Voices Unveiled: Enhancing Urban Upgrading through Participatory Data Collection in South African Informal Settlements

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Abstract. Participatory data collection has become increasingly significant in urban planning, especially in the Global South, where informal settlements are expanding rapidly but remain excluded from official data systems. In South Africa, about one in four urban residents lives in informal settlements, yet their realities are frequently ignored in development planning. This marginalization is partly due to the absence of accurate, community-generated data, which deepens inequalities in service delivery, land tenure, and infrastructure provision. This paper explores how participatory data collection can support more equitable urban upgrading in South African informal settlements. Drawing on a mixed-methods study—using surveys, interviews, participatory workshops, and document analysis—we examine three settlements in Gauteng and the Western Cape. Our analysis focuses on the interactions among residents, NGOs, and municipal officials, and the extent to which participatory data shapes planning outcomes and governance. The findings indicate that participatory data efforts improve data reliability and promote community ownership. However, they also highlight persistent challenges: unequal power relations, superficial engagement, and resistance from formal institutions. While participatory approaches hold transformative potential, their impact is often limited by a lack of genuine co-production and institutional uptake. We argue that embedding participatory data practices within a broader framework of data justice and municipal accountability is vital. When formalized within planning systems, participatory data collection can shift urban upgrading from a top-down technical process to one that is inclusive, responsive, and grounded in the lived realities of informal settlement residents.

1. INTRODUCTION

Informal settlements represent one of the most pressing urban challenges in the Global South. In South Africa, they house nearly one in four urban residents and continue to grow due to persistent poverty, rapid urbanisation, and historical spatial inequalities rooted in apartheid-era planning. Despite their demographic and socio-political significance, informal settlements often remain statistically invisible, largely because conventional data systems do not account for their heterogeneity, fluidity, and legal ambiguity (Kamana et al., 2023). The absence of reliable, community-specific data leads to urban upgrading initiatives that fail to reflect the lived experiences, priorities, and capacities of the communities they serve.

Participatory data collection has gained increasing traction as an alternative and complementary approach to conventional, technocratic planning methods. It seeks to democratise urban knowledge production by involving community members in generating, interpreting, and applying data for local development processes (Eriksson et al., 2021). In contexts like South Africa's informal settlements, where land tenure is often contested, service provision is uneven, and institutional engagement is fragmented, participatory approaches hold particular relevance. They offer a platform through which historically marginalised groups can assert their agency, claim visibility, and influence the direction of urban upgrading projects.

Several civil society initiatives in South Africa, notably those led by the Community Organisation Resource Centre (CORC), the Informal Settlement Network (ISN), and Slum/Shack Dwellers International (SDI), have demonstrated how participatory data tools can shape development trajectories. These initiatives often use household enumerations, spatial mapping, and participatory assessments to document community needs and develop upgrading strategies that are locally grounded and collectively owned (Broto et al., 2022). However, participatory processes are not immune to critique. Questions persist around power asymmetries, the authenticity of participation, and the ability of community actors to meaningfully influence decision-making.

This paper explores the effectiveness of participatory data collection in enhancing urban upgrading in South African informal settlements. It addresses the following core research questions:

- What are the motivations and expectations of stakeholders engaged in participatory data collection?
- What challenges and tensions arise during participatory data collection processes?
- How do participatory data practices impact the quality, relevance, and legitimacy of information used in urban upgrading?

By engaging these questions, the paper contributes to ongoing debates on inclusive urban governance, participatory planning, and the politics of knowledge production. Drawing on empirical research conducted in multiple South African informal settlements and situated within the conceptual lenses of co-production Sutherland et al. (2024), data justice, and participatory planning, the study argues that meaningful participatory data collection enhances the technical validity of urban interventions and their social legitimacy and responsiveness.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Urban planning in the Global South has increasingly been challenged to become more inclusive, participatory, and responsive to the realities of informality. Traditional data collection methods, which are often centralised, expert-driven, and inflexible, have consistently failed to capture the complexity of informal settlements. In response, a growing body of literature has explored participatory data collection as both a methodological innovation and a political act, capable of reshaping how cities plan and for

whom (Bhanye, 2025). This section critically reviews key theoretical debates and empirical findings on the nexus between participatory data, informal settlements, and urban upgrading, focusing on five thematic areas: (1) informality and the politics of invisibility, (2) participatory data as co-production, (3) stakeholder motivations and the authenticity of participation, (4) data justice, and (5) the institutionalisation of participatory planning.

