we examine how the discourse on sustainable cities has evolved within the international governance framework of sustainable development, culminating in Sustainable Development Goal (SDG) 11 of the 2030 Agenda—“Make cities and human settlements inclusive, safe, resilient and sustainable”—which includes environmental and climate action, especially through Target 11.b (UN, 2015). We choose to focus on the sustainable city, based on the principles of sustainable development and SDG 11, since it is undoubtedly the “dominant policy narrative among the world's major cities” (Long & Rice, 2019, p. 993; see also de Jong et al., 2015) and has shaped the urban development agenda for the last decades. We furthermore maintain that “smart cities,” which have gained worldwide recognition (Helbing et al., 2021) and have increasingly featured in academic research (de Jong et al., 2015), are presented as the means to enhance urban resilience through technological advancements and data-driven decision-making (Beretta,

2015). While both frameworks represent the “currently predominant paradigms of urbanism” (Bibri et al., 2023, p. 10), we contend that recent policy initiatives, such as the European Mission Cities, signal the rise of a new urban imaginary: the climate-neutral city. This emerging imaginary appears as a “natural” successor to both sustainable and smart cities, combining environmental targets with technological solutions under a decarbonization mandate. In line with the literature on climate urbanism (Long & Rice, 2019), we hypothesize that climate change has become a central legitimizing narrative in urban planning—frequently mobilized to justify technocratic and neoliberal development strategies.

The present review aims to critically examine how the conceptual building blocks of sustainable and smart urbanism are being reconfigured within the discourse of the climate-neutral city. To make this case, the review is structured with an initial methodological note, followed by a genealogical-analytical section on sustainable and smart cities that traces how these concepts have contributed to the emergence of climate neutrality as a new urban imaginary. By climate-neutral cities we understand “cities that have committed to an emissions reduction target with a goal of at least an 80% reduction in GHG emissions by a given year from baseline or have signed up to an initiative committing to such a decarbonization goal” (Seto et al., 2021, p. 380), which implies important structural and infrastructural changes for city planning and citizens’ behavior. In this light, the climate-neutral city can be seen as a hybrid—one that emerges at the intersection of the sustainable city’s ethical imperative of cities bearing responsibility for environmental action and the smart city’s technological promise of optimization.

The first analytical section traces the evolution of the sustainable city paradigm through key global events and agreements—such as the 1992 Rio Conference, Rio+20, and the adoption of the UN 2030 Agenda—and shows how this discourse helped position cities as central actors in the governance of sustainability and, increasingly, climate action. This trajectory reflects a shift toward interpreting sustainable development primarily in environmental terms, while reinforcing the role of cities, beyond the nation-state, in the multilevel governance of climate change (Betsill & Bulkeley, 2003). The second analytical section turns to the smart city discourse, emphasizing the central role of digitalization and ICT in advancing a vision of urban efficiency, optimization, and control. We interpret this discourse as closely aligned with neoliberal rationalities, positioning technology as both a solution and strategy for managing urban complexity. In the concluding discussion, we argue that the emerging imaginary of the climate-neutral city draws upon and hybridizes elements from both these discourses, thereby promoting it to a new urban imperative. The use we make of the term *imaginary* reflects the fact that urban climate neutrality is not merely a new policy goal but a reconfiguration of urban futures: one that aligns climate objectives with technological and market-oriented governance, and that may risk reinforcing existing inequalities if not critically examined. We conclude by reflecting on what this means for the future of urban sustainability beyond 2030.

2. Methodological Note

Adopting an interpretative perspective, we performed a historical review of the literature to analyse how the two dominant discourses of sustainability and smartness in urban policy and planning have shaped the emerging discourse of urban climate mitigation. This is done by employing genealogy (Foucault, 1977) as a method that “emphasizes the ‘process’ and action or practice aspects of discourse arrangements and the meaning of power-knowledge complexes” (Keller, 2013, p. 50). While we adopt a rather loose interpretation of the genealogical method, by mainly developing a narrative literature review of both scholarly works and

policy documents, we adhere to Koopman's account, following which "genealogy at its best involves a critique in the form of the historical problematization of the present" (2013, p. 2). Rather than conducting a purely historical analysis of a concept's development, genealogy facilitates inquiry into the multiplicity of factors, discourses, and practices that shape the conditions of truth in the present. We do not offer a comprehensive history of the development of the climate-neutral city discourse, but rather a genealogy of how two seemingly separate discourses—on sustainability and smartness—have come to shape the present understanding of the climate-neutral city. While we do employ a genealogical method, we do not necessarily apply a strictly Foucauldian reading of the issue at hand, but rather an approach aimed at tracing the roots of an emerging imaginary (Jasanoff & Kim, 2015) based on the review of existing dominant knowledge in the global urban agenda (Parnell, 2016). As explained by Jasanoff (2015), sociotechnical imaginaries are "collectively held and performed visions of desirable futures' (or of resistance against the undesirable), and they are also 'animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology'" (p. 19). The term helps to better understand how scientific knowledge and technological innovations interact with social and political processes in shaping visions of the future. The theory emphasizes that these imaginaries are not only about what technologies can do but also about how they align with societal values, identity, and governance.

The choice of the narrative literature review emphasizes the idea that the field of urban sustainability research and practice is characterized by overlapping and contested bodies of knowledge that cannot be adequately captured through purely systematic methods. A narrative review, while open to critique for subjectivity, can offer the necessary flexibility to critically engage with dominant paradigms, such as urban sustainable development. The selection of literature—which comprises 14 international policy documents on sustainable, smart, and climate-neutral cities, as well as around 70 scholarly papers—was driven by thematic and theoretical relevance rather than exhaustiveness or objectivity. Inclusion criteria involved peer-reviewed scholarly works that critically engage with "sustainable cities," "smart cities," and "climate-neutral cities," published in English and Italian mainly since 2000. Furthermore, some of the most relevant policy documents concerning the global governance of sustainable urban development were analysed, including UN, European, and national initiatives of particular relevance for sustainable, smart, and climate-neutral cities—as an example, these spanned from the Agenda 21, to the 2030 Agenda and the New Urban Agenda, to the preparatory documents for the European Mission Cities. Since we believe that urban efforts towards climate mitigation can have a significant impact on how cities will be governed and shape urban social orders and practices for years to come, "if we are to reconstruct our present so that it may yield better futures, we first need a grip on the materials out of which our present has been constructed in the past" (Koopman, 2013, p. 12).

3. Emergence and Evolution of the Sustainable City

3.1. *The Sustainable City in Practice in Global Policies*

It is argued that the discourse of sustainable development has been central to the blooming of the climate-neutral city initiatives of recent years, as it has been developed since the 1980s through international organizations, quickly becoming the "dominant global discourse of ecological concern" (Dryzek, 2022, p. 149). Sustainable development gained momentum, starting with the publication of the Brundtland Report in 1987 (World Commission on Environment and Development [WCED], 1987), whereby the WCED was tasked to

formulate a “global agenda for change” (WCED, 1987, p. 1). Central to the Brundtland concept of sustainable development is the idea that economic progress and environmental conservation can be harmonized, ensuring that present needs are fulfilled without compromising the capacity of future generations to meet their own. In this light, sustainable development has been understood as a win-win concept that allows for the restoration of environmental degradation, while simultaneously stimulating economic development that should thus help reduce poverty, all by considering issues of international and intra- and intergenerational justice (Betsill & Bulkeley, 2003). The fundamental interconnection of environmental, economic, and social issues addressed through sustainable development positions green growth (i.e., economic growth decoupled from environmental resource depletion) as a key strategy for poverty reduction. In this framework, the report highlights the role that cities and urban settlements can have for sustainable development and how widespread citizens’ participation can aid in the process. By devoting Chapter 9 to “The urban challenge,” the report has helped lay the ground for two central processes that have come to define the international discourse of sustainable cities. On the one hand, the principle of multilevel governance for sustainable development (Betsill & Bulkeley, 2003; Hooghe & Marks, 1997) involves an expansion of actors beyond the nation-state, both vertically and horizontally (Bulkeley et al., 2015). This principle has also been identified as a “polycentric” landscape in urban climate action, among which global city networks play a central role (Acuto et al., 2024). This also suggests a shift in the power balance between the actors, at least in principle, “to both higher (transnational) and lower (local) levels of political organization” (Dryzek, 2022, p. 158). On the other hand, in interpreting the role of citizens’ participation in decision-making processes as a guarantee of more equitable societies, the concept of sustainable development has overshadowed the other dimensions of justice in environmental policy, namely justice as distribution (of good and bad, and of rights and responsibilities) and justice as the recognition of pre-existing inequalities (Fraser, 2009; Schlosberg, 2007). Contentment with the notion that participation alone improves equity within cities and globally, along with the belief that economic growth resolves poverty, has contributed to an understanding of sustainable development that strongly favors two of its three founding pillars—environmental and economic—while giving less attention to equity (Long & Rice, 2019). In this instance, Dryzek highlights how “sustainable development has been increasingly linked to the idea of ‘green growth,’ which covers only the economic and environmental pillars, not social justice” (Dryzek, 2022, p. 156).

Through the subsequent international commitments and conferences on sustainable development, the idea of sustainable cities in these terms has been further developed. Particularly at the 1992 UN Conference on Environment and Development in Rio de Janeiro, cities were recognized as having a more active role in achieving sustainable development. Chapter 28 of Agenda 21—the document adopted after Rio—is devoted to “local authorities’ initiatives in support of Agenda 21” (UN, 1992). In this framework, local authorities have been called upon to begin consultative and participatory efforts for developing Local Agenda 21 (LA21), an initiative that has attracted significant local, national, and international attention and mobilization. “Through consultation and consensus-building, local authorities would learn from citizens and local, civic, community, business, and industrial organizations and acquire the information needed for formulating the best strategies. The consultation process would increase household awareness of sustainable development issues” (UN, 1992, n. 28.3). As we can appreciate from this statement, rather than promoting a vision to tackle urban inequalities, the envisioned participatory processes should help educate and raise awareness of the citizens on the challenges of urban sustainability. This understanding unveils another widely accepted principle that has come to shape sustainability politics: the role of science and technology as legitimizing forces for urban sustainability transitions (Miller & Levenda, 2017).

Successive initiatives at the international level have further supported these dynamics by stressing the possibility of cities to move and act for sustainable development beyond the nation-state, and through international networks such as C40 and ICLEI (Acuto et al., 2024). In this regard, Bulkeley (2006) focuses on the role that best practice dissemination for sustainable cities plays in supporting mainstream political rationalities of urban development: “It is evident that best practice entails more than the articulation of technical knowledge, or practical know-how. It is at once a political rationality about appropriate urban futures, and a governmental technology through which the urban sustainability problem is rendered governable” (2006, p. 1041). From her perspective, international initiatives such as UN-HABITAT and the Best Practices and Local Leadership Programme, established in 1997, have also emphasized the dissemination of best practices for sustainable urban development, thereby overshadowing the view that urban sustainable transitions are inherently political and contested (Miller & Levenda, 2017). In a similar vein, Cociña et al. draw an analysis of the processes of knowledge translation, i.e., “looking at how knowledge has been articulated, circulated and valued” (2019, p. 130) in the global urban agenda between research and practice. Through a historical perspective, the authors explore how different forms of knowledge—particularly from research and community-based initiatives—have interacted with, influenced, or been marginalized in shaping global urban policies and discourses. They conclude that global urban agendas are co-produced through negotiations of power and representation, yet these processes largely reproduce existing power unbalances. Moreover, the “data-bias” (Cociña et al., 2019, p. 139) that has characterized the most recent global urban initiatives could inhibit the emergence of viable alternative forms of knowledge.

3.2. *The Limits of the Sustainable City Concept*

The 1990s have seen an increasing number of international initiatives, as well as literature trying to delve deeper into the idea of the sustainable city and what the city can do for sustainable development (Satterthwaite, 1997). While agreement as to what the sustainable city should look like has yet to be found. Even the most recent initiatives since the beginning of the 21st century seem to reinforce the dynamics identified previously. Within the framework of the global governance of sustainable development, a key milestone after Rio was the 2002 World Summit on Sustainable Development, held in Johannesburg, South Africa, also known as Rio+10. However, it was especially at Rio+20—the UN Conference on Sustainable Development held in Rio de Janeiro in 2012—that urban sustainable development received significant attention, and the groundwork was laid for future commitments in this area. Most notably, Rio+20 occurred during a period of global economic apprehension following the 2008 financial crisis, which significantly influenced the latest conception of sustainable development, making it even more focused on green growth (Bina, 2013). The severity of the economic and environmental crises has prompted the international community to recognize the need for concerted action and has further drawn attention to the role that cities can play in achieving sustainable development. This led to the adoption, in 2015, of the UN Agenda for Sustainable Development, also known as the 2030 Agenda, and its SDGs (UN, 2015).

Among the 17 goals, SDG 11 focuses on making cities and human settlements inclusive, safe, resilient, and sustainable, and addresses the challenges of rapid urbanization, aiming to ensure that cities are well-planned, environmentally friendly, and equitable (UN, 2015). Not unlike the LA21, SDG 11 represents an even deeper acknowledgment that local governments and other non-state actors, beyond the state, play a fundamental role in achieving sustainable development. The adoption of a specific goal on cities has resulted from a growing network of urban and non-state actors advocating for greater commitment to addressing the

challenges of urbanization and urban equity (Cociña et al., 2019). As Revi noted, while SDG 11 is only one out of 17 “the global discussion around the New Urban Agenda (NUA) of HABITAT III has made it moderately clear that most of the SDGs will never be achieved without sustainable urbanization, and vice versa” (2016, p. xi). In fact, just one year after the adoption of the Agenda, the third HABITAT conference of the UN was held in Quito, which adopted a “NUA” (UN, 2017). With a specific focus on urban settlements, this agreement could be seen as the operational and strategic framework to support the realization of SDG 11. But while both SDG 11 and the NUA express high expectations, there is a general lack of prioritization, financial and institutional capacity that make it unlikely for both to deliver their goals in a timely manner (Revi, 2016). Instead of establishing more binding political commitments in this direction, the overall approach of the 2030 Agenda has been described as “global governance by goal setting” (Biermann et al., 2017; Koch & Krellenberg, 2018). The focus here is less on legally binding engagements and more on the monitoring and reporting of data: “Consequently, the success of the SDGs does not depend on the strict application of existing laws and regulations, but rather on those “weak” instruments such as reporting on the process” (Koch & Krellenberg, 2018, p. 3), with a direct involvement of cities to monitor progress and provide data.

While the 2030 Agenda and the UN-HABITAT III New Urban Agenda introduced a more explicitly universal framing of “sustainable cities,” Kaika (2017) argues that, in practice, this shift primarily reinforced the emphasis on systemic monitoring and reporting—often through indicators and data-driven mechanisms, even if qualitative and voluntary (see e.g., UCLG & UN HABITAT, 2020). While this data-driven approach is undoubtedly useful for global comparison and advancement tracking, even relating to experience previous than the 2030 Agenda, Bulkeley and Betsill noticed that “this propensity for analyses of urban sustainability to focus on technocentric models and wish-lists of measures which should be introduced...has meant that critical questions concerning the political struggles which take place in defining what urban sustainability might entail have been neglected” (2005, p. 43). The centrality of data, indicators, footprints, and other science- and data-driven measures has become the rule for sustainable cities, and the way to obtain all this information has increasingly become equated with “smart” (Kaika, 2017). In this instance, Cociña et al. highlight how, in the preparation phases of HABITAT III, there has been a strengthened “focus on *expert-led* processes and *measurable data* as the main kind of inputs labelled as valuable knowledge” (2019, p. 138). This principle is then recalled in the final UN-HABITAT III text, which calls for “robust science-policy interfaces in urban and territorial planning and policy formulation and institutionalized mechanisms for sharing and exchanging information, knowledge and expertise, including the collection, analysis, standardization and dissemination of geographically based, community-collected, high-quality, timely and reliable data” (UN, 2017, p. 39, in Cociña et al., 2019, p. 138), and makes explicit reference to the smart-city approach to reach its goals (Cociña et al., 2019). In a similar vein, the centrality of measurable data is a central feature in climate urbanism, which refers to the processes through which climate change has become a primary driver of urban planning and governance, slowly replacing the attention of sustainable urbanism for general environmental performance with specific carbon accounting and emission reduction targets (Long & Rice, 2019). Climate urbanism is emerging as a priority in urban planning over sustainable urbanism because it aligns more directly with the urgency of SDG 13 “Climate Action” and the Paris Agreement targets by prioritizing carbon reduction and resilience-building. This reframing of SDG 11 through a climate-first lens emphasizes mitigation and adaptation as strategic priorities in urban planning, whereby technology, ICT, and the smart city approach have become essential tools for governments in addressing climate change.

4. Emergence and Evolution of the Smart City

The scientific literature agrees (see, e.g., Alawadhi et al., 2012; Fischer, 1995; Petroccia et al., 2020) that the term *smart city* originated in California's Silicon Valley in the early 1990s, when two well-known multinational companies, IBM and CISCO, proposed an ideal city model centered on high technology, with a strong focus on digitalization in the development of urban infrastructures and services.

The term has gained significant attention and become popular since the 2007–2008 global financial crisis. Bria and Morozov (2018) highlight how, in a context in which states had fewer resources to invest in public infrastructure and services, these large companies, essentially in a monopoly position, could sell their services to public administrations at a low price. Authors explain how the smart city concept has been artificial from the beginning, created by large technology companies to sell their services to public administrations. They proposed a “one-size-fits-all, generic” solution that can then work anywhere: a technological, technocratic solution that presents almost all problems as technical problems, with no ideological or political background. In particular, in 2008, IBM launched the *Smarter Planet* project, which aimed to use smart technology and systems to create smarter electricity grids, as well as food, water, health, and traffic systems. In 2009, IBM introduced the *Smarter Cities Challenge*, an initiative in which IBM experts assisted cities worldwide in addressing their most critical challenges by providing recommendations on how to make the city smarter and more efficient.

The discourse on smart cities, initially strongly centered on ICT topics, has evolved into conceptual variations that tend to progressively take a more holistic view (Capdevila & Zarlenga, 2015). The California Institute for Smart Communities was among the first to focus on how communities could become smart and how a city could be designed to implement information technologies (Alawadhi et al., 2012). Some years later, the Center of Governance at the University of Ottawa began criticizing the idea of smart cities as being too technically oriented. In this reading, the smart city should have a strong governance-oriented approach that emphasizes the role of social capital and relations in urban development (Albino et al., 2015). In an important work, Nam and Pardo (2011) considered three core factors: technology (infrastructures of hardware and software), people (creativity, diversity, education), and institutions (governance and policy). At the European level, the work of Giffinger et al. (2007) remains central, where the authors propose a ranking of “smart cities” of European medium-size cities based on an analytical framework composed of six characteristics: smart economy, smart people, smart governance, smart mobility, smart environment, and smart living. Consequently, a smart city can be defined as one that performs effectively across these six characteristics.

4.1. The Smart City in Practice in Global Cities

Many countries and cities have launched their own smart city projects to resolve urbanization issues and challenges. In 2020, UN-HABITAT (2020) launched the flagship program People-Centered Smart Cities, acknowledging the transformative potential that digital technologies can have for sustainable urban development. Moreover, UN-HABITAT (2022) published a guide on *Urban Planning Law for Climate Smart Cities* to help countries establish legal frameworks necessary for effective domestic implementation of the Paris Agreement. The U.S. was among the first countries to launch a smart city project, incorporating many of the *Smarter Planet* concepts promoted by President Barack Obama. In 2015, the U.S. administration announced a new “Smart Cities” Initiative for investing over 160 million U.S. dollars in federal research,

aiming to help local communities tackle their urbanization challenges, such as traffic congestion and climate-change effects (The White House, 2015). In the same year, the Government of India adopted the National Smart Cities Mission, an urban renewal and retrofitting program to develop smart cities across the country, making them citizen-friendly and sustainable (<https://smartcities.gov.in>). In 2017, the Hong Kong government unveiled the *Hong Kong Smart City Blueprint*, a set of smart city initiatives and pilot projects aimed at addressing challenges such as population aging and resource scarcity (ITB, 2017). In the same year, Singapore approved its Smart Nation Initiative (Ho, 2017); in Europe, Amsterdam was one of the first cities adopting a Smart City program (Carlo Francesco, 2016). The European Union defined a smart city as a city seeking to address public issues via ICT-based solutions based on a multi-stakeholder, municipally-based partnership (Beretta, 2018; European Parliament, 2014). European cities had been experiencing an increasing process of urbanization for years, with over two-thirds of the population already living in cities, and increasing the burden on energy, transportation, water, buildings, and public spaces. In this context, ICT was considered a key enabler for cities in addressing these challenges, permitting solutions that were both highly efficient and sustainable, and able to generate economic prosperity and social well-being (Beretta, 2018).

The EU demonstrated its strong conviction in smart cities from the outset: in March 2010, it proposed the Europe 2020 Strategy to exit the financial crisis and prepare the EU economy for the challenges of the following decade. The document was titled *2020—A Strategy for Smart, Sustainable and Inclusive Growth*, including smartness of growth among its main objectives.

4.2. The Limits of the Smart City Concept

When the term was first used in the 1990s, the focus was on the significance of new ICT regarding modern infrastructures within cities. The “smart city” label diffused in the first years of the new century as an “urban labelling” phenomenon. As Hollands explains (2008, p. 305), the terminology “smart city” is to a degree rhetorical: “What city does not want to be smart or intelligent?” The problem is that, as no city wants to be considered “dumb,” technologies are quickly implemented to sell the city as a “smart city.” The city thus protects its image and improves its competitive capacity by positioning itself as an attractive city for business, citizens, and tourism (Del-Real et al., 2021).

The concept of smart cities grew from the 1990s until today and has received considerable attention in recent years. In the first stage, the development of the smart city concept has been led by an efficiency-based, technocratic, and neoliberal view of urban development, which mainly sees technology and public-private partnership as the means to optimizing the management of urban processes (Kitchin, 2014, 2015; Vanolo, 2018). Over time, this technocratic vision has evolved to make room for more soft components, such as human capital, social capital, and cultural heritage, or more holistic and comprehensive objectives, such as quality of life, safety, and environmental protection. As Caragliu et al. (2011) state, “a city [is] smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance” (2011, p. 70).

Nevertheless, several authors showed how the smart cities concept remained attached to neoliberal principles such as market efficiency, an increasing role of the private sector, and competitiveness (Kitchin, 2015; Vanolo,

2018). Also driven by the adoption of the 17 SDGs of the UN Agenda set for 2030, the growing recognition of the limits of a smart urban development model that focuses solely on market efficiency and competitiveness has led scholars and policymakers to rethink their understanding of smart cities (Almirall et al., 2016; Capdevila & Zarlenga, 2015; Gadecki, 2018; Hsu et al., 2018; Pick, 2017; Wang et al., 2021; Zvolska et al., 2019).

Moreover, investments aimed at attracting the so-called creative class (Florida, 2017), associated with the development of tourism, and the wide adoption of global digital platforms have driven negative effects, such as inequalities, gentrification, and segregation (Cocola-Gant & Gago, 2019; Florida, 2017; Frenken & Schor, 2019; Ganzaroli et al., 2021). Smart cities and, in particular, the so-called creative cities (Florida, 2002) risked becoming polarized not only economically, but also socially and culturally, with, on one hand, the “creative” workers and, on the other, the “uncreative class” lacking knowledge or specialization in technologies. In smart cities, inequalities often exist not only in work and living conditions and areas of residence (Hollands, 2008), but also in the allocation of spaces (Byrne, 1999) and opportunities for free time (Chatterton & Hollands, 2003). Thus, smart cities do not seem particularly positive places concerning class distinction, inclusion, or social justice. As Hollands (2008) maintains, although such cities may boast creativity, diversity, tolerance, and culture, they often appear more focused on attracting “creative” workers with technological expertise than on using information technology and art for social inclusion.

The limits of the *smart cities* concept are also shown by Blasi et al. (2022). In their research on the existing literature on smart cities from 1999 to 2021, they highlight how the smart city is still understood as a technological paradigm mainly oriented toward efficiency and effectiveness in the management of urban processes. Moreover, even if there are scholars warning about the social and environmental risks associated with a smart society (Cardullo et al., 2019; Florida, 2017), most of those risks are largely overlooked and are not part of the current debate on the development of smart cities.

In their literature review, Mora et al. (2019) argued that two competing visions for smart cities had emerged. The first one employs a technology-led and market-oriented approach as the primary driving forces shaping smart cities. The second represents a human-centric and people-driven approach to smart cities, in which technological development is aligned with human, social, cultural, economic, and environmental factors. In this case, the smart city is not conceived as a technological object but as a socio-technical system in which ICTs serve public interests. However, they judged that this second approach had not yet been able to provide the knowledge necessary to move from theory to practice.

Indeed, Del-Real et al. (2021) argue that smart city technologies are being implemented without any consideration for their impact on society. Rather than being neutral, smart city technologies are viewed as neoliberal tools that justify practices of devolution, deregulation, and privatization (Clark, 2020; Greenfield, 2013). Smart city initiatives prioritize technological solutions over political, social, and community-oriented solutions (Greenfield, 2013; Mattern, 2013), providing solutions that benefit private industries rather than citizens and residents (Clark, 2020; Coletta et al., 2019). Beretta (2018) highlights the risks of internal polarization, with the weakest sectors excluded from the international network and at the service of the wealthy (and interconnected). She highlighted that technology risks becoming not a means of greater democracy but, rather, a factor that widens the gap between rich and poor, between those online and offline, and between those obliged to stand by and those in power. Hollands (2008), for example, shows that in the city of San Diego, during the economic boom, poverty levels increased, even though in the previous

decade a low level of unemployment was registered. Furthermore, it has been argued that smart city initiatives facilitate technocratic and top-down forms of governance and government (Vanolo, 2014), based on a spirit of civic paternalism that neglects to actively involve citizens and other stakeholders in addressing urban issues (Shelton & Lodato, 2018).

Paskaleva and Cooper (2022) affirm that, over the last decade, the EU has promoted the use of Smart City initiatives to—among other goals—improve citizens' quality of life. Chang and Smith (2023) conducted a literature review concluding that, since 2019, citizens' quality of life has become a central priority in smart cities studies. Reference is increasingly made to “quality-life oriented smart cities” (Cantuarias-Villessuzanne et al., 2021), “human smart cities” (Keshavarzi et al., 2021), “citizen-centric smart cities” (Shami et al., 2022), “people-centric smart cities” (Ji et al., 2021), “happiness-driven smart cities” (Zhu et al., 2022), and “smart age-friendly cities” (Ivan et al., 2020). However, citizens are often considered as users, testers, or consumers rather than producers and sources of creativity and innovation; instead, there is a need to engage citizens in the co-design of smart processes and solutions; it is necessary to create an effective system of urban management that creates a productive dialogue between government and society, taking into account the opinions of citizens.

Among others, Helbing et al. (2021) argue that the so-called citizen-centered solutions are often based on profiling, targeting, and behavioral change. In that way, they violate values such as privacy, informational self-determination, and other fundamental rights, which are implied by the Universal Declaration of Human Rights. In this respect, Bria and Morozov (2018) point to the process of “data extractivism,” whereby web users give up their data for free to large monopolistic companies (Apple, Amazon, Facebook, Google, Microsoft) interested in our consumption patterns, in exchange for having free or very cheap services.

Helbing et al. (2021) highlight the discussion about surveillance-based approaches in smart cities with reference to predictive policing. Great concerns were triggered by the high false-positive rates of the corresponding algorithms (Gless, 2018) and by issues of systematic bias and discrimination (Kim, 2016; Mayson, 2018), for example, against people of color (Obermeyer et al., 2019). Significant discrimination was also found in facial recognition algorithms. The currently promoted human-centred AI approach is insufficient. It lacks coordination capacity and the ability to promote collective intelligence. It also does not sufficiently support the emergence of shared values and collective action to address urban challenges that require cooperation and consensus (Cavazos et al., 2020).

To get a more general picture, it is interesting to consider the systematic review of existing literature made by Bina et al. (2020), showing a rapidly growing critical literature of smart cities based in the social sciences. They organized their critique into three parts considered to be constitutive of the techno-utopian approach to urban development and management, which resonate with our own conclusions: (1) *Technological solutionism and the economization of urban life*, which refer to configurations of technological with neoliberal visions of urban management. The idea is that smart cities and the use of ICT are not just answers to urban problems but represent a new paradigm of urban development centered around core values of efficiency and productivity (Caprotti, 2015). (2) *Quantitative universalism and reductionism*: Urban systems are monitored through extensive networks of data collection, processed by algorithms and mathematical models (Kitchin, 2014). Urban life is reduced to quantitative language, big data systems and management replace wider urban expertise, and technocratic management replaces democratic policymaking and politics (Beretta,

2018; Chandler, 2015; Madrigal, 2013; Morozov, 2013; Söderström et al., 2014). (3) *The illusion of political neutrality of smart technology*: Technocratic regimes are proposed as the only alternative, in which “urban affairs are framed as an apolitical matter” (Söderström et al., 2014; Vanolo, 2014). The smart model is perceived as an optimizing urban management instrument, through standardized processes for decision-making (Joss, 2016). Furthermore, the smart city model is increasingly shifting from a focus on efficiency toward environmental sustainability (Bibri & Krogstie, 2017) and climate neutrality, as digital tools like AI, digital twins, and urban data platforms are used to plan and optimize low-carbon infrastructures. In this instance, the European Commission’s title for the urban carbon neutrality mission—to deliver 112 climate-neutral cities by 2030—is highly symbolic, as it explicitly links smartness and climate neutrality: EU Mission “Climate-Neutral and Smart Cities” (European Commission, 2021).

5. Discussion: From Sustainable and Smart...

We have discussed sustainable and smart cities, offering a critical appraisal of how their dominant adoption mechanisms within the urban governance framework shape understandings not only of the contents of these two concepts but also of how they frame the politics of urban development.

Regarding the sustainable city, we have highlighted four underlying processes related to the global vision of urban governance. First, while the original formulation of sustainable development and its successors, including SDG 11, make explicit reference to equity and justice as one of the three main pillars, most international commitments make few references to the type of justice to be achieved, instead emphasizing participation (i.e., procedural justice) as a means of ensuring equity in policy outcomes and securing citizen buy-in. In this instance, Target 11.3—“By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries” (UN, 2015)—is a good example. As Hatuka et al. highlight, “in the sustainable and resilient [city] concepts, individuals’ participation is regarded as part of their responsibility to contribute to the place-making and well-being of the city” (2018, p. 173). Second, the focus of sustainable development has shifted to the environmental and economic pillars, equating sustainability with green growth (Bina, 2013; Dryzek, 2022). Third, multilevel governance, as a shift away from the centrality and sovereignty of the nation-state in environmental and sustainable issues, has allowed an opening to new modes of governance both vertically and horizontally (Bulkeley et al., 2015). With the adoption of the 2030 Agenda, this process has seen a shift towards what has been defined as “global governance by goal setting” (Biermann et al., 2017; Koch & Krellenberg, 2018), whereby monitoring and control of sustainability performance, also by non-national actors, is the premise for the achievement of sustainability goals. This last process implies yet another dynamic, which we consider the fourth underlying principle of urban sustainability: the role of science and technology as legitimizing forces for urban sustainability transitions (Miller & Levenda, 2017) and their ability to depoliticize sustainable development (Long & Rice, 2019). In this instance, there is an increasing recognition that ICT constitutes a promising response to the challenge of urban sustainability (Sengupta & Sengupta, 2022). Contemporary debate in urban and academic literature is increasingly focused on ICT and sustainability as well as their amalgamation, especially for climate objectives, also focusing on the role that AI could play (Bibri et al., 2023). Bibri et al. (2023) highlight that AI could play a significant role in urban sustainability, especially for data-driven environmental management and carbon accounting, but they also recognize some challenges related to the environmental costs and ethical challenges it poses.

With respect to the smart city, three different yet similar tendencies in the international political discourse can be identified. First, the centrality of ICT and technological solutions for smart city initiatives facilitates technocratic and top-down forms of governance and government (Miller & Levenda, 2017). This process rests on the apolitical assumption that science-based, technological fixes are per se good, without contesting the sociotechnical nature of technology in the first place. As asserted by Feenberg (2005, p. 3), the whole technology design is “an ontological decision fraught with political consequences. The exclusion of the vast majority from participation in this decision is profoundly undemocratic.” Similarly, in acknowledging the emergence of the smart city as central for the dominant role of science and technology in urban sustainability transitions, Miller and Levenda (2017, pp. 349–350) critically assess how:

Scientific research on urban sustainability not only produces knowledge about the city and sustainability transitions but also helps to shape political identities, relationships, institutions, and beliefs about sustainability goals (Miller, 2013, 2014). This co-production process can shape the discourse and policy choices around urban sustainability, thereby exercising power.

The issue of power and its distribution brings us to the second process identified concerning smart cities: the central role played by non-governmental, private companies in developing and promoting smart monitoring and control systems. “Smartness reframes urban sustainability challenges as market opportunities for corporations to sell digital solutions” (Evans et al., 2019, p. 588). This tendency implies a neoliberal view of urban development that is based on efficiency principles and the privatization of services. Lastly, there is the role played by citizens and how they are interpreted within the framework of smartness. As it has become clear, citizens are often considered as users, testers, or consumers rather than producers of the technologies implied in the smart city (Cardullo & Kitchin, 2019; Vanolo, 2014). They somewhat feed the monitoring and control systems, without really having a say in how these are designed, leaving an enormous space for ethical considerations.

6. Conclusion: ...to Climate-Neutral?

Using a critical historical analysis with a genealogical approach to the literature on sustainable and smart cities, as well as to the main events and policies shaping these concepts, we have identified how these discourses have evolved. Also based on our previous work (Beretta & Bracchi, 2023), we see how these processes have contributed to the framing of an emerging imaginary of the climate-neutral city, especially in the European context. The climate-neutral city, aimed at “radically reducing GHG emissions from urban activities while simultaneously removing GHG emissions from the atmosphere” (Seto et al., 2021), combines most of the characteristics identified for sustainable and smart urban development (Hatuka et al., 2018) into what has been defined as climate urbanism (Long & Rice, 2019). Long and Rice highlight, in particular, how the data bias in the global urban agenda is further exacerbated in climate urbanism, the new policy orientation focused on the centrality of cities for climate action and for protecting their role as engines of economic growth, as “carbon and other GHGs provide clear, measurable objects for regulation and surveillance by urban governance while also serving as a single, publicly legible outcome” (2019, p. 997).

The global and European governance of urban climate change mitigation—which has been developing since the 1990s with experiences such as ICLEI’s Cities for Climate Protection program (Acuto et al., 2024; Betsill & Bulkeley, 2003, 2004)—has seen an expansion in scope and scale, especially since the 2015 Paris

Agreement (UNFCCC, 2015). Recently launched initiatives include, e.g., the 2021 C40 Cities Race to Zero Initiative and the 2021 Mission Climate-Neutral and Smart Cities launched by the European Commission. These initiatives indicate a renewed interest in the environmental dimension of the global crises, with climate change as the most pressing environmental issue to be tackled through CO₂eq accounting. They further emphasize the urgency and vulnerability of urban areas and the need for a transition to new energy systems, technological innovation, and (infra)structural modernization. This passage, central to global climate change governance, aligns the discourse of the sustainable city in ecological and economic terms (i.e., green growth) with the central role of technologies in smart cities as indispensable devices for the reduction of emissions (i.e., ecological modernization). The smart city concept has changed the urban ecosystem by embedding digital technologies in the city fabric to enhance the quality of life of its inhabitants, at least in theory. de Jong et al. (2015) show how, since 2010, the concept of smart cities has been on its way to becoming a leading driver of urban sustainability. As stated in the UNDP document “Smart and Inclusive Cities” (2024, p. 4):

Cities worldwide face increasingly complex challenges while striving to achieve sustainable urban living. It requires a smarter approach to urban development that harnesses the opportunities provided by modern-day technologies while addressing the needs of local communities, businesses, and residents....Facilitating smarter and inclusive city development is one of the pathways toward a sustainable urban future. Smarter and inclusive cities make use of the opportunities provided by emerging technologies to facilitate economic growth, social inclusion, and climate action. Making cities smarter and more inclusive can bring about transformational change in towns and cities to improve the quality of life, protect natural resources, and pursue socio-economic development.

In a nutshell, there is a discursive hegemony of smartness over the current form of sustainable urban development, with a newly rediscovered emphasis on its environmental dimension in terms of urgent climate change responses. Similarly, in presenting the Mission Climate-Neutral and Smart Cities by 2030, the European Commission highlights the co-benefits of a climate transition enabled through technologies:

To achieve in ten years what Europe plans to achieve in 30 years is a huge challenge that requires a systemic transformation of European cities. Still, this is both necessary and feasible. It is necessary for acting on the global climate emergency and for delivering co-benefits that will improve the health, wellbeing and prosperity of citizens. It is feasible because technologies and innovative solutions for sustainable energy, transport, food, water and material systems already exist. (European Commission et al., 2020, p. 9)

As Tozer and Klenk demonstrate by analysing a similar initiative, the Carbon Neutral City Alliance, there is an emerging sociotechnical imaginary of urban climate neutrality, which is “structuring shifts in policy and practice. There is a focus on technological fixes and innovation as solutions, as well as on influencing the behaviour of individuals” (2018, p. 179). In this vein, the latest UN Report *Synergy Solutions for Climate and SDG Action* (UNDESA & UNFCCC, 2024) highlights how “cities are uniquely positioned to lead the charge in leveraging synergies and limiting trade-offs between the SDGs and climate objectives. Specifically, demand-side climate solutions often implemented in cities offer significant potential for climate-SDG synergies” (p. 15).

Therefore, if we were to ask whether the urban climate neutrality imaginary is based on the assumptions and underlying ideals of both sustainable and smart cities, the answer would likely be affirmative. As critical literature highlights (Castán Broto & Westman, 2020), urban climate politics is often dominated by neoliberal economic interests, perpetuating inequalities and marginalization while prioritizing growth and investment over socio-environmental transformation. This has led to calls for justice-oriented strategies that address underlying political, social, and economic structures driving climate vulnerabilities and risks. In line with existing studies (Hatuka et al., 2018; Long & Rice, 2019; While et al., 2010), we observe a hegemony of climate urbanism in contemporary efforts to steer cities towards more sustainable forms. While it is paramount to engage with climate change for the urban future, we share the apprehension that this urban imaginary may insufficiently account for issues of present and future justice.

This concern also extends to what the future of urban sustainability post-2030 Agenda might entail. Looking at the present, and beyond the 2030 Agenda timeframe, urban sustainability is increasingly being reimagined through the lens of climate action, whereby elements of sustainable and smart urbanism strategically merge to shape new policy priorities towards climate neutrality. This invites further research into how the climate-neutral city imaginary is being institutionalized through international city networks and local initiatives, how it restructures urban governance, and how it is contested or reconfigured by alternative urban actors in ways that reflect broader struggles over equity, inclusion, and recognition. In short, planners and decision-makers should be advised not to overlook the social justice dimension of sustainable urban development in the transition to climate neutrality by adopting more situated and reflexive approaches in the search for solutions.

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Contesting the Right to Sustainable Cities Under Neoliberalism: The Case of Macrocampamento Los Arenales, Chile

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Abstract

This article examines the grassroots urbanism of Los Arenales, a large informal settlement in Antofagasta, Chile, within the theoretical framework of Henri Lefebvre’s right to the city and its application under neoliberal constraints. It critiques the limitations of the Sustainable Development Goals (SDGs), particularly their top-down implementation and neoliberal tendencies, by juxtaposing them with community-driven approaches rooted in spatial justice, participatory governance, and collective agency. Employing a mixed-methods, embedded case study approach, the study draws on data collected between 2017 and 2023, including participatory mapping, 14 semi-structured interviews, and engaged research initiatives. Two key projects—Chile’s first cooperative bakery in an informal settlement and the Know Your City initiative—serve as focal points for analysing grassroots strategies. Findings highlight how these initiatives foster economic autonomy, social solidarity, and political advocacy, advancing residents’ right to the city. However, challenges such as reliance on external support and systemic barriers underscore the limitations of grassroots efforts under neoliberal governance. The article concludes that Los Arenales exemplifies the transformative potential of grassroots urbanism, while advocating for structural reforms and inclusive policies to enable equitable urban development. It underscores the importance of integrating lived experiences into urban planning to achieve justice and sustainability within the Global South.

Keywords

contested urbanism; grassroots urban planning; informality; right to the city; Sustainable Development Goals

1. Introduction

The United Nations 2030 Agenda, articulated through the Sustainable Development Goals (SDGs), aspires to guide urban sustainability. Yet critics fault its limited transformative reach, reliance on voluntary pledges, and entanglement with growth-centred paradigms that entrench structural inequalities and asymmetrical power relations across (sub)national spaces (Liverman, 2018; Nightingale, 2018; Sultana, 2018). Such inequities are most acute in the Global South, where informal settlements subject residents to intensified deprivation and systemic neglect (Butcher, 2022).

Henri Lefebvre's right to the city (Lefebvre, 1968/2009)—later advanced by Harvey (2012), Mitchell (2003), and Purcell (2002)—offers a critical counter-frame, demanding collective control over urban space rather than mere access to its resources. Under neoliberalism, though, the slogan of the right to the city is routinely co-opted as urban branding, stripped of substantive calls for spatial justice (Fursova, 2018). Even so, Latin American grassroots movements continue wielding it as a counter-hegemonic claim to dignity, participation, and territorial autonomy (Vergara-Perucich & Arias-Loyola, 2019).

Chile embodies these tensions. Ranked 28th in the 2022 Sustainable Development Report, the country nonetheless lags on SDGs 1 and 10, while SDG 11 exposes a fragmented planning regime and stark socio-spatial segregation. The 2019 social uprising highlighted deficits under SDG 16, and multiscale governance remains partial (SDG 17). Incremental reforms thus fail to redress deep-seated inequalities, signalling the need for a more radical reconceptualisation of development.

This article addresses the debate through Los Arenales, one of Chile's largest informal settlements in Antofagasta. Situated in the Atacama Desert, the region hosts vast copper and lithium reserves critical to global energy transitions (U. S. Geological Survey, 2024) and, since the commodity supercycle, attracts extensive Latin American migration (Arias-Loyola et al., 2022; Arias-Loyola & Vergara-Perucich, 2021). The 2010–2015 copper boom, peaking above \$10,000 per tonne in 2011, later collapsed, exposing Chile's vulnerability to commodity dependence and revealing an urgent need for diversification.

Extractivist legacies shape Antofagasta's contested landscape. Successive nitrate, copper, and lithium cycles have produced labour influxes, dispossession, and ecological degradation (Galaz-Mandakovic, 2023; Galaz-Mandakovic & Rivera, 2021). Although the city functions as a logistical hub, it suffers soaring living costs, pollution, and acute housing shortages. As formal housing becomes unattainable, campamentos proliferate. Founded in 2014, Los Arenales shelters thousands of mainly migrant families in precarious structures lacking reliable water, electricity, and sanitation, yet collectively mobilises to exercise the right to the city through territorial resistance and self-management (Vergara-Perucich & Barramuño, 2023).