2.1. Informal Settlements and the Politics of Invisibility

Informal settlements are often marginalised in physical, legal, and statistical terms. These areas are frequently absent from official censuses, municipal records, and GIS databases, rendering their inhabitants invisible in policymaking. This invisibility is not a passive omission but a product of historical, political, and institutional choices. As argues, urban informality is "an idiom of urbanisation," actively produced through the selective application of laws and the discretionary exercise of state power (Chakraborty et al., 2015). The consequence of this invisibility is that upgrading interventions often misallocate resources or are based on erroneous assumptions about community priorities and capacities. Without accurate, disaggregated, and context-sensitive data, planners struggle to develop interventions that reflect actual needs (McConnell & Hart, 2019). The absence of data is thus a key mechanism of marginalisation, used to justify inaction or displacement under the guise of development.

2.2. Participatory Data Collection as Co-Production

Participatory data collection involves the active involvement of community members in identifying what data should be collected, how it should be interpreted, and how it should be used. It aligns with the theoretical framework of co-production, which challenges the traditional dichotomy between expert and lay knowledge (Duea et al., 2022). Co-production emphasises mutual learning, shared authority, and the integration of different knowledge systems in decision-making.

In urban planning, co-production has been operationalised through participatory mapping, community-led enumerations, storytelling, photovoice, and digital data platforms. These tools are particularly potent in contexts where formal data is missing or contested. In Cape Town, for instance, the Violence Prevention through Urban Upgrading (VPUU) project used participatory mapping to identify community-defined safety concerns addressed through localised interventions (Hoffman, 2022). In Johannesburg and Durban, SDI's "Know Your City" campaign has involved residents in documenting their settlements, influencing municipal upgrading plans.

However, co-production is not always a smooth or equitable process. Pre-existing power dynamics, institutional logics, and resource asymmetries shape it (Wang & Li, 2024). Ensuring that co-production is not a form of managed participation where community voices are acknowledged but ultimately sidelined requires strong facilitation and accountability mechanisms.

2.3. Stakeholder Motivations and the Question of Authentic Participation

Participatory initiatives often involve various stakeholders, community members, NGOs, academics, donors, and government agencies, each with distinct motivations and expectations. While residents may collect data to improve access to services or assert land rights, NGOs might be driven by goals of advocacy or fundraising (Ghafran & Yasmin, 2024). Similarly, municipal officials may support participatory data processes to legitimise predetermined plans or mitigate community resistance.

This divergence can lead to tokenism, where participation is superficial or symbolic rather than meaningful. Arnstein's "ladder of participation" remains a useful heuristic, distinguishing between forms of participation that empower and those that merely inform or consult (Venter et al., 2019). In South Africa's Informal Settlement Upgrading Programme (ISUP), several studies have highlighted how participatory rhetoric often masks highly centralised decision-making processes.

For participation to be authentic, it must involve decision-making power, transparency, and sustained engagement. Temporary or consultative engagements can foster cynicism and distrust, especially when data collection is not followed by tangible outcomes (Sasaki & Baba, 2024). Authenticity also requires intra-community inclusivity, ensuring that women, youth, and other marginalised groups are not excluded or co-opted by dominant local elites.

2.4. Data Justice and Ethical Considerations

Recent scholarship has introduced the concept of data justice to frame the ethical and political dimensions of data production and use. Data justice refers to equitable access to, representation within, and benefits from data systems (Christine & Thinyane, 2021). It encompasses procedural justice (who participates), instrumental justice (how data is used), and distributive justice (who benefits).

Data justice is vital in informal settlements because communities have historically been the objects rather than the agents of data processes. Participatory data practices offer an opportunity to reverse this trend, but only if they are designed with safeguards to prevent exploitation, misrepresentation, and extractives. For example, communities should be informed about how their data will be used, have the right to approve or veto its dissemination, and benefit from its outcomes. The misuse of participatory data can have harmful consequences. Sometimes, information about illegal dwellings or informal businesses has been used to justify evictions or service disconnections (Nethercote, 2023). Therefore, participatory data initiatives must be embedded in informed consent frameworks, data sovereignty, and community accountability.

2.5. Participatory Planning and Institutionalisation

Participatory planning involves integrating community perspectives into formal urban governance processes. While the South African planning system provides legal mandates for participation, most notably through the Municipal Systems Act and the National Housing Code Mamokhere and Meyer (2022), implementation has often been uneven, and informal settlements remain under-represented in planning forums.