Our study interrogates how Los Arenales reconfigures SDG practice, especially Goals 1, 10, and 11, via two emblematic initiatives. The CINTRA cooperative bakery fosters local livelihoods, collective ownership, and food security. The Know Your City (KYC) programme, a participatory mapping endeavour, documents service gaps and hazards, leveraging data for claims-making. These projects illustrate how marginalised communities fashion spatial justice and territorial agency within informal urbanism, constituting counter-epistemologies against the technocratic SDG apparatus. Los Arenales thus emerges not as a site of passive lack but as a grassroots laboratory where informality, co-production, and critical pedagogy forge alternative development imaginaries.

Methodologically, the research draws on longitudinal action-planning (2017–2023): 14 semi-structured interviews, co-produced urban plans, and involvement in seminars and service-learning. This participatory stance foregrounds lived experience, interrogating both outcomes and ethical-ontological dimensions of community practice. Findings reveal the transformative capacity of bottom-up, adaptive strategies to advance urban sustainability and social justice.

First, the CINTRA bakery contests SDG 1's narrow income metrics by embedding solidarity-economy principles: collective governance, gender-inclusive employment, and reinvestment into local infrastructure. It reframes poverty alleviation as empowerment through cooperativism rather than market insertion. Second, KYC rematerialises SDG 11's abstract indicators via citizen-generated data that expose infrastructural absences and environmental risks, compelling municipal recognition. Together, these practices re-politicise development by linking survival strategies to claims of dignity and democratic participation.

Los Arenales also problematises SDG 10. Migrant residents confront legal precarity, xenophobia, and a speculative land market. In response, the settlement deploys a politics of presence—occupation, self-build, and collective service provision—that makes visible otherwise erased urban subjects. Such practices resonate with recent scholarship viewing resilience not as system stability but as community-driven autonomy, innovation, and resistance (Vergara-Perucich & Arias-Loyola, 2019). They exemplify a right to fail, in which experimental initiatives may falter without punitive fallout, turning setbacks into learning and heightened agency.

Overall, Los Arenales illuminates both the failures of neoliberal urban governance and the possibilities inherent in cooperative alternatives. Community initiatives do more than fill governance voids; they re-signify sustainability as a contested political project. By situating grassroots action within wider development debates, the case of Los Arenales underscores that genuinely inclusive cities must be co-produced from below.

The article proceeds by situating the right to the city in relation to SDG discourse, detailing the participatory methodology, and analysing Los Arenales' initiatives. It closes by advocating governance innovations rooted in horizontal, cooperative practice to confront Latin America's distinctive urban challenges. Only through such re-grounded, justice-oriented strategies can the SDGs transcend technocratic abstraction and engage the lived realities of the urban majority.

2. Theoretical Framework

2.1. A Critical Perspective on SDGs

Adopted in 2015, the SDGs extend the Millennium Development Goals' poverty-oriented agenda by embedding 17 goals and 169 targets that foreground interconnectedness, inclusion, and sustainability (United Nations, 2015). Yet their national-scale, indicator-driven approach has drawn sustained critique. Universal metrics often flatten territorial diversity and mask local power relations, thereby reproducing neoliberal logics and marginalising already-vulnerable groups (Liverman, 2018; Nightingale, 2018; Sultana, 2018). Quantification without spatial nuance obscures the intersectional character of deprivation, particularly in informal urban contexts (Butcher, 2022). Internal goal tensions—most visibly between growth

(SDG 8) and climate action (SDG 13)—further underscore the framework’s contradictions (Kumar et al., 2024). Likewise, SDG 11’s city-scale targets privilege formalised economies and infrastructure, sidelining informal settlements that house the urban majority across the Global South (Liverman, 2018). Re-embedding the SDGs in lived territorial realities thus demands a spatially sensitive, justice-oriented re-reading capable of challenging entrenched inequalities (Boano & Vergara-Perucich, 2017).

2.2. Sustainable Concrete Utopias Under Neoliberalism

Henri Lefebvre’s right to the city asserts inhabitants’ collective power to shape urban space against exclusionary structures (Balto, 2023; Strüver et al., 2021). Framed as a third-generation human right (Shingne, 2021), it underpins claims to adequate housing, democratic participation, and spatial justice (Kempin Reuter, 2019; Muñoz, 2018). Yet, neoliberal urbanism routinely co-opts the slogan of the right to the city: Growth-led smart-city agendas monetise space, reinforce class privilege, and eclipse resident needs (Nogueira & Shin, 2022). In the Global South, rolling back welfare, labour informalisation, and speculative land markets entrench precarity and widen inequalities (Burte & Kamath, 2023; Lam, 2024; Mendes & Lau, 2020). Neoliberal governance, inflected by colonial and racial hierarchies, also magnifies health disparities and social harm (Jamieson et al., 2020; Nunes, 2020).

Lefebvre’s allied notion of concrete utopia offers a reparative counter-terrain: actionable, collectively imagined futures rooted in present possibilities (Mitchell, 2003; Purcell, 2013, 2014). Grassroots movements deploy these utopias to contest urban inequality, reclaim territory, and experiment with cooperative forms of provisioning (Harvey, 2012; Vergara-Perucich & Arias-Loyola, 2019). Such praxis privileges collaboration, ethics, and adaptive learning over competition, thereby aligning with SDG principles while rejecting the framework’s technocratic reductionism (Liverman, 2018; Nightingale, 2018).

Central to these experiments is the right to fail: the freedom for marginalised communities to test social-economic alternatives—and learn from setbacks—without disproportionate punishment (Arias-Loyola & Vergara-Perucich, 2021). Valuing failure as a pathway to resilience embeds iterative innovation within collective action, helping informal actors navigate structural exclusion while pursuing transformative urban inclusion.

2.3. Space-Sensitive Methods to the Rescue

Geography, as a discipline, provides the epistemic tools necessary to expose and rectify the SDGs’ scalar blind spots. Its spatial lens illuminates how social, political, and ecological processes combine unevenly across territories, enabling more nuanced assessments of goal interactions (Liverman, 2018). Conceptually, geographical thought insists on contextual, historically informed understandings of poverty and justice, challenging static universal indicators (Harvey, 2012; Smith, 2008). Methodologically, it critiques over-reliance on top-down metrics and advocates mixed-method, participatory approaches that foreground local agency (Sultana, 2018).

In practice, geographical information systems (GIS), participatory mapping and focus groups weave community knowledge into diagnostic and planning exercises, ensuring interventions accord with situated priorities (Arias-Loyola & Vergara-Perucich, 2021; Brown et al., 2015). Temporal-spatial analyses capture

dynamic phenomena such as seasonal livelihoods or migration pulses that static datasets overlook (Nightingale, 2018).

Urban studies complement this agenda by treating cities as crucibles where sustainability challenges concentrate. Spatial analytics map land-use change, housing access, transport, and green-space distribution, revealing intra-urban disparities and guiding targeted SDG action (Butcher, 2022). Participatory planning embeds residents in co-design, bolstering democratic legitimacy and equity (Brown & Raymond, 2014). Resilience research tracks urban adaptation to climate, resource, or demographic shocks, offering models for polycentric, flexible governance (Williams et al., 2019). Critical urban scholarship further dissects how neoliberal arrangements hollow out public goods, arguing for justice-centred alternatives (Boano & Vergara-Perucich, 2017). For the purpose of our analysis, resilience denotes community-driven capacity to generate political agency, autonomy, and innovation amid structural neglect, transforming adversity from a situation to endure into a collective practice of resistance, territorial appropriation, and alternative urban imaginaries, rather than just settling for stability or recovery.

By integrating geographical sensitivity, mixed methods, and politicised urban critique, these disciplines recalibrate SDG implementation toward concrete utopias grounded in everyday practice. They reveal that sustainable development cannot rest on universal metrics or market fixes but must be co-produced through context-specific, justice-oriented experimentation that honours both the right to the city and the right to fail.

3. Methodology

This article employs an embedded case study (Yin, 2009)—anchored in action research and participatory planning—to reinterpret grassroots urbanism in the macrocampamento Los Arenales, Antofagasta. Rather than gathering new data, it synthesises documentation produced between 2017 and 2023: prior projects, participatory-mapping outputs, service-learning reflections, and published analyses. Two emblematic initiatives structure the discussion: CINTRA, Chile's first cooperative bakery within an informal settlement, and the KYC participatory-mapping programme. Fourteen semi-structured interviews with residents, officials, academics, and NGO staff, alongside georeferenced maps and technical reports, are treated as testimonies of struggle, creativity, and resistance that unsettle mainstream SDG narratives.

Situated in a post-positivist epistemology that values co-produced knowledge, the study deploys participatory GIS, ethnographic observation, and community workshops to reconstruct territorial logics from inhabitants' standpoints. Transductive reasoning traces dialectical links between everyday spatial practices and wider political-economic structures, while the pedagogical dimension illustrates how knowledge generated in, with, and for marginalised communities can animate alternative imaginaries of urban development.

By reframing informal settlements as loci of political agency rather than passive policy targets, the article shows how grassroots urbanism exposes fissures in the SDG architecture and articulates concrete utopias for more just futures. Los Arenales thus becomes an instructive site for rethinking sustainability in the urban Global South, challenging universalist prescriptions without claiming blanket generalisability.

Figure 1 situates the right to the city where community engagement, grassroots innovation, and utopian projection overlap within neoliberal urbanism. Engagement and innovation are already channelled through SDGs 1, 10, and 11; dotted arrows mark their instrumentalisation by existing sustainability agendas. Utopia, by contrast, occupies the diagram's outer rim, signalling imaginaries that refuse managerial capture and push beyond reformism. The model frames the right to the city not as a neutral bridge but as contested terrain where local practices negotiate global governance imperatives, implying that transformative urban futures demand politicising sustainability beyond the SDG script.

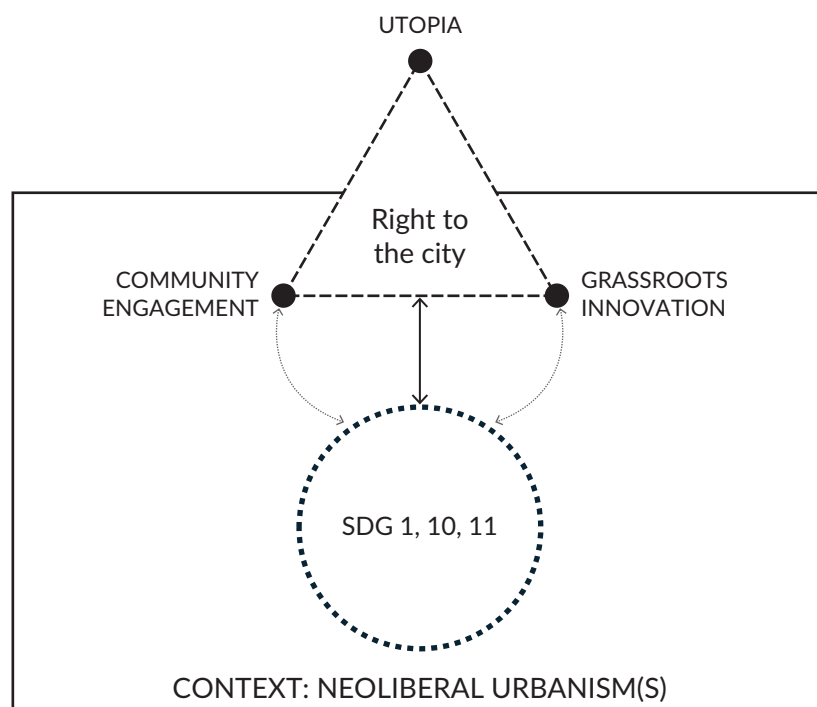


Figure 1. Synthesis of analysis.

4. Case Studies: Cooperative Bakery and KYC

Situated on public land at Antofagasta's northern fringe, Los Arenales is Chile's largest informal settlement and a vivid marker of extractive, speculative urbanism (Figure 2). More than 1,000 mainly Latin American migrant households occupied the site after the 2015–2016 copper crash, when shrinking mining jobs and one of the country's costliest housing markets barred them from formal options (Vergara-Perucich & Arias-Loyola, 2021). Early housing committees operated in isolation amid xenophobia, restrictive subsidies, and scant state support, framing the camp as a collective territorial claim against abandonment rather than a housing solution.

A turning point came in 2017, when United Nations Special Rapporteur Leilani Farha toured northern settlements to expose housing precarity, embedding Los Arenales within a rights-based discourse and legitimising self-management. Momentum grew after Rompiendo Barreras linked fragmented committees in 2016, culminating in the Ministry of Housing and Urbanism's December 2024 commitment to an in-situ upgrading plan.

Grassroots initiatives flourished despite the absence of water, electricity, tenure security, or the laying-out of a street (Figure 3). Residents erected self-built dwellings, communal infrastructure, and planning alliances with NGOs, academics, and sympathetic officials—practices read as situated resilience but better understood as everyday resistance to Chile’s neoliberal urban model (Arias-Loyola & Vergara-Perucich, 2021; Vergara-Perucich & Boano, 2021).

Two projects typify this ethos. The CINTRA cooperative bakery—Chile’s first within an informal settlement—emerged through partnerships with local organisations and universities; by transforming daily bread-making into a collective enterprise, it restored dignity, generated income, and enacted Lefebvrian spatial production (Arias-Loyola & Vergara-Perucich, 2021). The KYC programme, financed by Slum Dwellers International, provided leadership training, participatory mapping, service-learning studios, and technical audits; its cartographic outputs armed residents to negotiate with state agencies while cultivating political confidence (Andrade & Bickel, 2022).

Los Arenales thus operates as an urban laboratory where mutual aid, gendered leadership, and territorial knowledge expose fissures in the SDGs’ technocratic script. Far from a governance gap, the settlement shows how grassroots innovation can rebut neoliberal urbanism and articulate concrete utopias for more just futures (Sugranyes, 2023).

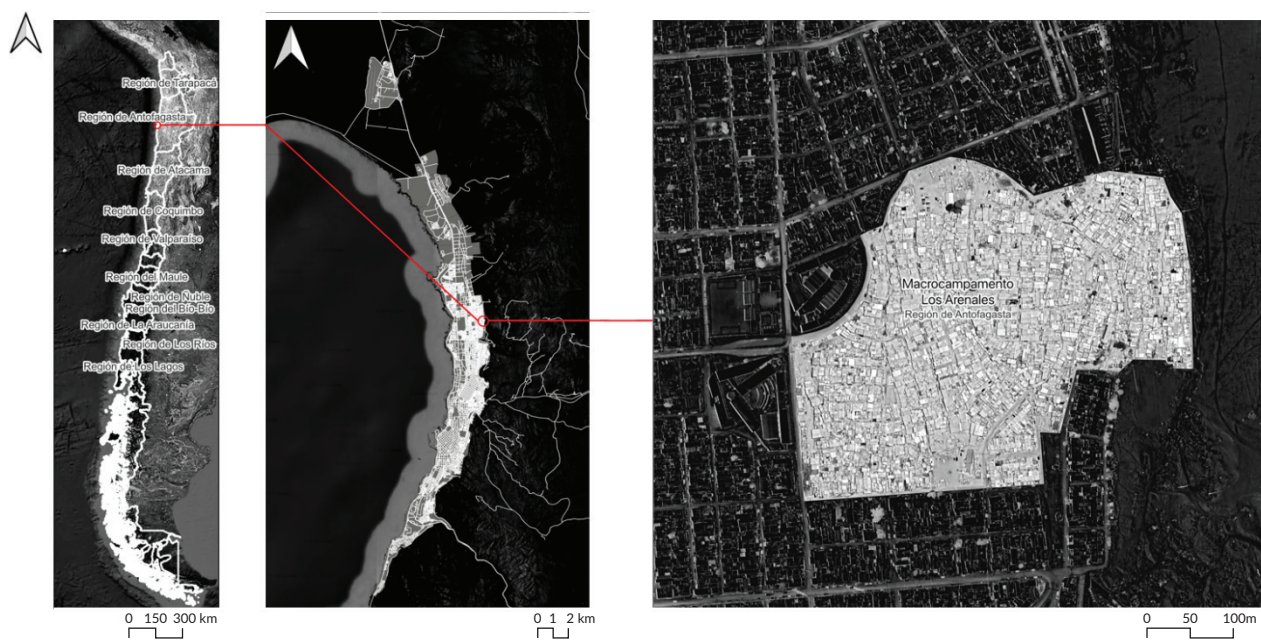


Figure 2. Macrocampamento Los Arenales in the city of Antofagasta.



Figure 3. View of a street in the macrocampamento Los Arenales.

5. Findings

5.1. Cooperatively Owning a Means of Production: Conflicts and Learnings From CINTRA, the First Cooperative Bakery

Established in 2017, CINTRA Los Arenales is Chile's first cooperative bakery in an informal settlement in Chile (Vergara-Perucich & Arias-Loyola, 2019). Led by migrant women and aided by academics, NGOs, and officials, it tackles poverty while contesting neoliberal housing policy. Bread exceeds nutrition: Collective production restores dignity, affirms cultural diversity, and claims the right to shared space. Loaves blending Peruvian, Colombian, Chilean, and Bolivian recipes weave communal identity and ensure that no resident is excluded (Arias-Loyola & Vergara-Perucich, 2020).

Guided by Lefebvrian spatial justice and diverse-economy theory, CINTRA reframes informality as autonomy, not deficit (Arias-Loyola & Vergara-Perucich, 2021). Logistical and financial hurdles expose Chile's neoliberal limits yet confirm a right to fail: each setback deepens collective learning, strengthens internal networks, and raises public visibility. Collaboration is decisive: grassroots drive plus academic know-how and NGO logistics secure equipment, training, and legal status.

An engaged-research model replaces extractive data collection with horizontal co-learning, embedding theory in residents' realities, though dependence on external grants preserves tensions between autonomy and responsabilisation. Nevertheless, CINTRA yields tangible gains: vocational skills, mutual aid, and a narrative that shifts Los Arenales from stigmatised periphery to locus of creativity and agency—making bread both sustenance and emblem of urban inclusion (Arias-Loyola & Vergara-Perucich, 2020).

The CINTRA bakery offers broader insights into grassroots cooperatives in the Global South, highlighting their dual role as spaces of resistance and negotiation. It exemplifies how marginalised communities can carve out autonomy and dignity within oppressive systems while exposing structural barriers to sustained transformation. As an experimental socio-economic model, it provides valuable lessons for fostering equitable and inclusive urban futures. One representative explains:

[Before the bakery and the KYC project,] when we had a [general] meeting, no one wanted to [attend] because they were scared that something might happen to them while walking to the meeting. But then, [the neighbours] slowly started to know each other, and realised we all have the same problems [which increased] the degree of trust...and in believing more in our struggle [for a dignified life]...[These projects] have allowed us to become an organisation of dwellers, to dream about having dignified and fair housing. (INT1)

5.2. *Community Mapping the Informal Space: Grassrooted Architectures for Living Better*

Los Arenales' ad-hoc morphology speaks of urgency and scarcity. Set on arid municipal land, its sub-campamentos—Eulogio Gordo, Nuevo Amanecer Latino, and others—exist without paved roads, sewers, or potable water. Extreme heat, flash-flood gullies, and dwellings fashioned from pallets and corrugated zinc blend affordability with hazard, revealing exclusion from Antofagasta's formal housing market.

Yet residents carve plazas, meeting halls, and committees that sustain social life. The KYC initiative harnessed this energy through a public-participation GIS campaign (Vergara-Perucich & Arias-Loyola, 2021). Mixed workshops of migrants, academics, and NGOs fused sketch maps with GPS traces to chart boundaries, taps, risk zones, and occupation timelines from 2013. Four iterative stages—recounting origins, reconstructing spatial histories, mapping priorities, and publicly validating findings—produced layered cartographies now used to demand in-situ upgrading, tenure security, and equitable services (Figure 4).

Mapping also cultivated belonging. Visualising shared struggles consolidated consensus on cooperative plot allocation, countering Antofagasta's speculative land logic. While such bottom-up planning still confronts a neoliberal policy regime that outsources housing and withholds recognition, Los Arenales' cartographic praxis demonstrates how situated knowledge politicises space, strengthens collective agency, and presses the state to honour the right to the city.

The evolution of Los Arenales highlights the potential of informality as a site of resistance and collective agency. Rather than framing informality as a problem to eradicate, the settlement demonstrates how marginalised communities reclaim urban spaces and challenge dominant urban planning paradigms. Its spatial practices, from cooperative land allocation to participatory mapping, offer valuable insights for reimagining urban governance in ways that prioritise equity and justice. This experience was highly valued by Los Arenales inhabitants as one of the KYC outputs. Interviewee 7 underscores the pivotal role of the KYC initiative, noting that the combination of soil analysis and participatory mapping carried out “with the neighbours...is very important for the community and for me.” Building on this collective praxis, Interviewee 8 insists that “we, the neighbours, will be part of this participatory organisation, becoming builders of our own space and our own city.” That aspiration, Interviewee 13 adds, must be realised in an urban future “grounded in solid technical foundations and animated by a clear ideological commitment.”



Figure 4. Community-made map of macrocampamento Los Arenales. Source: Vergara-Perucich and Arias-Loyola (2021).

5.3. A Critical Pedagogy: Walls, Painting, and College Students

As a spin-off from the KYC initiative, a service-learning programme embedded architecture, accounting, and business students and faculty in Los Arenales to tackle local challenges through spatial and organisational interventions (Arias-Loyola et al., 2023). Anchored in the right to the city, the scheme fused technical know-how with residents' lived knowledge: Inhabitants mapped service gaps and power relations, while students translated these insights into design proposals, accounting tools, and governance plans. Co-produced outputs—painting workshops, façade upgrades, and organisational guides—met immediate needs yet also pursued the longer goal of formal urban integration. Students gained experiential insight into grassroots realities, and residents strengthened their advocacy and planning capacities, showing how service-learning can align academic practice with community-driven inclusion.

Drawing on Freire's emancipatory pedagogy, the programme embedded education within residents' struggles, treating local experience as expertise (Freire, 2005). Participatory mapping, design sessions, and public art fostered collective memory, negotiation skills, and ownership of space, challenging portrayals of informal settlements as zones of failure.

Sustainability remains precarious: Fragile infrastructure, insecure tenure, and political marginalisation constrain continuity, while reliance on external academics and NGOs risks misalignment with shifting priorities. These tensions expose how empowerment rhetoric can inadvertently reinforce neoliberal logics of individual responsibility. Nonetheless, the programme demonstrates that critical pedagogy and co-production can generate tangible improvements and socio-political agency, positioning Los Arenales as a site where grassroots knowledge reframes urban futures.

Despite these tensions, critical pedagogies in Los Arenales offer valuable lessons for educators, planners, and policymakers. Embedding education within the socio-spatial realities of marginalised communities ensures relevance and transformative potential. These initiatives foster resilience, solidarity, and collective agency, providing a powerful model for addressing urban inequalities through participatory and emancipatory education. In the words of one of the participating students:

When you come to study, it's not just about preparing yourself. And when you leave here, you're not always going to be surrounded by books; you're going to interact with a world where there are people. If you only look out for yourself and don't care about others, we're not going to achieve a truly developed society. (Business student in Observatorio Regional de Desarrollo Humano, 2018)

The critical pedagogies of Los Arenales illustrate the profound possibilities and persistent tensions of grassroots education in contexts of urban informality. By centring the voices and experiences of residents, these initiatives challenge dominant paradigms of education and urban development, offering a compelling vision of what an inclusive and equitable urban future might entail. At the same time, they remind us of the need for structural changes that go beyond localised efforts, addressing the root causes of urban exclusion and inequality. As such, the experience of Los Arenales provides both inspiration and critical insights for advancing the transformative potential of education in the struggle for urban justice. In the words of one of Los Arenales' representatives:

For me, it was very important when the young people came to paint the façades of our sports field. We hope they can continue coming to do such beautiful projects. This way, they don't get carried away by the comments or the bad reputation we have for irregularly occupying these lands, and they can see the reality of the families living here and how we coexist. The entire project the young people carried out, bringing colour to the heart of the settlement, which is the sports field, was incredible. (INT2)

6. Discussion

The findings from Los Arenales intersect meaningfully with the SDGs, particularly SDGs 1 (No Poverty), 10 (Reduced Inequalities), and 11 (Sustainable Cities and Communities). The grassroots initiatives analysed challenge the SDG framework's emphasis on top-down approaches by highlighting the importance of community-driven processes. While the SDGs aim for inclusivity and sustainability, the Los Arenales case reveals how these goals can fall short when implemented within neoliberal structures that marginalise informal settlements. The bakery and participatory mapping projects serve as counterpoints, demonstrating how localised, context-sensitive interventions can address inequalities in ways that the SDGs often fail to achieve. These initiatives illustrate that advancing the SDGs requires not only measurable outcomes but also methodologies that engage the lived realities of marginalised populations and prioritise their agency. While this article emphasises the challenges of precarity in Los Arenales, the findings also reveal a more nuanced terrain of collective agency. Beyond formal initiatives such as KYC or the cooperative bakery, residents of Los Arenales have enacted informal planning practices, including self-built housing, cooperative land allocation, and mutual care networks among women. These socio-spatial practices not only contest neoliberal planning logics but also cultivate dignified living through grassroots self-management. Recognising these forms of territorial agency helps to move beyond deficit framings and positions the community as active political subjects in shaping their urban futures.

Table 1 reframes the SDGs—especially SDGs 1, 10, and 11—through the lens of grassroots praxis under structural neglect:

- **SDG 1 (No Poverty):** In Los Arenales, poverty alleviation is not an outcome of formal jobs or state transfers but of self-managed production anchored in social ties. The CINTRA bakery shows how economic resilience stems from a shared craft—bread-making—that restores territorial dignity and expands residents’ capacity to act rather than merely boosting income (Vergara-Perucich & Arias-Loyola, 2019).
- **SDG 10 (Reduced Inequalities):** Inequality in Los Arenales is experienced as systemic exclusion modulated by race, migrant status, and institutional neglect. Co-governance and intersectional solidarity—rather than national redistribution alone—emerge as key bottom-up strategies.
- **SDG 11 (Sustainable Cities and Communities):** Los Arenales contests technocratic visions of sustainability that privilege market housing and expert planning. Informal land allocation, participatory mapping, and cooperative enterprise advance a situated sustainability rooted in everyday territorial struggle.

Table 1. Key insights based on research on Los Arenales aligned with the SDGs.

SDG	Pending Challenges in Chile	Los Arenales Contribution	Critical Concepts	Relevant Sub-Targets
SDG 1—No Poverty	Persistent poverty among migrants.	Cooperative bakery builds local economic resilience and food security.	Territorial agency; self-management; everyday dignity.	1.5: Build the resilience of the poor and those in vulnerable situations; 1.8: Create sound policy frameworks based on pro-poor and gender-sensitive strategies.
SDG 10—Reduced Inequalities	Entrenched regional and social inequalities.	Collective land allocation and organisation mitigate exclusion.	Grassroots solidarity; intersectionality; co-governance.	10.2: Empower and promote the social, economic, and political inclusion of all; 10.3: Ensure equal opportunity and reduce inequalities of outcome.
SDG 11—Sustainable Cities and Communities	Socio-spatial segregation and weak integrative planning.	Self-built urbanism legitimises informal spatial production.	Right to the city; spatial justice; informal urbanism.	11.1: Ensure access for all to adequate, safe, and affordable housing; 11.3: Enhance inclusive and sustainable urbanisation and participatory planning.

Urban-resilience discourse often praises the capacity to absorb shocks; Los Arenales instead accents collective action, territorial appropriation, and political agency (Williams et al., 2019). Grassroots initiatives—CINTRA and KYC mapping—rework dominant spatial logics, aligning resilience with autonomy, dignity, and alternative urban imaginaries (Balto, 2023; Strüver et al., 2021). These practices are better read as deliberate resistance to neoliberal planning than as passive adaptation: Migrant-led land allocation, cooperative production, and

informal governance constitute a counter-urbanism that positions informality as innovation and epistemic plurality (Kielin-Maziarz, 2021).

Henri Lefebvre's right to the city thus returns as a lived framework. Self-built housing, mutual-care networks, and collectively managed infrastructure translate the right into everyday practice. CINTRA reconfigures urban space through cooperation, turning bread into a vehicle of solidarity; KYC mapping recovers collective memory and renegotiates relations with the state (Shingne, 2021). Such initiatives corroborate claims that structurally supported grassroots agency can transform urban governance (Turok & Scheba, 2019).

Los Arenales' gains remain fragile. They rely on external funding and alliances with NGOs, academics, and sporadically sympathetic officials. Migrant residents still confront an extractive, exclusionary economy, exposing the limits of bottom-up action under neoliberalism (Jamieson et al., 2020). Pursuing economic self-sufficiency can slide into neoliberal responsibilisation, obscuring the need for systemic reform (Mendes & Lau, 2020; Nogueira & Shin, 2022). Service gaps, insecure tenure, and hostile policies continually test community initiatives.

The community's right to fail (Arias-Loyola & Vergara-Perucich, 2021) values experimentation and learning from missteps. Leaders shifted tactics—from autonomous mobilisation to selective engagement with formal planning—mirroring a dialectic between resistance and institutional negotiation. This pragmatism bore fruit in 2024 when Chile's Ministry of Housing and Urbanism approved a master plan for Los Arenales: embryonic recognition that grew from persistent territorial claims.

Los Arenales illuminates how grassroots initiatives can reinterpret SDGs from below, advancing poverty reduction, equality, and urban sustainability outside conventional policy channels. By elevating territorial dignity, co-governance, and situated knowledge, the settlement demonstrates that informality can generate political agency and alternative urban futures—yet only if external partnerships shift from managerial support to genuine solidarity that addresses structural injustice.

Importantly, the symbolic dimension of these practices cannot be overstated. Bread-making, public murals, and participatory design workshops do not merely serve utilitarian functions but generate shared meaning, identity, and political cohesion. Such aesthetic and cultural practices contest the stigma often associated with informal settlements, resisting homogenising urban imaginaries and asserting the legitimacy of difference (Arias-Loyola et al., 2023). Yet this symbolic power must not obscure material precarities. There is a risk that celebrating the creativity of informality can romanticise its conditions, obscuring the structural violence that underpins them. Thus, recognising informal settlements as sites of experimentation and resilience must always be paired with an analysis of their structural subordination and a commitment to dismantling the systems that perpetuate it.

Participatory urbanism, in this sense, is not a panacea but a strategic tool. It enables communities to articulate spatial claims, generate data, and engage with planning systems from a position of relative strength. The mapping exercises in Los Arenales not only helped residents document their histories and boundaries but also became instruments for negotiating infrastructure provision and tenure security (Vergara-Perucich & Arias-Loyola, 2021). These methodological tools bridge epistemic divides and legitimise local knowledge within formal planning frameworks, reinforcing calls for more inclusive and situated forms of governance (Brown & Raymond, 2014; Kempin Reuter, 2019).

Ultimately, the experience of Los Arenales raises broader questions about the scalability and institutionalisation of grassroots practices. Can such initiatives inform metropolitan planning without losing their radical edge? Does the engagement with state institutions signify co-optation or a strategic negotiation? And are these practices exceptional or indicative of a broader shift among informal urban communities in Latin America? Answering these questions requires comparative research and longitudinal tracking of such initiatives beyond their pilot stages. What Los Arenales offers is not a model to be replicated wholesale, but a critical perspective on how grassroots agency, symbolic action, and territorial struggle can reconfigure the terrain of urban justice in deeply unequal cities.

In policy terms, the lessons are clear. Urban planning must move beyond deficit-based framings of informality, recognising settlements like Los Arenales as sites of knowledge, experimentation, and political possibility. This requires embedding participatory methodologies—such as mapping, co-design, and collaborative governance—within formal systems, without subordinating them to technocratic imperatives. Moreover, symbolic acts, like the collective production of bread, must be taken seriously in policy discourse, not as cultural add-ons but as expressions of agency and visions of alternative futures. Ultimately, the transformative potential of grassroots urbanism depends on a political willingness to see in the informal not a failure of planning, but an invitation to reimagine it altogether.

Theoretically, the findings from Los Arenales contribute to debates on sustainability, justice, and autonomy in urbanism. By emphasising the dialectical relationship between grassroots agency and systemic structures, the case illustrates how marginalised communities navigate and resist neoliberal constraints while advancing their visions of spatial justice. The concept of concrete utopias, rooted in Lefebvre's work, emerges as a vital framework for imagining and realising alternative urban futures. Furthermore, the case challenges the romanticisation of informality by showing that while grassroots practices can be transformative, they must be complemented by systemic reforms to dismantle structural inequities. These insights imply a critical re-evaluation of how sustainability is defined and pursued in urban contexts, advocating for a holistic approach balancing autonomy with broader institutional support, to achieve justice-driven urban development.

7. Conclusions

Los Arenales illustrates how grassroots urbanism can reshape urban governance while revealing the structural constraints of neoliberal frameworks. Two flagship initiatives—CINTRA, a cooperative bakery, and the KYC participatory-mapping programme—render Lefebvre's right to the city tangible, reinterpreting informal settlements as sites of resistance, resilience, and innovation rather than pure deprivation. CINTRA's model of solidarity-based ownership advances economic self-sufficiency and reconfigures social relations; KYC's mapping workshops enable residents to historicise their territory, lobby for infrastructure, and embed community knowledge in planning processes.

These practices sit at the nexus of grassroots agency, the right to the city, and the SDGs. By mobilising cooperative labour, self-built infrastructure, and collective governance, Los Arenales contests technocratic readings of SDG 1 (No Poverty), SDG 10 (Reduced Inequalities), and SDG 11 (Sustainable Cities and Communities). Poverty is re-understood as a rupture of territorial dignity; inequality appears as systemic exclusion structured by race, migratory status, and institutional neglect; sustainability emerges through

everyday mutual aid rather than market-centred innovation. Informal settlements thus become arenas where SDG agendas are inhabited, contested, and redefined through situated practice.

Los Arenales also resonates with anarchist-geographical principles of mutual aid, decentralised decision-making, and non-hierarchical organisation (Ince, 2012, 2019; Springer, 2016; Springer et al., 2012). Yet it is not a fully anarchist polity: Episodes of autonomy—emergency kitchens, improvised healthcare—were transitory, and leadership eventually sought formal recognition from municipal, regional, and national authorities. The settlement embodies pragmatic politics: strategic oscillations between autonomy and negotiation, aimed at securing tenure and services without sacrificing collective agency.

The study underscores the fragility of such initiatives under neoliberalism. CINTRA and KYC depend on support from NGOs, academics, and occasional state allies, raising questions of sustainability and autonomy. Their right to fail (Arias-Loyola & Vergara-Perucich, 2021)—embracing experimentation, learning, and recalibration—offers a critical counterpoint to managerial efficiency, yet it remains vulnerable to funding cycles and political shifts. Longitudinal and comparative research across Latin American cities is needed to gauge the scalability and durability of these grassroots strategies.

Symbolic practices warrant closer attention. Bread-making, public art, and participatory aesthetics forge collective identity, legitimise space, and nourish mobilisation. Such cultural repertoires have political weight: They translate solidarity into visible form and challenge narratives that cast informality as pathology. Recognising informal settlements as epistemic laboratories can expand global urban scholarship, positioning places like Los Arenales as producers of theory rather than objects of intervention.

Policy implications flow from this reframing. Governments should institutionalise participatory governance that acknowledges informal settlements as legitimate urban territories instead of temporary anomalies. Financial schemes must supply long-term resources without eroding local autonomy—moving from project-based aid to sustained, community-controlled funds. Urban integration policies should preserve the grassroots ethos, allowing resident-led design and incremental upgrading rather than replacing self-built environments with top-down blueprints.

Public officials can adopt participatory methodologies—community mapping, service-learning studios, co-design workshops—to incorporate residents' knowledge into statutory planning. These practices should be anchored in the affective and cultural dimensions of collective life, recognising how territorial identity sustains social cohesion and political commitment.

Future research ought to track how grassroots innovations adapt across varied institutional contexts. Comparative case studies can reveal how different socio-spatial conditions enable or constrain co-operative economies and participatory planning. Interdisciplinary methods—merging geography, urban studies, anthropology, and design—will be essential to refine critical urban praxis and broaden debates on socio-spatial justice.

Los Arenales contributes to theoretical discussions of informality, neoliberalism, and resistance. Its initiatives demonstrate that resilience, conceived as collective agency, is constantly produced through trial, error, and iterative learning (Balto, 2023; Strüver et al., 2021; Williams et al., 2019). They caution, however, against

romanticising informality. External partnerships can reproduce dependency, and the pursuit of self-reliance can slip into neoliberal responsibilisation, obscuring demands for structural reform (Jamieson et al., 2020; Mendes & Lau, 2020; Nogueira & Shin, 2022).

Yet Los Arenales offers a compelling model of grassroots urbanism grounded in dignity, solidarity, and collective autonomy. It challenges planners and policymakers to reconceive urban development through more horizontal, inclusive lenses. This potential was partially recognised in December 2024, when Chile's Ministry of Housing and Urbanism approved an in-situ upgrading plan for the settlement. While symbolically powerful, the plan remains embryonic and has yet to fully integrate the participatory practices that catalysed it—highlighting the enduring tension between bottom-up mobilisation and top-down planning in the pursuit of urban justice.

Ultimately, Los Arenales is not a singular anomaly but a paradigmatic terrain for interrogating the contradictions of SDG implementation under systemic exclusion. Its experiences—especially CINTRA and KYC—reveal the capacity of marginalised communities to articulate alternative urban futures, demonstrating that informal settlements can generate rigorous social innovation and critical urban knowledge when given space to flourish.

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Conflict of Interests

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Data Availability

Further information can be obtained from the authors by e-mail on request.

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National Urban Policies as Instruments for Global Urban Agendas Localization: Lessons From Argentina

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Abstract

This article examines how national urban policies (NUPs) function as instruments for localising global frameworks, including the New Urban Agenda and SDGs. Using Argentina’s NUP development (2017–2019) as the primary case and Neuquén’s provincial implementation as a comparative example, this analysis reveals how international sustainability frameworks are translated across governance levels. The research employs stakeholder interviews and documentary analysis to examine policy formulation and implementation processes. Findings reveal significant challenges limiting NUP effectiveness: governance coordination difficulties, limited policy innovation despite international technical support, insufficient implementation mechanisms, and vulnerability to political transitions. These challenges were exacerbated by Argentina’s recent political shift under President Milei’s administration, characterized by state retrenchment and multilateral framework rejection. Argentina’s experience demonstrates that although global frameworks function as “coalition magnets” during policy formulation, sustained implementation requires deeper institutional anchoring beyond international legitimacy alone. The contrast between national policy abandonment and Neuquén’s continued engagement illustrates how federal systems create institutional redundancy for policy resilience. The analysis contributes to policy localisation scholarship by revealing how institutional context, temporal dynamics, actor networks, and implementation mechanisms interact across governance scales. Despite limitations, NUPs remain valuable vehicles for SDGs localisation when developed with appropriate consideration of existing institutional arrangements and implementation pathways, offering lessons for post-2030 sustainability agenda design in multilevel governance systems experiencing political volatility. The Argentine case particularly highlights how federal structures can enable subnational continuity even when national support disappears, suggesting the importance of multi-scalar approaches to global framework implementation.

Keywords

Argentina; multilevel governance; national urban policy; New Urban Agenda; policy implementation; SDGs localisation; territorial planning

1. Introduction

In 2015–2016, the UN adopted the 2030 Agenda for Sustainable Development and the New Urban Agenda (NUA), establishing universal frameworks for sustainable urban development. Translating these international commitments into meaningful local action requires effective “localisation”—the process of adapting, implementing, and monitoring global goals at national and subnational levels (Acuto et al., 2023; Caprotti et al., 2017; Croese et al., 2020; Parnell, 2016; Valencia et al., 2019; Watson, 2016).

National Urban Policies (NUPs) have emerged as key localisation instruments. International organizations define a NUP as “a coherent set of decisions through a deliberate government-led process of coordinating and rallying various actors toward a common vision that will promote more transformative, productive, inclusive and resilient urban development for the long term” (OECD et al., 2021, p. 20). Despite their potential, there is limited empirical evidence on how NUPs function as localisation instruments in practice, particularly in federal systems and Latin American contexts.

Argentina presents a compelling case study. Between 2017–2019, Argentina developed a NUP with the UN-Habitat support as part of its NUA implementation commitment within the country’s complex federal structure. However, the NUP was abandoned following the 2019 electoral transition when President Alberto Fernández’s administration dissolved the responsible sub-secretariat. Since December 2023, President Javier Milei’s administration has implemented radical state retrenchment policies, representing an even more dramatic departure from multilateral frameworks. Contrasting with these national political transitions, Neuquén province developed a comprehensive approach to implementing the NUA through a collaborative project with UN-Habitat, demonstrating how subnational governments can maintain engagement with global frameworks despite national policy discontinuity (UN-Habitat & Provincia del Neuquén, 2023).

This article investigates Argentina’s experience developing and implementing a NUP, examining the national policy formulation process (2017–2019) and contrasting it with Neuquén’s provincial implementation (initiated in 2017 but intensified from 2021–2023). Neuquén’s experience represents the sole concrete attempt to localise the NUA in Argentina, serving as the practical implementation experiment that the national NUP could not achieve at scale. The analysis addresses three central questions: (a) How did Argentina’s NUP incorporate NUA and SDG principles? (b) What coordination mechanisms were established between governance levels and stakeholders? And (c) what challenges arose and what lessons emerge for improving NUPs as localisation instruments, considering Argentina’s current political context?

This research contributes to emerging scholarship on SDG localisation mechanisms (Acuto et al., 2023; Croese et al., 2020; Watson, 2016) by providing empirical insights on policy implementation challenges in multilevel governance contexts experiencing political transitions. It argues that while NUPs offer promising potential as localisation tools, their effectiveness depends on appropriate institutional designs,

implementation pathways, and capacity to withstand domestic political shifts—factors that proved particularly challenging in the Argentinian case.

The study proceeds as follows: Section 2 develops a four-dimensional theoretical framework for analysing policy localisation, Section 3 outlines the qualitative methodology, Section 4 provides the empirical background on Argentina's territorial planning evolution and NUP development, Section 5 analyses the localisation process through the theoretical framework's four dimensions, Section 6 discusses broader implications for policy localisation theory, and Section 7 concludes with lessons for post-2030 sustainability agenda design.