Case studies suggest that participatory data collection can bridge this gap by producing actionable insights that resonate with community realities and institutional logic. For example, in eThekwini Municipality, community profiling was used to prioritise infrastructure delivery in high-need areas (Ricker et al., 2020). Similarly, Cape Town's VPUU program used resident-generated data to inform public space design, aligning technical plans with community-defined safety priorities.

Nonetheless, participatory data often remains peripheral to official systems due to questions of validity, standardisation, and bureaucratic inertia. Institutionalising participatory data requires technical adjustments such as harmonising methodologies and

cultural shifts that recognise the legitimacy of community knowledge (Béné et al., 2024). This may involve developing municipal guidelines for using participatory data, building staff capacity, and creating platforms for sustained dialogue between communities and planners.

2.6. Gaps in the Literature

Despite a growing literature on participatory data and upgrading, several gaps persist. First, most studies focus on community and NGO perspectives, with limited attention to how government officials interpret and act on participatory data (Aranda et al., 2023). Second, there is inadequate analysis of the internal politics of participation, particularly how gender, age, and social status shape who gets to speak for "the community". Third, few studies track long-term impacts, focusing instead on short-term outputs like community maps or enumeration reports.

There is also limited exploration of how digital technologies such as mobile mapping apps, drones, and online data platforms intersect with participatory approaches in the South African context. These tools offer new opportunities and raise ethical, logistical, and epistemological challenges (Sarku & Ayamga, 2025). Finally, comparative research is needed to identify which conditions enable participatory data to influence formal planning and which barriers persist across contexts.

2.7. Conceptual Framework

This study adopts a conceptual framework that draws on three intersecting lenses: co-production, data justice, and critical participatory planning. Co-production provides a basis for understanding how knowledge and authority are shared between communities and formal institutions. Data justice offers a normative guide for assessing the fairness and inclusivity of data practices. Critical participatory planning situates participatory data within broader struggles over power, rights, and recognition in urban governance (Yua et al., 2022). Together, these lenses enable a multidimensional analysis of participatory data collection that moves beyond methodological innovation to interrogate its social, political, and ethical dimensions.

3. METHODOLOGY

This study adopted a mixed-methods research design grounded in Participatory Action Research (PAR) principles, allowing for a comprehensive exploration of how participatory data collection influences urban upgrading in South African informal settlements. Combining qualitative and quantitative approaches enabled data triangulation and enriched the reliability of the findings (Shearn et al., 2021). The research was conducted in three purposively selected informal settlements in Gauteng and the Western Cape, each with a distinct history of engagement in participatory upgrading and varying levels of infrastructural development. Stakeholders included community residents, NGO representatives, and municipal officials. Seventy-two residents participated in structured surveys, 15 key informants were interviewed using semi-structured guides, and three participatory workshops were conducted, each facilitating community mapping, storytelling Felmingham et al. (2023), and reflection exercises to elicit collective insights. These engagements were complemented by document analysis of municipal upgrading plans, NGO data reports, and settlement profiles to contextualise and verify empirical observations.

4. RESULTS

This section presents the empirical findings from the study, drawn from surveys, interviews, participatory workshops, and document analysis conducted across three informal settlements. The results are organised thematically to reflect the major patterns that emerged during data analysis (Da Silva et al., 2024). These include (1) stakeholder motivations and expectations; (2) the politics of participation and internal power dynamics; (3) knowledge and capacity gaps; (4) trust, transparency, and data accountability; and (5) the influence of participatory data on upgrading outcomes.

4.1. Stakeholder Motivations and Expectations

The study revealed that residents, NGOs, and government officials engaged in participatory data collection with varying intentions. For many residents, participation was driven by expectations of improved service delivery, such as formal housing, sanitation infrastructure, and electricity (Tejedo-Romero et al., 2022). This instrumental view of data reflected hopes that visibility through enumeration would translate into material gains. NGO representatives, particularly those affiliated with SDI and community-based organisations, emphasised the strategic value of data for advocacy and mobilisation. They viewed participatory enumeration as a way to claim legitimacy in policy spaces (Afiyah, 2024). On the other hand, government officials acknowledged participatory data as a valuable planning tool but expressed reservations about data validity and concerns over its alignment with official datasets.