2. Theoretical Framework: Localising Global Urban Agendas in the Argentinian Context

This article examines Argentina's NUP development through a four-dimensional policy localisation framework. Drawing on policy mobilities, institutional theory, and multilevel governance literature, I propose that localisation effectiveness depends on four interconnected dimensions: institutional context (path dependency), temporal dynamics (critical junctures), actor networks (coalition building), and implementation mechanisms (multilevel coordination).

Rather than treating localisation as a linear transfer, this framework recognizes it as a complex phenomenon where global frameworks undergo "assemblage, disassembly and reassembly" (McCann & Ward, 2012, p. 43) through these four dimensions operating simultaneously, creating distinct pathways varying significantly across national and subnational contexts.

2.1. Institutional Context and Path Dependency

The localisation of global urban agendas is fundamentally shaped by pre-existing institutional configurations, which create distinctive pathways for international frameworks. Policy mobilities literature recognizes that policies mutate as they travel, undergoing complex translation and adaptation processes (Stone, 2012, 2017). These processes are both constrained and enabled by path dependency, wherein historical arrangements create specific trajectories that influence policy adoption and implementation (Pierson, 2000; Sorensen, 2018).

In Argentina, the institutional legacy of alternating democratic and authoritarian regimes, centralized federal structures punctuated by decentralization periods, and cyclical economic crises creates a distinctive matrix conditioning NUA interpretation and implementation (Catenazzi & Reese, 2016). As Blanc and Cotella (2023a, p. 394) argue, "the localisation of global urban policy is shaped path dependently by the combination of timing and sequence that characterises the process." Argentina's federal structure adds particular complexity as provinces retain significant constitutional powers over urban development, creating multi-layered governance challenges differing markedly from unitary states (Catenazzi & Reese, 2016).

The regional context further influences interpretation within these constraints. Latin America has distinctive urban reform traditions predating current global frameworks, providing alternative urban imaginaries and practices (Blanc et al., 2022; Galland & Elinbaum, 2018; Silvestre & Jajamovich, 2020). The region pioneered the "right to the city" concept, later embedded in frameworks like the NUA (Wigle & Zárate, 2022) and

Argentina specifically has rich urban social movement and progressive housing policy histories constituting important interpretive lenses (Catenazzi et al., 2009). Contemporary scholarship recognizes Latin American cities as sources of innovations traveling globally (Porto de Oliveira et al., 2020), with programs like participatory budgeting exemplifying South-North policy mobility (Sintomer et al., 2012).

2.2. Temporal Dynamics and Critical Junctures

Policy adoption timing represents a crucial dimension in understanding global framework localisation. Policy transfer unfolds across different temporal phases, influenced by “critical junctures” where domestic and international policy windows align (Porto de Oliveira et al., 2020). For Argentina, the 2015 government change coinciding with SDGs and NUA adoption created a potential critical juncture for urban policy reorientation (Collier & Collier, 2015). However, effectiveness depends on establishing durable implementation mechanisms that survive beyond initial windows.

Blanc et al. (2023) distinguish between “fast-track institutionalization” and incremental approaches to localising urban frameworks. In Argentina, where institutional coherence is fragmented across scales, sequencing becomes particularly relevant. Electoral cycles create additional temporal pressures, as governments may rush initiatives before transitions, potentially compromising anchoring mechanisms.

Federal systems reveal how temporal dynamics operate differently across scales. While national governments face electoral pressures creating short-term horizons, provincial and municipal governments may have different political cycles, creating alternative implementation opportunities. This multi-temporal dimension means localisation processes unfold differently at various governance levels, enabling policy continuity even when national support disappears.

2.3. Actor Networks and Coalition Building

Global frameworks shape localisation through their capacity as “coalition magnets” (Blanc & Cotella, 2023b), bringing together divergent stakeholders. Global urban frameworks operate through “pasteurized urban narratives,” facilitating coalition building via relatively vague, consensus-oriented language, creating “overlapping consensus” (Barnett & Parnell, 2016; Blanc & Cotella, 2023a). In Argentina, where political polarization complicates policy continuity, this function serves both enabling and constraining roles, allowing selective implementation or “cherry-picking” (Forestier & Kim, 2020).

International actors significantly influence localisation through technical expertise, financial resources, and political legitimacy. International organizations, bilateral agencies, and transnational networks actively promote particular approaches, shaping adaptation (Acuto, 2016; Blanc & Cotella, 2023a). In Argentina, organizations like UN-Habitat, the Inter-American Development Bank, and the World Bank have historically shaped urban policies (Catenazzi & Reese, 2016). Blanc and Cotella (2023a) identify two key “leveraging factors”: access to international funding creates incentives for alignment, potentially influencing priorities based on funding rather than local needs; and international endorsement provides political legitimacy to domestic initiatives, enabling leaders to justify reforms by citing international best practices.

Different international actors impact localisation differently—development agencies tend toward flexibility while global urban agencies prioritize standardized frameworks (Blanc & Cotella, 2023b). Critical perspectives question whether frameworks adequately address fundamental challenges or merely promote “urban solutionism”—technical fixes failing to address structural causes (Montero, 2020). Questions arise about participation and whose knowledge counts as legitimate (Robin & Acuto, 2018), particularly relevant where tension exists between technical expertise and experiential knowledge of urban movements (Catenazzi et al., 2009).

2.4. Implementation Mechanisms and Multilevel Governance

Implementation challenges in multilevel governance systems present the most immediate dimension affecting translation into concrete outcomes. Effective localisation requires coordination across governance levels—particularly complex in federal systems where constitutional authority is distributed (Valencia et al., 2019). Argentina’s federal structure, with three government tiers plus inter-jurisdictional entities for metropolitan areas, creates formidable coordination challenges (Catenazzi & Reese, 2016). Urban boundary delimitation represents another challenge, particularly in metropolitan regions like Buenos Aires, spanning multiple jurisdictions where fragmentation impedes coherent implementation (Catenazzi et al., 2009).

Data gaps and monitoring challenges further complicate implementation. Many cities lack the technical capacity for comprehensive data collection needed to monitor commitments (Croese et al., 2020). In Argentina, where municipal governments often have limited resources, this challenge is particularly acute for smaller cities outside major metropolitan areas (Lanfranchi et al., 2018). These constraints create cascading effects where inadequate monitoring prevents evidence-based adjustments, leading to implementation drift.

The implementation dimension reveals how other framework dimensions interact in practice. Path-dependent arrangements influence feasible mechanisms, temporal dynamics affect political sustainability across cycles, actor networks determine stakeholder engagement and conflict resolution, while global framework content shapes specific challenges. This multi-dimensional challenge requires coordination, addressing technical, administrative, political, fiscal, and institutional dimensions across Argentina’s complex federal landscape.

3. Methodology

This study employed a qualitative case study approach to examine Argentina’s NUP development process (2017–2019) and its subsequent implementation dynamics. The research design incorporated a comparative dimension through analysis of Neuquén’s provincial implementation experience and consideration of policy discontinuities under the Milei administration (2023–present). The methodological framework was structured to comprehensively operationalize the four theoretical dimensions: institutional context, temporal dynamics, actor networks, and implementation mechanisms.

Primary data consisted of five in-depth, semi-structured interviews with key stakeholders directly involved in Argentina’s NUP development process. The purposive sample included national government officials from the Ministry of Interior, Public Works and Housing, UN-Habitat technical consultants who provided advisory

support, and urban planning experts who participated in policy formulation activities. Interview participants were identified through institutional mapping and snowball sampling techniques. Each interview lasted approximately 60 minutes and was conducted in Spanish between 2019 and 2024. The interview protocol addressed each theoretical dimension through targeted questions examining: (a) the influence of existing planning frameworks, particularly the Plan Estratégico Territorial (PET; in English, Strategic Territorial Plan), on NUP development; (b) temporal factors including electoral cycle timing and critical junctures; (c) stakeholder participation processes and international agency involvement; and (d) coordination mechanisms and implementation challenges across governance levels. All interviews were audio-recorded with participant consent, transcribed verbatim, and subsequently translated into English for analysis.

Secondary data analysis encompassed a comprehensive examination of official documents selected to capture dynamics across the four theoretical dimensions. The documentary corpus included: government planning documents comprising all PET iterations (Consejo Federal de Planificación, 2018; Ministerio de Planificación Federal, Inversión Pública y Servicios, 2008, 2011, 2015; Ministerio del Interior, Obras Públicas y Vivienda & Secretaría de Planificación Territorial y Coordinación de Obra Pública, 2018). National Urban Forum proceedings, and the final NUP document; international framework documents (UN-Habitat & Provincia del Neuquén, 2023; UN-Habitat & República Argentina, 2016) establishing the policy development process and Neuquén's implementation report; and provincial implementation documents (Gobierno de Neuquén, 2021) focusing on regulatory instruments implementing sustainability frameworks. Recent government documents from the Milei administration were analyzed to understand policy discontinuities, including presidential decrees on state restructuring, official communications regarding international framework withdrawal, and budget documents eliminating urban development programs (Milei, 2023; República Argentina, 2023a, 2023b, 2024; Sigal, 2024).

Data analysis proceeded through a four-stage process examining different localisation dimensions. First, a detailed chronology identified critical junctures, policy windows, and temporal dynamics, mapping electoral cycles, international agenda adoption timelines, and institutional changes. Second, content analysis of the NUP and related instruments examined how global principles were translated into national policy, identifying institutional path dependencies and adaptation mechanisms. Third, coordination mechanisms and governance arrangements at national and provincial levels were analyzed to understand multilevel implementation dynamics, including formal structures, resource allocation, and stakeholder engagement. Fourth, recent political changes and their effects on policy instruments were examined to assess the interaction between temporal dynamics and institutional resilience during political transitions.

Interview transcripts and documentary materials were coded using a deductive approach based on the four theoretical dimensions, with additional inductive coding capturing emergent themes. Data triangulation was achieved through the comparison of interview accounts with documentary evidence and cross-validation between different stakeholder perspectives.

4. Argentina's Path Toward a National Urban Policy

This section provides the empirical background necessary to understand Argentina's experience with NUP development and implementation. It traces the institutional and political context that shaped how global urban frameworks were received and adapted in Argentina's federal system, examining the historical evolution of

territorial planning, the specific process through which the NUP was developed between 2017–2019, and the subsequent localisation experiment in Neuquén province. This contextual foundation establishes the factual basis for the theoretical analysis that follows, demonstrating how Argentina’s complex institutional landscape, political transitions, and federal governance structure created specific conditions for policy localisation that varied significantly between national and provincial levels.

4.1. Territorial Planning in Argentina

Argentina has a federal governance structure where planning authority is distributed across national, provincial, and municipal levels. As established in the National Constitution (República Argentina, 1994, art. 121, 124), provinces maintain significant autonomy and hold primary responsibility for land use planning, while municipalities are granted varying degrees of authority depending on provincial legislation (República Argentina, 1994, art. 123). This fragmentation of planning authority has historically complicated efforts to establish coherent national approaches to territorial development. As Reese (2006) describes, this has created a heterogeneous landscape of urban legislation across the country’s 24 provinces.

The fragmentation of territorial planning in Argentina stems from multiple interconnected factors. The diversity of actors involved creates conflicting expectations and power asymmetries, resulting in a complex institutional landscape where divergent interests shape the evolution of urban and territorial policies. These policies have been characterized by advances and setbacks, directly reflecting the conjunctural variation of power relations throughout Argentina’s political history.

The federal organization of planning across national, provincial, and municipal government levels presents significant challenges, as each operates with different types of regulatory capacity. Despite the National Constitution’s promotion of territorially balanced development, Argentina still lacks a comprehensive National Law on Territorial Planning to articulate these efforts cohesively. While specific responsibilities exist at each level, provinces and municipalities retain primary legislative authority and responsibility for land use planning.

Further destabilizing planning efforts is the volatile political-economic environment in which these policies operate. Drastic shifts in political leadership and policy orientation, coupled with the state’s diminished intervention capacity due to limited public funds, create an unstable foundation. This instability stems from Argentina’s political culture of “continuous national refounding,” which inhibits the establishment and achievement of long-term social goals (Suárez-Cao, 2011), alongside macroeconomic cycles of currency fluctuations exacerbated by the national central bank’s reserve limitations.

The PET has served as the primary national instrument for guiding strategic infrastructure investments since 2008 until 2018, undergoing four iterations (in 2008, 2011, 2015, and 2018) under different administrations and gradually expanding from infrastructure focus to broader territorial planning dimensions (Ministerio de Planificación Federal, Inversión Pública y Servicios, 2008, 2011, 2015; Ministerio del Interior, Obras Públicas y Vivienda & Secretaría de Planificación Territorial y Coordinación de Obra Pública, 2018).

4.2. The Historical Evolution of Urban Agendas in Argentina

Argentina's national urban agenda has evolved through two primary cycles over the past two decades. The first (2003–2015) marked the institutionalization of territorial planning after several years where market forces dominated development processes. The second cycle (2015–2019) reflected significant changes in political leadership alongside innovations in territorial planning approaches.

The 2003–2015 period saw the Argentine state reassert its central role in territorial planning as a development tool. This was formalized in 2004 with the creation of the Ministry of Federal Planning, Public Investment, and Services, followed in 2008 by the establishment of the Consejo Federal de Planificación (in English, Federal Council for Territorial and Land-Use Planning). This national agency—comprising the federal government, all provinces, and the city of Buenos Aires—received a mandate to issue planning guidelines and address institutional bottlenecks across provincial frameworks.

Under the Peronist governments of Néstor Kirchner (2003–2007) and Cristina Fernández de Kirchner (2007–2015), Argentina developed three versions of the PET. The first PET (2008) represented two significant innovations: the return to state planning for allocating public investment and territorial development and an inclusive methodology that incorporated input from provincial expert teams.

The subsequent period from 2015 to 2019 under President Mauricio Macri's administration marked a substantial reorientation in Argentina's approach to territorial planning. While maintaining some planning continuity, the government adopted elements of neoliberal policy approaches, reducing public service subsidies while preserving the extractivist economic model. A major institutional change was the creation of the Ministry of the Interior, Public Works, and Housing, which attempted to centralize territorial planning coordination.

In this new political context, Macri's administration developed the fourth PET (2018), explicitly linking infrastructure with production based on the premise that territorial development could be achieved through job creation. This version proposed public works portfolios prioritized by both social needs and productive potential. Concurrent with this effort, between 2016 and 2018, Argentina worked with UN-Habitat to develop its NUP. This initiative represented an opportunity to adopt the NUA following Habitat III and create a framework to guide the country's urbanization process. This created a period of overlap where two national planning instruments coexisted: the fourth PET (validated by Federal Council for Territorial and Land-Use Planning) and the NUP, which was ultimately abandoned after the 2019 change in government when President Alberto Fernández's administration dissolved the sub-secretariat responsible for the NUP and established no comparable entity for continuation, reflecting the typical institutional discontinuity that accompanies political transitions in Argentina's presidential system. This 2019 abandonment due to institutional reorganization preceded the more radical ideological dismantling of urban policy infrastructure under President Milei's administration beginning in 2023.

4.3. From National Planning to Global Framework Adoption

Argentina's engagement with global urban frameworks evolved significantly over time. Between 2007 and 2011, the country participated in the localisation of the Millennium Development Goals, adapting national

targets and indicators through collaboration with the UN Development Programme and the National Council for the Coordination of Social Policies. This early localisation experience established initial pathways for translating international frameworks into national policies, though with limited focus on urban dimensions.

The election of Mauricio Macri as president in 2015 marked a shift in Argentina's approach to international engagement (Malamud, 2017). The new administration sought to position Argentina more prominently on the global stage, emphasizing integration into global markets and international frameworks. This coincided with the global adoption of the 2030 Agenda and the NUA, creating an opportunity for Argentina to demonstrate its commitment to these frameworks through the development of a NUP. The NUP initiative was conceived as a way for Argentina to align with international best practices and frameworks for urban development (Ministerio del Interior, Obras Públicas y Vivienda, 2018).

In 2016, Argentina signed a technical collaboration agreement with UN-Habitat for the development of a Plan Nacional Urbano y del Hábitat (in English, National Urban and Habitat Plan; UN-Habitat & República Argentina, 2016). This agreement marked the beginning of the NUA implementation process in Argentina and represented a strategic move by the Macri government to internationalize the country's political agenda, coinciding with Argentina's hosting of the G20 summit in 2018 and negotiations with the International Monetary Fund.

The development of Argentina's NUP followed a structured process with technical support from UN-Habitat. The work began with the National Urban Forum held in Mendoza in June 2017, which brought together 357 participants representing 18 provinces and 75 municipalities (Ministerio del Interior, Obras Públicas y Vivienda, 2018). The forum established multi-stakeholder working groups focused on four thematic areas: territorial governance of habitat, territorial development and urban planning, land and housing policies, and urban economy and municipal financing.

The resulting NUP document, published in 2018, proposed a vision for 2040 of "balanced territory and liveable, safe, resilient, and sustainable cities based on adequate and solid institutional, regulatory, and financing frameworks" (Ministerio del Interior, Obras Públicas y Vivienda & Secretaría de Planificación Territorial y Coordinación de Obra Pública, 2018, p. 15, translation by the author). It established six principles: equity in accessing the city, territorial balance between urban and rural systems, completeness in fighting poverty and inequality, care for the environment and resilience to climate change, economic opportunities, and democratic governance and social participation.

4.4. Provincial Localisation of the National Urban Agenda: The Neuquén Case

Neuquén's experience represents the sole concrete attempt to localise the NUA and related urban policy frameworks in Argentina, serving as the practical implementation experiment that the national NUP could not achieve at scale. In 2017, Neuquén formalized its commitment to the 2030 Agenda by designating the Consejo de Planificación y Acción para el Desarrollo (COPADE; in English, Provincial Planning and Development Action Secretariat) as the focal point for SDGs implementation. This institutional choice was significant, as COPADE has a 55-year history of contributing to provincial development planning and coordinates with national, provincial, and municipal bodies.

The province's approach to SDGs localisation involved reviewing existing provincial plans and subsequently revising SDG targets and indicators to align with local priorities. COPADE organized the provincial territory into five micro-regions based on geographic, social, and economic characteristics, allowing for more context-specific planning approaches. This regionalization proved particularly valuable during the Covid-19 pandemic, enabling the province to adjust policies according to territorial conditions. The province integrated SDG indicators into its existing data collection processes through the Provincial Statistics and Census Directorate, which had previously achieved the International Organization for Standardization 37120 certification for sustainable development indicators.

Building on this foundation, Neuquén developed a comprehensive approach to implementing the NUA through a collaborative project with UN-Habitat and other international partners. This initiative, titled Sustainable Cities—New Urban Agenda, focused on strengthening inclusive and integrated urban planning and sustainable public works management with gender equity criteria (UN-Habitat & Provincia del Neuquén, 2023). The program achieved remarkable scope, reaching the entire province with sustainability and gender perspective approaches, involving 35 local governments in territorial planning methodologies and training more than 1,200 people across 42 municipalities, 39 provincial state organisms, 22 private companies, and 18 civil society organizations (UN-Habitat & Provincia del Neuquén, 2023). The implementation included concrete deliverables such as four participatively developed municipal plans (in El Huecú, Las Lajas, Plaza Huincul, and Aluminé), three public space preliminary projects, and 13 local costings of care infrastructures.

The Neuquén experience demonstrates systematic policy localisation far beyond basic national framework adaptation, developing specific tools including a sustainability indicators matrix with 75 indicators across five infrastructure types, guides for incorporating sustainability criteria in public tender processes, and comprehensive training programs analyzing 220 works from the 2024 provincial public works plan (UN-Habitat & Provincia del Neuquén, 2023). This involved implementing Provincial Decree 1320/21 for sustainable public works promotion (Gobierno de Neuquén, 2021), establishing standardization guides and evaluation tools for public space quality across six dimensions: accessibility, uses and users, security and comfort, equipment, and environment, plus gender mainstreaming through 10 specialized training sessions reaching 260 people across public, private, and civil society sectors (UN-Habitat & Provincia del Neuquén, 2023), demonstrating policy integration and implementation depth absent from the national NUP process.

5. NUP Localisation in Argentina: A Multi-Dimensional Analysis

This section analyzes Argentina's NUP development through the four proposed theoretical dimensions: institutional context shaped by path dependency; temporal dynamics including critical junctures; actor networks involving coalition building and international agency; and implementation mechanisms across multilevel governance systems, drawing on interview insights and documentary evidence.

5.1. Institutional Legacies and Policy Innovation

Argentina's fragmented urban policy approach demonstrates how path-dependent institutional arrangements limited the NUP's effectiveness. The country's historical oscillation between centralization and decentralization created institutional inertia, limiting how international frameworks could be domestically implemented. The institutional legacy of territorial planning—characterized by fragmentation

across federal, provincial, and municipal levels—significantly constrained the NUP’s effectiveness despite its alignment with NUA principles.

The most evident manifestation was the parallel development of the NUP and PET without integration mechanisms, creating competing rather than complementary planning instruments. The Secretary of Urban Infrastructure led the NUP process while the Secretary of Territorial Planning simultaneously developed the PET, creating siloed processes that undermined policy coherence. Official documentation shows limited cross-referencing between instruments despite overlapping scope. Consequently, government stakeholders consistently noted that the lack of coordination led to confusion and duplicated efforts.

The legal standing of these planning instruments further reinforced path dependency. While the PET was developed through legal and administrative acts dating to 2004, the NUP remained a technical document without similar anchoring. This imbalance meant that despite NUP’s alignment with international frameworks, existing planning patterns continued to privilege the PET. From a vertical perspective, the federal structure complicated efforts to establish coherent frameworks across governance levels. While provincial and municipal representatives participated in initial consultations, the NUP lacked specific mechanisms ensuring their ownership and implementation.

In contrast, Neuquén’s alternative approach illustrates the importance of working with existing institutional structures. The province built on COPADE’s 55-year institutional history and established planning systems, integrating SDG targets within frameworks that already possessed legitimacy and operational capacity. As revealed through interviews, provincial officials emphasized that they viewed the SDGs and NUA not as replacements for existing planning systems, but rather as complementary frameworks that could strengthen ongoing efforts. This incremental approach demonstrated greater resilience than the national attempt to introduce parallel planning frameworks.

5.2. Timing, Continuity, and Disruption

Argentina’s NUP development timing created a potential critical juncture when domestic and international policy windows aligned. The 2015 Macri election coincided with SDGs and NUA adoption, creating policy innovation opportunities. Moreover, the administration’s emphasis on positioning Argentina globally created political momentum for engaging international frameworks.

However, empirical evidence reveals Argentina’s NUP process failed to establish durable implementation mechanisms withstanding political transitions. The case reveals three critical weaknesses. First, the NUP lacked legislative anchoring, remaining a technical document without formal legal status. In contrast to Chile’s Urban Development Policy, formally adopted through presidential decree, Argentina’s NUP had no similar formalization. Second, the process established a few institutional mechanisms ensuring implementation continuity beyond initial development. Multi-stakeholder working groups guiding formulation weren’t transformed into permanent implementation bodies with clear mandates and resources. Third, the timing of development so close to electoral cycles left insufficient time for institutionalization before political change.

As revealed through interviews, former ministerial officials emphasized the temporal pressures they faced, noting that the rush to complete the policy before the administration's end prevented proper embedding within governmental structures. The timing of the NUP development process coincided with the electoral cycle, with the policy being finalized shortly before the national elections. Consequently, when Alberto Fernández was elected in 2019, representing Macri's opposition coalition, the NUP lost institutional support entirely. The new administration's organizational changes led to the dissolution of the sub-secretariat that designed the NUP, with no comparable entity established for continuation.

In stark contrast, the difference between national policy discontinuity and Neuquén's institutional stability emphasizes the importance of timing and political continuity. The province's continuous governance under the Movimiento Popular Neuquino party since 1963 created conditions more conducive to long-term planning, allowing for gradual adaptation of global frameworks to local contexts (Favaro, 2015). This stability enabled sustained engagement with global frameworks across different political cycles, demonstrating how temporal dynamics operate differently across governance scales.

5.3. Building Coalitions Across Governance Levels

Argentina's NUP development demonstrates how global frameworks function as "coalition magnets" (Blanc & Cotella, 2023a) through broad narrative appeal. The inclusive development process—bringing together representatives from 18 provinces and 75 municipalities at the National Urban Forum—reflected attempts to build broad-based support around NUA-derived principles. These principles' relatively abstract nature (inclusion, sustainability, and integration) made initial consensus generation possible across diverse stakeholders.

Interview participants from the National Urban Forum emphasized that the broad nature of NUA principles allowed diverse stakeholders to find common ground, facilitating initial discussions. Furthermore, the participatory mechanisms employed during formulation—including regional forums, thematic working groups, and stakeholder consultations—successfully engaged a wide range of actors in the policy development process.

However, this consensus-building proved superficial without addressing underlying governance tensions. Multi-stakeholder working groups dissolved after development without clear pathways for continued implementation participation. The case illustrates coalition-building limitations without addressing underlying power dynamics. Argentina's NUP development process avoided directly addressing fundamental federal system tensions, such as resource allocation powers and land use decision-making authority. As highlighted in interviews, provincial officials noted that the NUP emphasized integration and coordination without specifying how power would be redistributed or how conflicts between levels of government would be resolved.

Consequently, this avoidance of contentious issues meant that while Argentina's NUP successfully engaged diverse stakeholders during formulation, it failed to translate this engagement into durable implementation coalitions. Without addressing these fundamental governance questions, the initial consensus dissolved when moving from abstract principles to concrete implementation.

Regarding underlying motivations, the research uncovered two primary drivers for Argentina's engagement with global frameworks: international legitimacy and positioning within global systems. The Macri administration explicitly positioned the NUP development as part of Argentina's reintegration into global networks, coinciding with the country's G20 presidency and negotiations with the International Monetary Fund. As revealed through interviews, multiple stakeholders identified the potential for accessing international financing as a key motivation for engaging with global urban frameworks. This external orientation may explain why the localisation process remained superficial—when the primary goal is international legitimacy rather than domestic transformation, policy development tends to prioritize symbolic compliance over substantive institutional change, resulting in frameworks that satisfy international audiences but lack the deep domestic anchoring necessary for effective implementation.

5.4. From Policy Design to Implementation

The translation from policy design to implementation revealed fundamental coordination challenges in Argentina's multilevel governance system. The NUP lacked specificity regarding the governmental agency responsible for its development, sources of funding for implementation, and regulatory instruments to institutionalize it. Documentation from the Ministry of Interior, Public Works, and Housing reveals no follow-up legislation or regulations to formalize the NUP within Argentina's legal framework. The document itself acknowledged that without legislative backing, the policy would remain vulnerable to changes in administration but provided no concrete strategy to address this vulnerability.

The federal structure complicated efforts to establish coherent implementation frameworks, with the NUP lacking specific mechanisms to ensure provincial and municipal ownership despite their participation in initial consultations. The policy maintained a traditional hierarchical approach that contrasted with the relational nature of urban governance. This disconnect between planning approach and urban reality was particularly problematic in the Argentine context, where institutional capacities to implement top-down planning were limited.

Neuquén's implementation experience demonstrates both the potential and limitations of provincial-level localisation. While COPADE coordinated SDGs localisation, the provincial NUP development remained disconnected from this process, and technical capacity for monitoring and evaluation varied significantly across government departments and municipalities. Data gaps and monitoring challenges further complicated implementation, with many cities lacking the technical capacity for comprehensive data collection needed to monitor progress on global commitments.

Despite these challenges, Neuquén's systematic approach demonstrates the potential for effective implementation when appropriate institutional conditions exist. The province's comprehensive training programs, technical tools development, and integration across multiple government levels achieved concrete results that contrasted with the national experience. However, external motivations proved insufficient without building genuine domestic ownership. The rapid abandonment of the NUP under changing political leadership indicates that the policy never developed the deep institutional roots necessary to withstand political transitions.

5.5. Neuquén as Implementation Laboratory

Neuquén's experience represents the only concrete example of national urban policy localisation in Argentina, shaped by the specific temporal sequence of policy development and unique institutional conditions that enabled implementation. The national NUP development occurred during a political window that closed before systematic localisation could occur elsewhere, while Neuquén's engagement with UN-Habitat and commitment to implementing the 2030 Agenda created conditions for sustained policy translation.

The contrast between national policy discontinuity and provincial institutional continuity demonstrates how four analytical dimensions interact differently across governance levels. While the national level experienced institutional fragmentation, temporal disruption, coalition dissolution, and implementation abandonment, Neuquén's political continuity, institutional capacity, and systematic planning approach enabled sustained engagement with policy principles even when national support disappeared.

This dramatic shift reveals that without deep domestic ownership and institutional anchoring, localisation efforts based primarily on international legitimacy remain highly vulnerable to changing political orientations. When domestic political priorities fundamentally question the assumptions underlying global frameworks, localisation efforts require deeper institutional anchoring than international endorsement alone can provide. Moreover, the limited replication elsewhere reflects broader structural challenges in Argentina's federal system, including institutional fragmentation, policy discontinuity across electoral cycles, and varying technical capacities across subnational governments. This demonstrates that effective localisation requires not only appropriate policy content but also institutional stability, sustained political commitment, and systematic implementation capacity.

6. Discussion

The analysis of Argentina's NUP experience demonstrates how the four-dimensional framework effectively illuminates the complex dynamics of policy localisation in multilevel governance systems. This section examines how the theoretical framework performed in understanding Argentina's case identifies the novel insights that emerged and assesses the contributions to policy localisation scholarship. The Argentine case reveals that localisation is not a linear process but rather involves simultaneous interactions between institutional legacies, temporal opportunities, coalition dynamics, and implementation capacities across multiple governance scales.

6.1. Interactive Dimensions Across Governance Scales

The four-dimensional framework effectively illuminated policy localisation dynamics in Argentina's federal system, revealing important interactions between dimensions that single-lens analyses might overlook. The framework's analytical power lies in capturing how institutional context, temporal dynamics, actor networks, and implementation mechanisms operate simultaneously rather than sequentially, creating distinct localisation pathways across governance levels.

The analysis revealed significant interactions between dimensions that extend existing theoretical understanding. Institutional path dependencies shaped which temporal opportunities could be effectively utilized—Argentina’s federal fragmentation meant that even favourable policy windows could not overcome structural coordination challenges. Coalition-building processes were fundamentally constrained by existing power distributions embedded in institutional arrangements, while implementation challenges reflected the cumulative effects of institutional fragmentation, temporal pressures, and coalition instability.

The contrast between national and provincial experiences demonstrates how the same dimensions operate differently across governance scales. While national-level analysis revealed institutional fragmentation constraining policy innovation, Neuquén’s provincial experience showed how similar institutional factors can enable rather than constrain localisation when new policies align with established planning trajectories. This finding extends path dependency theory by demonstrating that institutional effects are not predetermined but depend on the fit between new policy requirements and existing institutional capacities.

The framework revealed temporal dynamics extending beyond traditional critical juncture theory. While the 2015 election created a potential policy window aligned with global agenda adoption, the analysis shows that federal systems contain multiple, potentially asynchronous temporal dynamics across governance levels. Electoral pressures that drove rapid national policy development undermined the institutionalization necessary for sustainability, while Neuquén’s different political timeline enabled more gradual adaptation.

The actor network dimension illuminated how global frameworks function as “coalition magnets” while revealing important limitations to this capacity. Argentina’s initial consensus around broad NUP principles proved superficial when confronted with concrete implementation challenges that required power redistribution between governance levels. This finding contributes to understanding how coalition-building around abstract principles differs fundamentally from sustaining coalitions through implementation phases involving contested governance arrangements.

6.2. Multiple Pathways and Institutional Redundancy in Federal Systems

Argentina’s experience contributes to policy localisation scholarship in several areas: federal system dynamics, temporal sequencing effects, and the complex role of international agencies in domestic policy adaptation.

The analysis reveals how federal governance structures create distinctive localisation challenges that differ fundamentally from those in unitary states. Most existing literature treats federalism as a complicating factor rather than a fundamental structural characteristic shaping localisation processes. Argentina’s case demonstrates that federal systems contain multiple, potentially competing localisation pathways operating simultaneously across governance scales. The finding that subnational governments may provide more stable implementation platforms challenges policy transfer literature assumptions treating national governments as primary localisation agents. Neuquén’s continued engagement with global frameworks despite national abandonment suggests federal systems create policy resilience through institutional redundancy—a theoretical insight with implications for understanding sustainability commitment durability.

The analysis extends critical juncture theory by demonstrating that the sequencing of activities within policy windows significantly affects institutionalization outcomes. Argentina’s rushed policy development, driven

by electoral timing pressures, created a temporal trap where urgency to complete policies before political transitions undermined the institutionalization necessary for continuity. This finding reveals temporal dynamics in policy localisation that existing literature has insufficiently examined.

The case provides nuanced insights into how international technical assistance shapes localisation processes. UN-Habitat's support enabled policy development while potentially constraining innovation in addressing Argentina's specific federal coordination challenges. The close adherence to standardized frameworks rather than federal-specific solutions illustrates tensions between international legitimacy and domestic adaptation that existing literature has not adequately theorized. The rapid policy abandonment under political transition reveals vulnerabilities in localisation efforts relying primarily on international legitimacy rather than domestic institutional anchoring. This finding contributes to understanding policy sustainability by highlighting the conditional nature of international support as a foundation for domestic policy continuity.

Argentina's experience illuminates how regional urban traditions interact with global frameworks in ways that both complement and potentially compete with global prescriptions. Latin America's distinctive urban reform traditions created a receptive context for certain NUA elements while potentially generating resistance to others. This finding contributes to the "Southern turn" urban theory (Robinson, 2006; Roy, 2009; Watson, 2009) by demonstrating how global-local interactions involve negotiations between different urban imaginaries rather than simple global model adoption.

6.3. Localisation as Negotiation: Institutions, Coalitions, and International Interface

The theoretical insights emerging from Argentina's case advance understanding of how global urban agendas are localised in complex governance contexts, revealing mechanisms and dynamics with implications for localisation theory more broadly.

The analysis reveals that localisation occurs through multiple, simultaneous pathways within federal systems rather than hierarchical implementation from national to local levels. These findings challenge linear assumptions in much policy transfer literature and suggests that effective localisation theory must account for divergent implementation trajectories across governance scales within the same national context.

The theoretical framework illuminated fundamental tensions between adapting global frameworks to existing institutions versus imposing new institutional arrangements. Argentina's attempt to overlay new planning frameworks without addressing existing institutional arrangements proved less effective than Neuquén's integration of global commitments within established planning systems. This finding suggests that localisation theory should distinguish between adaptive and impositive approaches to institutional change.

The analysis contributes to understanding coalition dynamics in policy implementation by revealing how consensus around abstract principles differs from coalitions capable of sustaining contested implementation processes. The dissolution of Argentina's multi-stakeholder working groups after policy formulation illustrates theoretical insights about conditions necessary for coalition maintenance across policy phases.

The case advances theoretical understanding of how international agency involvement shapes domestic policy innovation. The standardization pressures accompanying international technical assistance can both

enable policy development and constrain context-specific innovation, creating theoretical tensions that existing literature has not fully explored. This finding suggests the need for more nuanced theoretical frameworks accounting for the conditional effects of international involvement on domestic policy adaptation processes.

7. Conclusion and Future Directions

The analysis of Argentina's experience with NUP development and implementation offers valuable insights into the complex dynamics of localising global urban frameworks in multilevel governance systems, with important implications for post-2030 sustainability agenda design. When viewed through the theoretical lenses of institutional context, temporal dynamics, actor networks, and implementation mechanisms, this case illustrates both the potential of NUPs as localisation instruments and the significant challenges they face in contexts of institutional fragmentation and policy discontinuity.

Four primary lessons emerge with direct implications for post-2030 sustainability agenda development. First, the path-dependent nature of policy localisation reveals that future global frameworks must accommodate diverse institutional configurations rather than imposing standardized models, explicitly recognizing multiple implementation pathways within existing arrangements. Second, while critical junctures create policy windows, sustaining momentum requires institutional anchoring mechanisms extending beyond electoral cycles—as demonstrated by Neuquén's experience, suggesting subnational governments may offer more stable platforms when building on established planning traditions. Third, the “pasteurized” nature of global framework narratives (Blanc & Cotella, 2023b) enables initial coalition-building but proves insufficient without addressing underlying power dynamics and governance contradictions. Post-2030 agendas must establish concrete mechanisms for ongoing stakeholder participation, particularly from marginalized communities, aligning with Latin American traditions of urban social movements. Finally, effective localisation depends on domestic ownership rather than international legitimacy alone—the Argentinian case reveals tensions between standardized global models and context-specific innovation needs, suggesting frameworks should support domestic adaptation rather than imposing uniform approaches.

These findings have particular significance within the broader Latin American context, where distinctive urban governance traditions create both resources and challenges for global framework localisation. The current rise of far-right governments across the region—exemplified by Argentina's dramatic policy reversal under Milei—reveals challenges extending beyond implementation capacity to fundamental questions about state roles in development planning. Argentina's urban policy landscape has undergone a radical transformation since December 2023, with aggressive state retrenchment policies dismantling existing coordination mechanisms and explicitly rejecting planning approaches advocated in global frameworks. The administration's market-fundamentalist position, dramatic budget cuts to urban programs, and skepticism toward international agreements demonstrate how quickly decades of institutional development can be reversed when political leadership fundamentally rejects global sustainability premises.

The Milei administration's approach reveals fundamental vulnerabilities in current global sustainability governance when confronted with ideologically hostile governments. Nevertheless, subnational persistence in maintaining sustainability commitments despite reduced national support demonstrates how federal systems provide institutional redundancy, enabling continued engagement with global frameworks. This

experience raises questions about embedded assumptions regarding state roles in sustainable development and suggests the need for post-2030 frameworks operating across diverse ideological contexts, potentially emphasizing market-based mechanisms, civil society engagement, and subnational implementation pathways functioning independently of national government support.

The rise of far-right governments explicitly rejecting international cooperation represents a fundamental challenge to global sustainability governance, extending beyond technical implementation to core issues of political legitimacy and state sovereignty. The Argentinian case offers valuable lessons about both vulnerabilities and unexpected resilience mechanisms in global sustainability governance, highlighting the need for approaches acknowledging not only institutional contexts and temporal dynamics but also the contested nature of sustainability politics in an increasingly polarized world.

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Data Availability

The datasets used in this study are not publicly available due to institutional restrictions.

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Rethinking Urban Sustainability Monitoring: Lessons Learnt From the SDG Indicators for Municipalities in Germany

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Abstract

The translation of global sustainability agendas into urban strategies remains a challenge for local governments. Nevertheless, the increasing number of municipalities establishing municipal sustainability management systems and publishing sustainability reports indicates a growing commitment by cities and regions to achieve the Sustainable Development Goals (SDGs). It also points to improvements in the way inputs, outputs, outcomes, and impacts are measured at the local level. This article draws on seven years of experience with the well-established SDG Indicators for Municipalities in Germany to provide a critical examination of the development and application of sustainable urban development indicators. As significant methodological and data deficits persist, fundamental questions arise for future monitoring approaches—for instance, regarding the necessity of quantifying sustainability aspects and the suitability of the SDGs for local action and monitoring. In advance of a post-2030 agenda, the utility of the existing SDG framework is increasingly being reassessed due to the existence of thematic gaps regarding sustainable urban development and normative trade-offs, including those related to social cohesion, basic public services, and the growth paradigm. SDG indicators at the local level naturally reproduce these limitations, unlike adapted monitoring systems that are tailored to local requirements, such as spatial and temporal granularity. Based on theoretical indicator evaluation frameworks and insights from municipal practice, this article identifies seven criteria that should be considered and balanced for the local monitoring of a future sustainability agenda.

Keywords

2030 Agenda; monitoring; sustainability indicators; sustainable urban development

1. Introduction

The 2030 Agenda finally paved the way for the widespread use of indicators as the commonly accepted monitoring mechanism for sustainable development. A universal and extensive roadmap such as the Sustainable Development Goals (SDGs), containing a wide range of targets that interact with each other, is reliant on evidence-driven tools for understanding progress and measuring success. However, according to Webb and Ayyub (2017), quantifying sustainability involves translating complex socio-ecological relationships into measurable indicators, and this presents challenges, especially in the area of sustainable urban development (SUD). SUD can be defined as follows:

The spatial manifestation of urban development processes that creates a built environment with norms, institutions and governance systems enabling individuals, households and societies to maximize their potential, optimize a vast range of services so that homes and dynamic neighborhoods, cities and towns are planned, built, renewed and consolidated restraining adverse impacts on the environment while safeguarding the quality of life, needs and livelihood of its present and future populations. (UN-Habitat, 2012, p. 1)

Despite its many aspects, this comprehensive definition makes it clear that impact assessment plays a central role in the facilitation and optimisation of SUD processes. Against this background, indicators can fulfil various functions: Firstly, they are essential for enabling evidence-based policy management by measuring the effectiveness of policies and interventions over time and tracking progress toward sustainability goals. Secondly, sustainability indicators can be used to visualise changes over a certain period of time and therefore, thirdly, to promote communication and transparency within the municipal administration and towards the public (e.g., Giles-Corti et al., 2020; Webb & Ayyub, 2017).

Depending on how indicators are perceived, developed, and used, their effects on SUD can vary to a great extent. Generally, indicators can be understood in two main ways: as neutral, technical tools that provide measurable data for policy-making, and as “message carriers” that reflect political and normative interpretations of sustainability. This means that developing indicators is not only a technical task, but also a dynamic and political process that helps define what urban sustainability actually means (Merino-Saum et al., 2020). The development of this understanding can be clearly observed in practice in the process of creating sustainability reports, such as Voluntary Local Reviews, which widely deploy quantitative assessments. Ortiz-Moya and Reggiani (2023) have identified three main aspects in which Voluntary Local Review processes can contribute to SUD policy integration: by promoting collaboration and interconnections across various policy sectors, by developing new tools to integrate the SDGs into mainstream practices, and by strengthening sustainability competencies. In this respect, reporting itself, with its deliberative processes, can lead to better indicators and vice versa. However, Koch et al. (2023), among others, point out that improving indicators, data, and communication tools does not automatically lead to better SUD governance and thus to positive outcomes. Nevertheless, understanding the differences in sustainable development via indicators can also enhance the ability of central authorities to balance aspects between national and various subnational levels (Benedek et al., 2021).

In addition to the overarching question of what role indicators play in SUD, there are specific methodological questions that arise when establishing an indicator system—both globally and locally. First of

all, it should be noted that there is no shortage of indicators and measurement concepts. In fact, the opposite is true: A broad range of measurement initiatives have been developed for monitoring and comparing the sustainability performance of cities worldwide, with some authors already stating that there has been an explosion of indicators, driven by the vague concept of sustainability and increasing data availability (Merino-Saum et al., 2020). This abundance of indicators makes selection all the more important. However, no single and universally legitimised method for choosing indicators exists, and each evaluation method has its own advantages and disadvantages, which emphasises the need for guidance that can provide practitioners with science-based and informed support (Gebara et al., 2024; Shi et al., 2019; Stitteneder, 2025).