4.2. The Politics of Participation and Power

Despite an overarching discourse of inclusion, the study found that participatory processes often reproduced power asymmetries. In two of the three sites, community members noted that their participation was limited to data collection, with minimal influence over analysis or decision-making. Instances of tokenistic participation were cited, where residents were used to legitimise externally driven plans without meaningful engagement (Lécuyer et al., 2024). Moreover, internal community hierarchies, particularly around gender, age, and leadership structures, affected who was selected as data collectors and whose voices were amplified. In Site C, for instance, youth and women reported exclusion from leadership-led processes despite having deep knowledge of local issues.

4.3. Capacity and Knowledge Gaps

Both community members and municipal actors highlighted significant capacity constraints in engaging with participatory data. While residents demonstrated high enthusiasm, many lacked the training or confidence to engage with technical tools or interpret spatial data outputs. Workshops revealed frustration over repetitive data collection efforts that lacked capacity-building

or continuity (Kourkouridis et al., 2024). Similarly, municipal officials cited a lack of internal expertise to integrate participatory data into formal planning instruments, such as GIS systems or budgeting frameworks. This disconnect undermined the potential for participatory processes to inform policy and implementation.

4.4. Trust, Transparency, and Accountability

The role of trust emerged as a critical determinant of participation quality. Residents expressed a higher willingness to engage in sites where previous participatory efforts had led to tangible improvements, such as installing water points or sanitation blocks. Conversely, scepticism and disengagement were prevalent in areas where data had been collected but never acted upon (Kovács et al., 2024). A common concern across all sites was the lack of feedback mechanisms. Residents were often unaware of how their data was being used, who had access to it, and what outcomes were expected. NGO facilitators acknowledged that resource limitations and short funding cycles often disrupted communication, contributing to mistrust.

4.5. Influence of Participatory Data on Upgrading Outcomes

Despite structural constraints, there were several examples where participatory data directly influenced upgrading decisions. In Site A, a community-generated report on sanitation access prompted a municipal pilot project to install shared ablution blocks. Residents involved in data collection were subsequently engaged in facility maintenance, demonstrating local ownership and sustainability. In Site C, participatory mapping undertaken by youth identified unsafe pathways and informal waste disposal sites, which were then incorporated into a city-led clean-up campaign (Van Der Merwe & Simha, 2023). However, such outcomes were often facilitated by intermediaries, typically NGOs or academic partners, who bridged the gap between communities and formal institutions. Without these actors, community data often remained underutilised due to a lack of institutional mandates for integration.

The results suggest that while participatory data collection holds promise for enhancing urban upgrading, its success depends on the depth of engagement, power-sharing mechanisms, and institutional receptiveness. When communities are empowered to shape data collection and interpretation, and when outputs are transparently communicated and acted upon, participatory processes foster trust, ownership, and social legitimacy (Khatiwada et al., 2024). However, persistent barriers undermine these potentials, including tokenism, limited capacity, and bureaucratic rigidity. The next section engages these findings through the lens of co-production, data justice, and participatory planning, exploring their broader implications for inclusive urban governance.

5. DISCUSSION

This study examined how participatory data collection shapes urban upgrading in South African informal settlements, focusing on stakeholder motivations, participatory dynamics, and data outcomes. The discussion below reflects on the empirical findings through three intersecting theoretical frameworks: co-production, data justice, and participatory planning (Khofi et al., 2025). It also identifies practical implications for governance, capacity-building, and institutional reform.

5.1. Co-Production and the Limits of Inclusion

While participatory data collection is widely promoted as a tool for empowering communities and decentralising planning, the findings of this study suggest that genuine co-production remains elusive. In all three case study sites, residents were involved primarily at the data-gathering stage but were seldom included in data interpretation, decision-making, or planning processes (Di Maddaloni et al., 2025). This aligns with critiques that many participatory processes, while rhetorically inclusive, are often instrumentalised to legitimise pre-existing plans. In such instances, participation is confined to consultation rather than collaboration or shared authority.

However, the study also identified instances where meaningful co-production was achieved, particularly in Site A, where residents who collected data on sanitation later participated in the design and maintenance of facilities. These experiences underscore the transformative potential of participation when residents are treated as partners, not mere informants (Nelson et al., 2021). Achieving this requires more than technical tools; it demands time, trust, and facilitative leadership that nurtures horizontal relationships among stakeholders.

5.2. Data Justice and Ethical Accountability

The concept of data justice provides an important ethical lens through which to assess participatory processes. While participatory data collection is often assumed to be inherently fair, the findings challenge this assumption. In Site C, for example, elite control over data collector selection led to excluding youth and women, undermining procedural justice (Haldar et al., 2024). Moreover, the lack of clear feedback loops and data-sharing agreements across all sites raised concerns around transparency and consent.

Data justice requires that communities not only contribute data but also retain some control over its use and benefit from its outcomes. Without institutional mechanisms to ensure this, such as community data ownership agreements or participatory monitoring structures, data practices risk becoming extractive rather than emancipatory (Braun & Hummel, 2022). The distrust expressed by residents in Site B illustrates the reputational risks of unfulfilled participatory promises. For participatory data to be ethically sound and socially impactful, actors must commit to sustained engagement, reflexivity, and accountability.

5.3. Participatory Planning and Institutional Constraints

The study's findings reaffirm a core tension in participatory planning: the gap between community-driven knowledge and bureaucratic planning logics. While municipal officials in the study acknowledged the value of community data, few had institutional guidelines or technical capacity to integrate this data into formal systems like GIS, zoning, or budgeting (Siangulube et al., 2023). This supports previous research showing that despite national policy mandates for participation, many local governments in South Africa struggle to operationalise participatory approaches.

Successful examples of participatory planning, such as those in the VPUU project in Cape Town, were typically mediated by

NGOs or academic partners who translated community data into formats usable by local authorities. However, this reliance on intermediaries raises concerns about sustainability and scalability. Institutionalisation is critical (Thellbro et al., 2022). Municipalities must develop formal procedures for validating, integrating, and responding to participatory data, supported by training programs and performance indicators linked to inclusive planning goals.

5.4. Participation as Political Practice

Beyond its technical utility, participatory data collection must be recognised as a political practice. When informal settlement residents document service gaps, delineate boundaries, or map environmental risks, they are not simply generating data but asserting visibility, legitimacy, and a claim to urban citizenship. This act of "speaking back" to the state challenges dominant narratives of informality as disorder or illegality (Terdoo, 2024). At the same time, this political agency is not without risk. Communities may face backlash from local elites or state actors, especially when data reveals uncomfortable truths or contradicts official records. Participatory processes must therefore be designed with technical and political protections to support community autonomy and safety (Süleymanoğlu-Kürüm et al., 2025). This includes ensuring secure data storage, anonymisation protocols, and collective control over dissemination.

5.5. Implications for Practice and Policy

The study identifies several practical implications for urban upgrading practice in South Africa and similar contexts:
1. Mandate Participatory Data in Planning Frameworks: National and municipal policies should formally require using participatory data to upgrade programs beyond ad hoc engagements.
2. Strengthen Feedback Loops and Transparency: Communities should receive regular updates on how their data is used, accompanied by joint evaluation processes to ensure mutual accountability.
3. Invest in Mutual Capacity-Building: Training efforts must target communities and municipal officials, fostering shared data literacy and planning capacity.
4. Institutionalise Data Ethics Protocols: Develop guidelines for informed consent, community data ownership, and ethical dissemination to protect vulnerable groups.
5. Build Sustainable Partnerships: To bridge technical and political divides, encourage long-term collaborations between municipalities, NGOs, and academic institutions.

By embedding these principles into planning systems, participatory data collection can become more than a project activity; it can be a foundational element of inclusive urban governance.

6. CONCLUSION

This study examined the significance of participatory data collection in supporting urban upgrading processes within South Africa's informal settlements. Through a mixed-methods approach incorporating surveys, interviews, participatory workshops, and document analysis, the research demonstrated that participatory approaches could enhance the relevance, legitimacy, and accuracy of urban data. However, the transformative impact of these approaches hinges on the quality of engagement, the responsiveness of institutions, and the ethical foundations guiding such processes. When participatory data collection is inclusive and community-driven, it serves not only as a methodological innovation but also as an ethical and political act. Instances where community members contributed to sanitation design or co-created spatial data that influenced municipal planning highlight the power of co-production. The value lies not solely in the data produced but, in the trust, agency, and collaborative governance it fosters. Nevertheless, the study also underscores critical limitations. Without deliberate facilitation, participation risks becoming symbolic, failing to shift decision-making power or address embedded inequalities. Power imbalances often dictate who participates and whose knowledge is recognised, raising concerns about exclusion and tokenism. To fully realise the potential of participatory data, institutional shifts are needed. These include integrating community-generated data into formal planning systems, strengthening accountability mechanisms, and adopting data justice principles. Recognising participatory data as a legitimate form of knowledge is essential for transforming state–citizen relations and confronting urban inequality. In this way, participatory data practices can contribute meaningfully to inclusive, just, and sustainable urban development in South Africa and beyond.

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