According to Tran (2016), the evaluation and selection of SUD indicators can be observed in two main processes: The top-down approach involves experts and researchers defining the overall sustainability framework and then identifying specific indicators within that structure. In contrast, the bottom-up approach emphasises the active involvement of various stakeholders to collaboratively shape the framework and identify key indicators. Although the distinction between these two approaches has become less clear recently, Merino-Saum et al. (2020) argue that both approaches can reinforce inherent tensions between competing goals and methodological principles. Some of these tensions relate to conflicting quality criteria for individual indicators, whereas others emerge when considering the indicator set in its entirety. In their study, they focus on the three trade-offs most frequently discussed in the literature: parsimony versus comprehensiveness, context-specificity versus general comparability, and complexity versus simplicity.

In Germany, the SUD indicator set “SDG Indicators for Municipalities” is the result of those methodological discussions (Jossin & Peters, 2022). Developed within the eponymous project, which has been carried out since 2018 with municipal stakeholders in Germany, the SDG Indicators for Municipalities aim at translating and adapting indicators to the local level for mapping the SDGs in German cities, counties, and towns. The indicator set is continuously developed through participatory processes that include regular group discussions with municipalities and working group sessions involving 10 key institutions—among them research organisations such as the German Institute of Urban Affairs, local government associations such as the German Association of Cities, foundations such as the Bertelsmann Stiftung, and government advisory bodies such as the German Council for Sustainable Development. With its transparent methodology and the provision of available indicator data in the associated SDG portal (<https://sdg-portal.de/en>), the indicator set now serves as a key resource for German municipalities (e.g., for the preparation of sustainability reports). The fourth indicator catalogue from 2024 contains 100 indicators to map around 75 percent of the targets of the 2030 Agenda—those that have been assessed as relevant for German municipalities from a scientific perspective (Bertelsmann Stiftung et al., 2024). The indicators originate from various sources, including global, European, and national catalogues, municipal reports, and information provided by many partners and project users. Other indicators are original project developments. Thus, the SDG Indicators for Municipalities can be seen as the result of a participatory top-down approach that—just like many other SUD indicator sets—must meet the needs of many scientific criteria and practical requirements in order to provide a low-threshold entry point into municipal sustainability management and achieve broad acceptance.

Since studies on indicator evaluation criteria for SUD rarely address expert and practitioner perspectives at the same time, and generally pay little attention to trade-offs within those criteria, this article intends to contribute to important questions on SDG localisation:

RQ1: What are the most relevant requirements for SUD indicator systems from both a scientific and a practical perspective?

RQ2: What interactions, synergies, and trade-offs can be identified between these requirements?

RQ3: In order to address the aforementioned requirements and interactions, what design options are available for indicator systems that facilitate their local application and therefore should be considered in a post-2030 agenda?

Answers to these research questions could support the development of future indicator systems on various governance levels. Key indicator evaluation criteria from relevant frameworks allow scholars and policy-makers to ensure the actual implementation of indicator systems, while enabling transparency and comparability. Practitioners, such as local authorities and relevant organisations, in turn could use those criteria as guidance to adapt general indicator systems by selecting, developing, and modifying indicators according to the local situation.

In order to best support these objectives, the article is structured as follows. Section 2 presents the methodological approach followed to collect and characterise the indicator evaluation criteria finally included in the analysis. Section 3 elucidates the study's results by presenting the reasoned selection of important criteria and providing individual descriptions and discussions. For each criterion, the analysis provides the identified theoretical criteria and tensions with other criteria, the practical requirements, and the derived future design options to handle tensions between different criteria and perspectives. Section 4 provides an overview of possible limitations, and Section 5 concludes the findings.

2. Methodology

To capture both the current scientific and practical discourse, the study is based on a mixed-method approach and two main data sources. For information on the practical applicability of criteria in the individual evaluation and selection of indicators on site, primary data from group discussions were collected. Since feedback from municipal representatives may not cover the scientific discourse on potential criteria, and since trade-offs and design options may be subject to local contextual factors or may already be the result of deliberative processes, this was preceded by extensive literature research.

The literature review was aimed at comparing and synthesising existing indicator evaluation frameworks (IEFs) with a special emphasis on SUD. Several well-known criteria sets and principles are employed by science, organisations, and practitioners to guide the development of monitoring systems and the selection of appropriate indicators. Therefore, IEFs were primarily extracted from practical guidelines for indicator development or standardised indicator systems of national or international bodies, which are usually published as grey literature, and supplemented by literature searches via Google Scholar and Web of Science. The literature review was conducted in November and December 2024 using a combination of different keywords, i.e., “indicator,” “monitoring,” “evaluation,” “selection,” “assessment,” “criteria,” “framework,” “standard,” “sustainable urban development,” “sustainability,” “local,” “regional,” “urban,” and “cities.” The identified criteria for SUD indicators, which are intended to show complex cause-and-effect relationships in simple key figures, are diverse. Accordingly, a variety of criteria grids have been established,

which have found their way into the field of indicator evaluation as acronyms, such as RACER, which stands for “Relevant, Acceptable, Credible, Easy and Robust” (European Commission, 2023).

The SDG Indicators for Municipalities play a special role in this analysis, as the underlying project provides both its own IEF and access to the practical requirements from municipalities, which the authors of this article collected in group discussions in their role as responsible researchers for the indicator development. The SDG Indicators for Municipalities project was launched in 2017 and is ongoing, i.e., the indicators are continuously being developed, which usually leads to a new edition of the indicators every two years. On the one hand, this allows incorporating new developments from all the indicator catalogues on which the SDG Indicators for Municipalities are based, and which are then developed further simultaneously. On the other hand, general and specific methodological, topical, and data deficits also persist (Jossin & Peters, 2022; Mori & Christodoulou, 2012; Nagy et al., 2018; Verma & Raghubanshi, 2018). Many aspects can be explained by the translation of an abstract global target system into a local indicator system, which is intended to provide concrete governance. In the process, information can be lost or unintended assumptions can be made that call the validity of the indicators into question. Therefore, continuous reflection on the criteria and their application is crucial to the project—this participatory approach forms the second source of the present analysis.

A total of five central workshops with representatives from German cities, counties, and towns and partner organisations were conducted during the phases of refining the SDG Indicators for Municipalities in its four editions from 2017 to 2024 (see Table 1). The workshops were designed in such a way that the practical requirements for an indicator system were surveyed and ranked, supplemented with scientific standards, and, on this basis, each proposed indicator was discussed with regard to its further development. The practical requirements, as well as information on individual indicators that allowed conclusions to be drawn about the set of indicators and their application in general, gathered during this seven-year period of semi-structured group discussions, were interpreted in light of the research questions.

Table 1. Central events in the project SDG Indicators for Municipalities for collecting requirements and aspects for discussion from representatives of municipalities in Germany.

SDG Indicators for Municipalities Edition	Event	Date/Venue	Total Participants	No. of Municipalities	No. of Organisations
4th edition, 2024	Workshop	22nd of November 2024, virtual	64	57	3
Development phase: 2023–2024	Workshop	11th of January 2024, virtual	84	61	4
3rd edition, 2022	Workshop	10th of November 2021, virtual	39	16	16
Development phase: 2021–2022					
2nd edition, 2020	Workshop	1st of October 2019, Hanover	25	12	8
Development phase: 2019–2020					
1st edition, 2018	Workshop	10th of October 2017, Hanover	27	13	5
Development phase: 2017–2018					

The 239 participants, most of whom had attended several workshops, represented 84 unique municipalities. More than 60 percent of these municipalities are cities with more than 100,000 inhabitants, which means that the sample primarily reflects an urban perspective. The comments provided by participants touch on a wide range of issues including the following: the importance of specific aspects for indicator development (“We value that there are now more indicators for SDG 13 & 17 with data”), barriers that hinder the application of indicators (“The modal split survey is expensive and cannot be mapped at city district level”), and conceptual questions regarding the design of indicators or indicator groups (“Why is the number of staff working on climate protection not measured?”). Due to the application of Chatham House Rules during the workshops and the general objective of developing a set of indicators for all municipalities, it is not possible to retroactively attribute the feedback to individual municipalities or municipality types. The workshop minutes, notes, and related emails contained a total of 64 comments and suggestions that were suitable for the analysis conducted in this study.

The data analysis was carried out by systematically combining both sources, literature on indicator evaluation frameworks and primary data from group discussions. In a first step, the 45 criteria identified from seven IEFs were grouped into 16 criteria clusters (see Table 2). Those clusters are the result of a comparison of the IEFs (rows in Table 2), each containing similar criteria, albeit sometimes labelled differently and formulated with different nuances. While the “validity” criterion in the SDG Indicators for Municipalities, for example, primarily addresses internal validity, the SPICED framework (“Subjective, Participatory, Interpreted and communicable, Cross-checked and compared, Empowering, Diverse and disaggregated”) adds that validity should be cross-checked by various stakeholders, thereby incorporating elements of an external validity check. These differences are mostly due to the different purposes and target groups of the individual IEFs and were taken into account accordingly when describing the final criteria (last column in Table 2). In a second step, each identified practical requirement from the workshops was assigned to a criterion cluster, e.g., data availability. Because a practitioner’s statement could touch on more than one criterion, a second assignment was allowed. Both criteria and requirements were added up, resulting in a ranking. As soon as 10 criteria or requirements were identified from the IEFs and the practical feedback, those criteria/requirements were considered essential for future urban monitoring systems and were discussed along with the results of the literature review.

Table 2. Comparison of IEFs and practical requirements for identifying essential criteria for future urban monitoring. The IEFs are acronyms for individual evaluation criteria listed in each column. Due to sorting by sum of criteria, the acronyms are not in the correct order. The colour intensity indicates the frequency of mentions: the more frequently an aspect is addressed in the IEFs or in practice, the greener the sum and the more relevant the requirement is for future urban monitoring.

IEFs							Description that summarises the key points of the respective IEF aspects	Sum of criteria from IEFs	Sum of requirements from municipalities	Requirements for future urban monitoring
SDG Indicators for Municipalities (Bertelsmann Stiftung et al., 2024)	SMART* (Doran, 1981, modified by Selvik et al., 2021)	RACER (European Commission, 2023, first published in 2005)	CREAM (Schiavo-Campo & Tommasi, 1999)	SPICED (Roche, 1999)	ADAPT (Villanueva, 2011)	FABRIC (UK National Audit Office, 2001)				
Validity	Specificity	Relevant	Relevant	Cross-checked and compared	Thorough	Focused	The indicators are closely linked to the objectives/aims/goals to be reached. They are formulated precisely and the data allow consistent interpretation. The validity of assessment needs to be cross-checked and compared by different actors and methods.	7	26	Relevance and validity
Data availability	Time-based	Easy to monitor	Economic			Cost-effective	The indicator values are available at reasonable cost and burden in an appropriate time frame and coverage.	5	10	(Economic) data availability
Comprehensibility		Credible	Clear	Interpreted and communicable		Appropriate	The indicators and the validity of the indicators are credible for non-experts, unambiguous, and easy to interpret and communicate.	5	9	Comprehensibility
Control relevance	Relevancy		Adequate		Dynamic	Integrated	The indicators provide essential information for management, are integrated, and thus, allow improvement of the overall performance.	5	5	Impact-oriented management

Table 2. (Cont.) Comparison of IEFs and practical requirements for identifying essential criteria for future urban monitoring. The IEFs are acronyms for individual evaluation criteria listed in each column. Due to sorting by sum of criteria, the acronyms are not in the correct order. The colour intensity indicates the frequency of mentions: the more frequently an aspect is addressed in the IEFs or in practice, the greener the sum and the more relevant the requirement is for future urban monitoring.

SDG Indicators for Municipalities (Bertelsmann Stiftung et al., 2024)	IEFs						Description that summarises the key points of the respective IEF aspects	Sum of criteria from IEFs	Sum of requirements from municipalities	Requirements for future urban monitoring
	SMART* (Doran, 1981, modified by Selvik et al., 2021)	RACER (European Commission, 2023, first published in 2005)	CREAM (Schiavo-Campo & Tommasi, 1999)	SPICED (Roche, 1999)	ADAPT (Villanueva, 2011)	FABRIC (UK National Audit Office, 2001)				
Data quality	Measurability	Robust against manipulation	Monitorable				The indicator data are measured accurately and reliably, enabling comparisons with other data.	4	2	
Function	Achievability				Active		The indicators can be differentiated in function and provide adequate information on actions, impacts, and states.	3	3	
Participation				Participatory	Participatory		The indicators are developed by and with those best placed to assess them or affected by the interventions.	3		
Acceptance		Accepted					The indicators are widely accepted, and their role and responsibilities are well defined.	2	5	
Completeness						Balanced	The indicators cover all significant areas of work.	2	4	
Stability						Robust	The indicators are able to withstand organisational changes and remain stable.	2	2	

Table 2. (Cont.) Comparison of IEFs and practical requirements for identifying essential criteria for future urban monitoring. The IEFs are acronyms for individual evaluation criteria listed in each column. Due to sorting by sum of criteria, the acronyms are not in the correct order. The colour intensity indicates the frequency of mentions: the more frequently an aspect is addressed in the IEFs or in practice, the greener the sum and the more relevant the requirement is for future urban monitoring.

SDG Indicators for Municipalities (Bertelsmann Stiftung et al., 2024)	IEFs						Description that summarises the key points of the respective IEF aspects	Sum of criteria from IEFs	Sum of requirements from municipalities	Requirements for future urban monitoring
	SMART* (Doran, 1981, modified by Selvik et al., 2021)	RACER (European Commission, 2023, first published in 2005)	CREAM (Schiavo-Campo & Tommasi, 1999)	SPICED (Roche, 1999)	ADAPT (Villanueva, 2011)	FABRIC (UK National Audit Office, 2001)				
Current relevance					Adaptive		The indicators reflect changes and correspond to the current state of science and practice.	2	2	
				Diverse and disaggregated			The indicators are diverse and disaggregated from a range of groups.	1	14	Diversity and aggregation level
Compatibility							The indicators are compatible with indicators from other sets.	1	11	Compatibility
Manageability							The indicators are not redundant. The number of indicators is therefore manageable.	1	9	Manageability
				Empowering			The process of setting and assessing indicators is empowering in itself and allows groups and individuals to reflect critically on their changing situation.	1	3	
				Subjective			The indicators are based on unique insights of informants.	1	1	

Notes: * SMART is presented as one specific set of criteria, however, many versions of the SMART acronym exist, where the letters can refer to other aspects or criteria; the analysis presented in this table is based on the modification by Selvik et al. (2021), which is designed to assess the quality of indicators; in his original publication, Doran (1981) was specifying that objectives should be specific, measurable, assignable, realistic and time-related.

3. Results and Discussion

Following the methodological approach, the literature review identified seven relevant IEFs, designed and used to guide the measurement of SUD. Due to their different origins and application purposes, each IEF has distinct characteristics, resulting in various strengths and weaknesses for indicator evaluation and selection in the context of SUD. Regardless of whether an IEF is more scientific or policy-oriented, it must be emphasised that IEFs are becoming more important as the number of available indicators and data grows, while administrative capacity in local and regional governments remains constant or even declines. In general, by systematically evaluating and selecting SUD indicators using clear criteria, cities can more effectively measure what matters, make and legitimise informed decisions, and drive effective change toward sustainability targets (e.g., Lynch et al., 2011). Choosing the right indicators remains a crucial step in the monitoring process, as the entire purpose of introducing an monitoring and evaluation system, which is directly linked to the increasing number of municipal sustainability strategies (Gieseler et al., 2024), is undermined if the indicators are not selected appropriately.

The SDG Indicators for Municipalities have evolved on the basis of the research and discussions that are also the subject of this article, which is why they address many criteria but have their own focus as a result of deliberation processes with various stakeholders (Bertelsmann Stiftung et al., 2024). The most prominent IEF is probably SMART (“Specificity, Measurability, Achievability, Relevancy, Time-based”), although many versions of the SMART acronym exist, where the letters sometimes refer to different aspects or criteria (Selvik et al., 2021). The scheme was originally developed for the purpose of guiding the development of goals and targets (Doran, 1981), which is why the criteria may not always be appropriate for indicator development. Furthermore, the practical application of the SMART principles is still problematic, as the criteria are interpreted differently (Climate-Eval Community of Practice, 2015). Nevertheless, being one of the first assessment tools (Doran, 1981), the SMART criteria have been widely applied by scholars and practitioners (e.g., Lynch et al., 2011; Namavar et al., 2023; Simon et al., 2016). Similar to the SMART criteria, but with a clear focus on indicator evaluation, the RACER framework is becoming increasingly established—not least because it has been developed, applied, and recommended by the European Commission. The RACER criteria originate from the European Commission’s Impact Assessment Guidelines and are used in the EU to evaluate the quality of indicators, particularly in the context of the circular economy transition and other policy initiatives, such as the monitoring of natural resource use in Germany (Gerdes et al., 2011; Papageorgiou et al., 2025). The RACER framework is also increasingly finding its way into monitoring and evaluation frameworks for SUD (e.g., Angelidou & Politis, 2024). With its focus on easy monitoring and acceptance of indicators, the IEF is particularly interesting for practical users. CREAM principles (“Clear, Relevant, Economic, Adequate, Monitorable”) were originally designed to select good performance indicators (Schiavo-Campo & Tommasi, 1999). However, its generally softer criteria make it possible to assess quantitative and qualitative indicators at the same time (Zall Kusek & Rist, 2004). These broader guidelines, expressed through aspects such as “adequate” and “monitorable” rather than “specific” and “measurable” as in the SMART scheme, can be beneficial when the quantification of processes and changes is difficult, but qualitative approaches allow progress to be assessed. Therefore, CREAM is recommended for complex contexts, such as the measurement of water resources management or gender-sensitive evaluations (e.g., Bertule et al., 2017; OECD, 2021). In contrast to all other IEFs, the SPICED principles focus on how indicators should be used rather than on how they should be developed—therefore, it is recommended to combine this framework with others (Climate-Eval Community

of Practice, 2015). These principles emphasise indicators that empower change (Roche, 1999). Originally developed for the impact assessment of development programmes, the SPICED framework is also used for assessing cultural ecosystem service indicators, for example (Hernández-Morcillo et al., 2013). With the ADAPT IEF (“Adaptive, Dynamic, Active, Participatory, Thorough”), Villanueva (2011) proposes a more flexible, alternative approach to SMART indicators that is more conducive to climate change adaptation and climate risk management and is consequently being used increasingly in this area. According to this IEF, indicators should measure actions rather than states. The criteria of the FABRIC IEF (“Focused, Appropriate, Balanced, Robust, Integrated, Cost-effective”) set the property of performance information that would be derived from the selected indicators (UK National Audit Office, 2001). Used primarily in institutional environments, this framework focuses on indicator assessments that allow the integration of management processes and the improvement of efficiency. Since all IEFs, albeit with varying attributes, refer extensively to indicator evaluation and are applied accordingly in SUD and its sub-fields, they are used to derive future requirements for indicators. The fact that almost all criteria are also addressed in the feedback from the municipalities further validates the selection of IEFs included in this analysis.

The 16 clusters that were created as part of this study contain only five criteria that are unique to a single IEF. This suggests the existence of universal quality criteria for indicator catalogues; these criteria can always be applied, regardless of the thematic focus or target group. Three of these five criteria are frequently discussed by practitioners and are classified as particularly important. On closer inspection, however, this is hardly surprising, as both the SDG Indicators for Municipalities and the SPICED framework consider not only how indicators should be developed but also how they should be applied, a topic which is highly relevant to municipalities. There may be various reasons why practitioners do not mention participatory indicator development, such as the fact that participation may already be perceived as part of a broader strategic process in the municipality, or the fact that responsibility for the selection of indicators may rest with administrative experts, while responsibility for the interpretation of the data is shared by all.

The overall comparison identified seven central criteria required by theory and practice: Relevance and validity, comprehensibility, impact-oriented management, and economic data availability are important criteria in both domains. In addition to technical aspects, such as data quality, function, or interdependencies of indicators, the designers of future monitoring systems should also provide the flexibility (“diverse and disaggregated”), compatibility, and manageability demanded by practitioners. Since all criteria are interlinked in many ways, elements from other frameworks are also considered in the following individual descriptions and discussions.

3.1. *Relevance and Validity*

There is no standardised definition or framework for SUD. In fact, the 2030 Agenda can be seen as the first framework designed to monitor progress in a systematic way. As a globally negotiated political consensus, the 2030 Agenda serves as a universal roadmap, but it poses challenges for local governments: Some of the targets are abstract, often unquantified, and primarily aimed at the national level in all countries equally (Valencia et al., 2019). For local authorities in individual countries, the development policy objectives and the means of implementation must be translated or, in some cases, omitted (López Chao et al., 2020; Nagy et al., 2018). In addition, the availability of small-scale data must be reviewed. Therefore, the SDG Indicators for Municipalities project included a comprehensive relevance check (Bertelsmann Stiftung et al., 2024). For this purpose, the 169 targets of the 17 SDGs were examined to determine whether they needed to be broken

down into sub-targets in order to enable a consistent assessment of their relevance for German municipalities. This was necessary for some targets, as components with different content may need to be assessed differently during the problem check or the task check. These checks answer the following questions: Does the target or sub-target describe a problem occurring in German municipalities, and is the local level capable of taking appropriate action? The final step is to consider whether the municipality can also generate impact in the Global South, for example through partnerships. Unfortunately, SDG targets pose a fundamental problem, as their wording leaves room for interpretation, making the results of the relevance check dependent on the specific interpretation chosen. For example, it is initially unclear what is meant by the “modern energy services” referred to in SDG 7.1: In some countries, nuclear power plants could also be considered modern energy sources; however, this would contradict the basic principle of “planet,” which explicitly calls for the protection of the planet from harm and action against climate change. In order to classify SDG 7.1 as a relevant sub-goal, “modern” was equated with clean and renewable. In contrast, the desertification mentioned in SDG 15.3.1 was not “translated” as soil degradation. As a result, this sub-target is not relevant for German municipalities, but is nevertheless relevant for municipalities in the Global South.

Despite localisation efforts, the SDG Indicators for Municipalities inherit the limitations of the orientation framework and therefore raise practical challenges. Lack of clarity with regard to the scope of the goal, different or missing time horizons, conflicts between ambition levels at global, national, and regional levels, etc.—the list of issues is long. According to feedback from municipalities, indicators often either fall short of the target, as seen with the recycling rate for SDG 12.5 (“By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse”), or exceed it, as with the premature mortality indicator for SDG 3.4 (“By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being”). For municipalities, the question often arises as to how an issue should be measured in order to do justice to sustainability. Municipal services can be seen as socially sustainable *per se*, but questions remain regarding how sustainable the services are in themselves (e.g., sustainable construction of a daycare centre) and what access the population has to the city’s services (e.g., physical access, proximity, affordability, safety, etc.). Moreover, certain subject areas in the 2030 Agenda that are underrepresented in the municipal context include, importantly, culture, sport, digitalisation, and land management.

A post-2030 agenda must contain clear and measurable targets, using indicators that are widely accepted and easy to implement. For example, SDG 13 could be substantiated with net-zero carbon dioxide emissions by mid-century and operationalised climate resilience targets (Fuso Nerini et al., 2024). Many of the issues raised above could be addressed by applying a systematic framework such as DPSIR (“Drivers, Pressures, State, Impact, and Response”) to a post-2030 agenda in order to promote a better understanding of the interrelations within and between goals, targets, measures, and impacts (Carr et al., 2007). DPSIR can be useful for assessing sustainable development at global, national, and local levels, but this requires finding a way to incorporate the aggregate effects of local and also informal responses to drivers, pressures, and conditions. This involves linking qualitative and quantitative data, considering objective and subjective states, and assessing target synergies and conflicts (Jossin & Peters, 2022). Rethinking and embracing the complexity and disorder of the connection between human well-being and the environment is an enormous challenge that cannot be fully resolved in a new framework for sustainable development. However, it becomes clear that scientific evidence and systems logic will need to be taken into greater account in any

forthcoming policy consensus. Implementing sustainable development, especially in the municipalities, is difficult in itself—an ambiguous framework does not contribute to greater acceptance and acceleration.

3.2. Compatibility

Since there is no uniform framework, but rather many guidelines and regulations, local authorities must ensure vertical and horizontal integration in order to ensure accountability. Vertically, municipalities are asking which policy levels they can use for comparison with their own values (e.g., county or national average). Horizontally, they are considering which other SUD frameworks, policies, and planning instruments their indicators can be compared with. In this context, inter-municipal comparability must also be mentioned, as it enables best practices to be learned on the basis of indicators. To address these issues, the SDG Indicators for Municipalities project emphasises transparency with regard to indicator origin and provides compatibility checks with indicators from other frameworks. Compatibility is checked and disclosed in two ways: firstly, based on the consistency of the indicators in terms of content, and secondly, based on definitional conformity. If two indicators share the same definition or calculation, the indicator is considered fully vertically integrated, meaning that aggregation or disaggregation should be possible. While the employment rate (SDG 8.5) and nature conservation areas (SDG 15.5) are defined largely consistently throughout various entities and can therefore be easily compared, different parameters usually apply to the cycle path network (SDG 11.2) and to the definition of homelessness (SDG 1.3), making it difficult to compare the data.

From a practical perspective, municipalities are often faced with the challenge of deciding which framework to use as a guideline when setting up a municipal sustainability management system. The 2030 Agenda is chosen not least because it is considered to be vertically integrated and connectable. However, some cities also use other orientation frameworks such as the “Economy for the Common Good” (Felber, 2019), and seek interfaces to other frameworks, such as the SDGs. Municipalities are faced above all with the questions of how the indicators contribute to the requirements of current or future legal frameworks and how they can ensure the comparability of indicators that are already being used in the municipality, e.g., in sectoral strategies. For indicators already in use, there are often minimal definitional deviations that show a different status quo or a different development. This also applies at the data level: In many municipalities, their own data deviate from the data contained in higher-level official statistics. If the definitions of indicators match, variances with regard to the data source can be identified more easily.

In general, compatibility and standardisation of indicators counteract the principle of necessity to adapt indicators to the specific needs of municipalities (Michalina et al., 2021) and data availability. This can be a major obstacle to effective impact measurement and the integration of indicators into individual management processes. In addition, compatibility is a difficult criterion for the selection of indicators if these are developed in a participatory manner—e.g., together with citizens. Hansson et al. (2019) therefore suggest decentring global measurability and comparability, as pre-defined indicator sets inhibit creativity when formulating indicators that can promote positive behaviour or behavioural change. However, standardised indicator language provides transparency, reliability, harmonisation of indicators, and comparability of results (Ruan & Yan, 2022). Furthermore, there is a risk that local interpretations can lead to unambitious measures where the SDGs are primarily used for branding, rather than as guidance for transformational change (Valencia et al., 2019). Expert-led and citizen-led approaches—the two methodological paradigms

that have evolved—and their respective characteristics are widely discussed in the literature (Turcu, 2013). For future monitoring systems, this implies an integration of compatible and adapted indicators whose origin and comparability are presented clearly and transparently.

3.3. Manageability

Although a catalogue of indicators that fully reflects the content of all 169 targets should be the ultimate goal, such a catalogue would probably have to consist of a multitude of indicators and would therefore go beyond the scope of municipal sustainability monitoring. Local authorities should be able to use the catalogue to take stock of their sustainable development as comprehensively as possible, but this process needs to be manageable and realistically feasible. For this reason, the focus of the SDG Indicators for Municipalities is on those targets or sub-targets that address key problems and challenges in German municipalities or in municipalities in the Global South and that can be solved or overcome by German municipalities—at least partially and, above all, measurably—through their own expertise. Generally, the indicator catalogue should contain no more indicators than there are relevant targets and sub-targets, assuming that some targets cannot yet be methodically measured through indicators and that some targets require different indicators to adequately reflect them. In SDG 3.8 (“Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all”), for instance, various medical facilities would need to be covered to gain an impression of the local health-care situation. However, measuring the municipal contribution to providing access to affordable essential medicines and vaccines for all is challenging, which is why no adequate indicators are expected at this point. Indicators that aggregate impacts or cover a range of measures, such as “nitrate in groundwater” or “operating sites with environmental and sustainability certificates,” are in turn linked to so many targets that they cannot be used to measure individual targets.

Many municipalities find large catalogues of indicators difficult to manage and communicate (“We have considerable interest in simple and clear solutions with an even distribution of a small number of indicators per target”). In practice, municipalities often deviate from the SDG logic and focus on selected strategic goals in their own fields of action with a single key indicator per area. However, this approach conflicts with the principle of completeness, as important aspects or target relationships may be neglected. When structuring a monitoring report based on the SDGs, this is particularly evident in SDG 11, the most important SDG for SUD, as it covers several areas such as housing, transport, cultural heritage, and natural disasters, which cannot be adequately represented by a single indicator.

In general, the length and depth of the indicator catalogue probably represents one of the most difficult balancing acts between scientific and practical requirements (Verma & Raghubanshi, 2018). From a theoretical perspective, the indicator set should strive for completeness in order to cover all relevant aspects of SUD and to be able to identify adequately interactions between indicator trends (Miller et al., 2013). However, instead of comprehensive metrics of complex urban sustainability issues, policy-makers in particular need to see indicators as supporting tools for informed decision-making (Valencia et al., 2019). Furthermore, a high number of indicators poses administrative challenges related to data collection. Taking regular updates of the data into account, data collection becomes a significant economic factor (Chen et al., 2025). Therefore, a smaller number of multi-purpose indicators that contribute to various targets could help to keep a future

indicator catalogue manageable. The same applies to composite indices, but their complex calculation and weighting may hinder validity and comprehensibility (Rodrigues & Franco, 2020; Tanguay et al., 2010).

3.4. Comprehensibility

As the level of government closest to citizens, municipalities need comprehensible indicators, as opposed to higher-level catalogues focused on measures of control. SUD monitoring must be accepted by a wide range of local stakeholders. However, data interpretation, as well as governance characteristics and processes, can often only be understood by experts (e.g., municipal roles and responsibilities). Comprehensibility is a cross-cutting criterion and can be evaluated in relation to all other criteria, across various purposes and target groups. The SDG Indicators for Municipalities evaluate the following statement: “An indicator is considered ‘plausible’ if both the statement of the indicator itself and the reference to the respective target or sub-target are comprehensible.” Comprehensibility may be impaired if an indicator is based—usually for reasons of data availability—on a definition or calculation that is not unequivocally clear, if it is associated with scientific and technical model assumptions, or if it can generally only be understood with (legal) background knowledge. As a result, it is not always possible to identify a clear link to the target at first glance. Accordingly, indicators are assessed differently. The “rental prices” indicator can be easily understood, and the approach to measuring access to affordable housing (SDG 11.1) is clear. In contrast, the indicator “landscape quality,” a composite index that measures a wide range of factors related to the cultural impact of humans on ecosystems on a 7-level scale (technical term: hemeroby), and therefore contributes to reducing the degradation of natural habitats (SDG 15.5), is less easy to comprehend. However, as one of the few proxies for biodiversity loss, the hemeroby index is a very valuable indicator. It is representative of the phenomenon that whenever official statistics are exhausted and scientific measurement concepts (must) be used, comprehensibility may be impaired.

In practice, in addition to the comprehensibility of the indicators and their validity, the interpretation of data is much discussed. While for some indicators an increase or a decrease is clearly positive in terms of sustainable development, this one-dimensional assessment is usually not possible for all indicators. The indicator “SGB II and XII rate” (SDG 1.3), for example, describes the proportion of eligible social welfare recipients in German municipalities according to the Social Insurance Code (SGB) II and XII. Both a decrease and an increase of values could be considered positive in terms of sustainable development: A falling rate could indicate that fewer people are dependent on social assistance, whereas a rising rate could mean that more people are receiving help. There are several other examples of sustainability indicators, especially in the social dimension, that can be interpreted ambiguously.

For a post-2030 agenda, the criterion of comprehensibility is of particular importance, as it bridges the gap between science, planning practice, administration, and politics. Thus, the complexity of indicators must be reduced and standardisation operations applied (Schetke et al., 2012). However, the more comprehensible an indicator and its characteristics needs to be, the more likely that less innovative measurement concepts can be used to close thematic gaps and that fewer administrative specifics can be taken into account, which may hamper impact assessments. Furthermore, the ability to measure sustainability dimensions in depth may be affected (Verma & Raghubanshi, 2018). Therefore, the usage and publication of indicator catalogues should be accompanied by comprehensive communication concepts and guidelines or training to ensure that everyone can follow and interpret the indicators and underlying data. In general, the applicability and acceptability of

indicator catalogues as well as the political influence on final indicator decisions will always be an issue (Mori & Christodoulou, 2012). Against this background, transparent methodologies in future measurement concepts and sustainability reports are essential.

3.5. Impact-Oriented Management

Monitoring is primarily intended to enable the continuous, systematic collection and analysis of data, with the goal of measuring progress toward achieving specific goals and targets. Embedded in a municipal sustainability management system with strategies and implementation plans, the data can be contextualised and analysed before and after an intervention in order to measure the potential or actual impact. The SDG Indicators for Municipalities aim to provide only indicators that enable impact-oriented management. However, two observations were made during the further development of the indicators, which were confirmed in the group discussions: Firstly, some indicators allow better derivation of necessary measures than others. Secondly, some indicators already imply a normative target achievement path that is interpreted into the target for municipalities. Both observations are based primarily on the underlying impact logic. Indicators that describe inputs and outputs and are therefore closer to the administrative realities can be more easily translated into actions. Outcome and impact indicators, on the other hand, require an assessment of the interventions that have led to certain effects. For example, the development of the impact indicator “ratio of employment rates of women and men” (SDG 5.1 “End all forms of discrimination against all women and girls everywhere”) depends on many factors in the individual and overall societal environment. The “proportion of women on the city council, municipal council or district council,” on the other hand, is a simple lever to “Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life” (SDG 5.5).

In practice, many municipalities naturally prefer the latter indicators with clear links between targets, measures, and indicators. Another example is the measurement of human resources, which often poses a particular challenge in German municipalities due to a shortage of staff (“Why is the number of staff working on climate protection not measured? In the absence of dedicated sustainability staff, these staff often have to keep an eye on these issues and are therefore very relevant.”). However, such indicators often only assume causal relationships without being able to quantify the exact impact, and this limits the problem-solving capacity of municipalities.

The SDGs and their indicators do not primarily address the quality of policies and plans nor the quality and effectiveness of their implementation (Valencia et al., 2019). Usually, the indicators represent either the beginning or the end of a cause–effect relationship and therefore rarely allow conclusions to be drawn about the impact of a particular measure. Despite experimenting with calculations and indexations that are combined with context, correlation, and sensitivity analysis, differing and inconsistent results can lead to misconceptions about the ability to assess SDG impacts (Janoušková et al., 2018). The development of valid sustainability impact assessments requires a comprehensive list of indicators and a range of weightages that vary according to context (Kaur & Garg, 2019). Synthesising completed impact assessments into standardised impact pathways that can be applied across different municipalities and situations has the potential to enhance monitoring systems in a post-2030 agenda.

3.6. Diversity and Aggregation Level

Indicators can be designed and analysed across multiple dimensions, including gender, age, education, sector, and administrative unit. Some of these also depend on the local operational level. Targeted assessments are useful as the challenges and policy impacts differ between groups. This applies in particular if the indicators reveal trends that require different approaches. Under the central, transformative promise of the 2030 Agenda, “Leave no one behind,” many targets and indicators within the SDGs predefine a distinctive consideration of groups. In the SDG Indicators for Municipalities, this is the case for poverty rates (SDG 1.3) that are differentiated for children, adolescents, and the elderly. Employment rates (SDG 8.5) are broken down by age and origin, energy balances of buildings (SDG 11.b) by new and existing buildings, water and energy consumption (SDG 12.2) by private households and industry, and greenhouse gas balances (SDG 13.2) by multiple sectors.

This differentiation is certainly supported by local authorities, but there is little consensus on the question of which subject areas require more attention. In many cases, municipalities want to sub-categorise indicators according to their administrative structure, and other municipalities because of their direct influence. Although the effect of policy instruments and sensitisation efforts for all groups outside the core administration in fact often remains unclear, the demarcation is still very difficult. For example, how should municipal companies and shareholdings such as municipal utilities, waste management, and local transport companies be addressed, given that there are at least indirect opportunities to exert influence? In the latter example, there are also strong differences between the sub-national aggregation levels. Depending on the respective state constitution, cities, counties, and towns are often responsible for different remits, which is why a so-called “scale blindness” is noticeable in the indicators—i.e., not all indicators are equally relevant for all types of local authorities. Furthermore, administrative borders may distort the measurement object and/or not take spill-over effects into account.

Generally, indicators should be diversifiable to address the most vulnerable groups and scalable to the governance level with maximum influence. The more tailored an indicator is, the more likely the measurement and results will be accepted for supporting implementation (Frare et al., 2020; Hansson et al., 2019). At the same time, it can be argued that indicators should not supersede other local measures of change, but complement and reinforce them. By definition, indicators point to facts that are not directly measurable or to broader issues. They must therefore not be used as definitive measures of specific interventions, but must be understood as guidelines for assessing progress (Klopp & Petretta, 2017). Since the diversity of indicators is also often the result of data unavailability (Ruan & Yan, 2022), and individual adjustments of indicator scope counteract the compatibility principle, a post-2030 agenda should pursue a flexible monitoring system with core and municipality-specific indicators.

3.7. (Economic) Data Availability

Given their limited resources, local authorities in particular are dependent on data availability and on cost-effective data collection for SUD. Knowing about the data availability bottleneck, the ambition of the SDG Indicators for Municipalities is to provide comprehensive data for all indicators for German municipalities with more than 5,000 inhabitants. In contrast to many other indicator sets, the project thus pursues a top-down approach. This is because most data is not based on voluntary reports from the

municipalities, but on official statistics from the federal or national government or overarching research projects. However, some indicators still require decentralised collection by the municipality. Indicator data relying on the collection based on this bottom-up approach, i.e., voluntary reporting by municipalities, could often not be published in the past, as the reports were either inadvertently or deliberately incomplete—usually for political reasons. This was the case, for example, for indicators on greenhouse gas balances (SDG 13.2) and city-to-city partnerships in the Global South (SDG 17.16).

Although municipalities value the provision of data on SUD, there are two major obstacles in practice: First, data vary between different statistical authorities, especially data on population, and this often leads to confusion. Second, data availability at the local level is still generally poor in temporal and spatial resolution (Hák et al., 2016). Most of the data are only available at the level of large cities and districts, have a time lag of up to two years, and are not collected annually. Accordingly, this is criticised when important indicators such as basic medical care close to home (SDG 3.8) cannot be provided for small, rural municipalities or when data on the expansion of renewable energies (SDG 7.2) are not up-to-date. Furthermore, the appropriate scale is discussed, especially for indicators that should also reflect the situation at the neighbourhood level (e.g., noise pollution) or in surrounding areas of the municipality (e.g., recreational areas). In contrast, when municipalities have to collect their own data, individual assessments are required, and some of them can only be operationalised with considerable financial and human resources—assuming detailed measurement concepts are available. Together with the time and economic pressure that data collection puts on local administrations, the data bottleneck can lead to indicators not being reported at all, impact indicators being replaced by input indicators (e.g., expenditure on specific measures), or a certain standard of data quality not being met.

For an economic, disaggregated data availability, advancements in digitalisation, artificial intelligence, and remote sensing, as well as strong capacity building, should be taken into account for post-2030 agenda monitoring systems (Lehner et al., 2018). In this context, smart and sustainable urban development should be considered jointly (Rathore et al., 2016), and local advocacy must be promoted, e.g., by linking indicator and budget development, which often attracts attention (Klopp & Petretta, 2017).

4. Limitations of the Study

This study tries to obtain a general overview of key aspects to consider in future indicator systems by means of a literature review of IEFs and related studies, complemented by insights from group discussions with municipalities located in Germany. Both sources have their limitations: The IEFs were developed for different purposes, hence they may not take the specifics of SUD governance frameworks, the planning system, or the local situation into account. Similarly, the discussion formats with the municipalities were originally not designed to systematically identify requirements for future urban monitoring approaches. Consequently, all comments and suggestions have been carefully checked for indications in this direction. However, it cannot be ruled out that some remarks have been misinterpreted. The amount of criteria and the remarks from both sources, together with the comprehensive literature review, are intended to eliminate major biases in the discussion. Enhanced by methodological approaches that analyse the concrete application of the various IEF criteria on site, e.g., the analysis of indicator sets in Voluntary Local Reviews, future research could further refine the results of the present study, potentially leading to a proposal for a novel IEF.

5. Conclusion

Sustainable urban development combines two complex disciplines that cover the entire spectrum of spatial impacts from socially just, ecologically sound, and prosperous governance. Although not primarily designed for this field or this policy level, the 2030 Agenda is seen as a framework that can guide municipalities as they strive to become inclusive, safe, resilient, and sustainable. Future monitoring systems must overcome the inherent limitations of the SDGs for SUD while meeting central theoretical and practical requirements. This article sheds light on experiences from SUD monitoring approaches and the SDG Indicators for Municipalities, aiming to provide valuable conclusions for measuring the impacts of municipal sustainability management.

Seven key requirements were identified, highlighting the need for balance in the selection of indicators depending on the perspectives and priorities, whether for a post-2030 agenda, a conceptual indicator catalogue such as the SDG Indicators for Municipalities, or local government frameworks. Relevance and validity, economic data availability, comprehensibility, and impact-oriented management are important criteria for theory and practice. In addition to technical aspects such as data quality, function, or interdependencies of indicators, the designers of future monitoring systems should also provide the flexibility, compatibility, and manageability demanded by practitioners. These criteria are not without contradictions. Indicators for SUD must reflect the environmental, social, and economic dimensions of sustainability while taking into account different conceptions of resilience, inclusion, and governance. When evaluating and selecting indicators, local and regional governments aim to identify the most suitable measuring variables that explain and guide developments for a wide range of stakeholders. In this respect, any remaining ambiguities in the identified and discussed criteria can serve as the flexible elements needed locally to facilitate policy-making for SUD. Depending on the governance structures and the local planning and participation culture, this can be achieved in a bottom-up or top-down manner, with a more scientific or practical orientation, and in a customised or interconnected way. A post-2030 agenda must reflect this flexibility while ensuring a universal and valid language for indicators and an easy derivation of actions. From a technical perspective, the many trade-offs between the criteria can be overcome with smart monitoring approaches: A set of core and municipality-specific indicators could ensure compatibility and adaptability; digital collection and capacity building could enhance data availability; communication approaches could promote comprehensibility; and multi-purpose indicators could limit the unmanageable length of an indicator catalogue. Above all, however, the further development of a clear, unambiguous, and relevant orientation framework that incorporates a strategic and operational nexus of targets, measures, and indicators remains of utmost importance.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

Further information and data on the SDG Indicators for Municipalities are available at <https://sdg-portal.de/en>

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