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Implementing participatory nature-based solutions in the Global South

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This article delves into the participatory aspects of the implementation of nature-based solutions (NbS) in the Global South. It examines the practices of community engagement in several projects conducted in informal settlements and how they relate to project visions. Building on previous work on community engagement for urban upgrading projects, we examine the relationship between the methods used to engage communities and the goals that guide the design and implementation of NbS. In doing so, we explore engagement practices that can support the emergence of transformative approaches in historically disadvantaged areas. We discuss how the degree of participation offered by different methods, such as citizen science and serious games, can substantially influence the outcomes of NbS projects by making them more integrated and site-specific. We conclude by discussing how the transformative implementation of NbS entails a multi-stakeholder proactive approach that is capable of supporting changes in the socio-ecological systems.

KEYWORDS

participatory methods, nature-based solutions, Global South, transformative, informal settlement

Introduction

Nature-based Solutions (NbS) have been gaining attention in the context of urban "upgrading projects" in informal settlements in the Global South (Cohen-Shacham et al., 2016). Ranging from raingardens to green roofs, tree planting or mangrove restoration initiatives, these projects have multiple functions including producing food, providing cultural value and serving as public space. In the context of informal settlements, areas historically characterized by reduced access to infrastructure and services (UN Habitat III, 2017), NbS have been framed as important strategies capable of mitigating some of the impacts of climate change such as heat waves and flooding (Sengupta, 2016; French et al., 2020; Sattherthwaite et al., 2020; Rauf et al., 2021).

The recent literature on experiences with NbS in the Global South indicates that community gardens and tree planting efforts are common, but community participation is still incipient in most informal settlement "greening" initiatives (Puskás et al., 2021; Kiss et al., 2022). While this trend is similar to that in wealthier urban centers, where NbS projects are still too rarely co-designed with local residents (Frantzeskaki, 2019; Kiss et al., 2022), there are challenges and controversies specific to the informal settlement context. Reflecting on those, several authors have warned against NbS-centered upgrading initiatives for reproducing unequal power relations and exacerbating existing vulnerabilities (Cousins, 2021; Kotsila et al., 2021; Seddon, 2022). While the literature indicates an interest to involve the communities in the implementation of NbS, examples of successful and just community involvement in the design of NbS in the Global South are still rare (Gouverneur, 2014; Das and King, 2019; French et al., 2020). This Perspective paper presents such examples and insights into how participation and project vision (the goals, values and expected outcomes that guide each initiative) are intertwined in NbS projects in informal settlements.

Transformative development of NbS in informal settlements entails discussions about institutional, social and ecological systems (Diep et al., 2019; French et al., 2020). The term "transformative" here refers to the reorientation of society's capacity toward proactive, transdisciplinary, multi-stakeholder initiatives that foster the development of novel solutions (De Graaf-van Dinther and Ovink, 2021). Transformative development should be guided by the fair distribution of benefits and risks (Mcmillan et al., 2021) as well as the prioritization of local livelihoods, including systems linked to food production and income generation. This is only possible by supporting institutional changes and acknowledging social and ecological processes within the settlements "through broad participation, including traditional, local, and scientific knowledge, as well as the distribution of benefits in a fair and equitable manner" (Cousins, 2021, 6).

The participatory ladder is a model for analyzing participation within informal settlement upgrading projects. Based on Sattherthwaite et al. (2020)'s reflections on housing and infrastructure-provision initiatives, the ladder identifies approaches that range from non-participatory, tokenistic and exploitative projects to highly collaborative, community-led efforts. While this framework provides a useful tool to evaluate the institutional aspects of upgrading projects, it assumes that higher levels of participation necessarily lead to more successful projects as it does not directly reflect on how participatory approaches affect goals, values and expectations throughout the project. In the context of NbS implementation, we consider that Sattherthwaite et al.'s ladder is insufficient to analyse an aspect essential to transformative initiatives: the social and ecological relationships that underpin NbS in informal settlements.

Participation and project vision underpin transformative approaches to nature-based solutions

Expanding Sattherthwaite et al.'s ladder, we argue that the transformative potential of an NbS is not only determined by the participatory approach used but, more importantly, by how this approach can transform the project vision and ensure that the NbS can be integrated with the local needs and environments. This is important because common types of NbS in informal settlements (including wetlands, green areas, and community gardens) are inevitably intertwined with social and ecological dimensions by providing services such as food production and income generation as well as playing cultural and spiritual roles in their contexts (Hamel and Tan, 2021). As such, transformative initiatives should be informed by socio-ecological systems and guided by the willingness to revise project's goals, values and expectations during the design and implementation of NbS.

There is a spectrum of community involvement in the implementation of NbS in informal settlement upgrading projects, ranging from non-participatory to transformative approaches (Figure 1, left-hand side). In parallel, there is a spectrum of ways in which NbS projects consider local needs and environments, represented by the categories of "project visions" ranging from initiatives that only replicate foreign initiatives to projects that are highly integrated with local social and ecological relationships (Figure 1, right-hand side). Combining these two elements suggest that projects with low levels of community participation generally lead to the replication of solutions developed in other locations. This is particularly challenging since informal settlements and their relationships with their surrounding contexts can vary significantly and, for this reason, require different approaches (Mulligan et al., 2020). On the other side of the spectrum, projects that strive for a transformational practice and deep community participation will lead to NbS being well integrated to the socio-ecological contexts. In the following, we illustrate the different levels participation and implications for project vision with examples from the literature and the authors' own experience.

From non-participatory to manipulative approaches

Despite the importance of community participation, many projects still operate according to a non-participatory or manipulative approach that uses engagement activities as a platform to impose or convince local stakeholders to agree with plans to replicate NbS from other contexts. While these projects may be guided by well-intended experts, minimal opportunities for critical discussions within the decision-making practices can lead to lack of transparency and to an unequal distribution

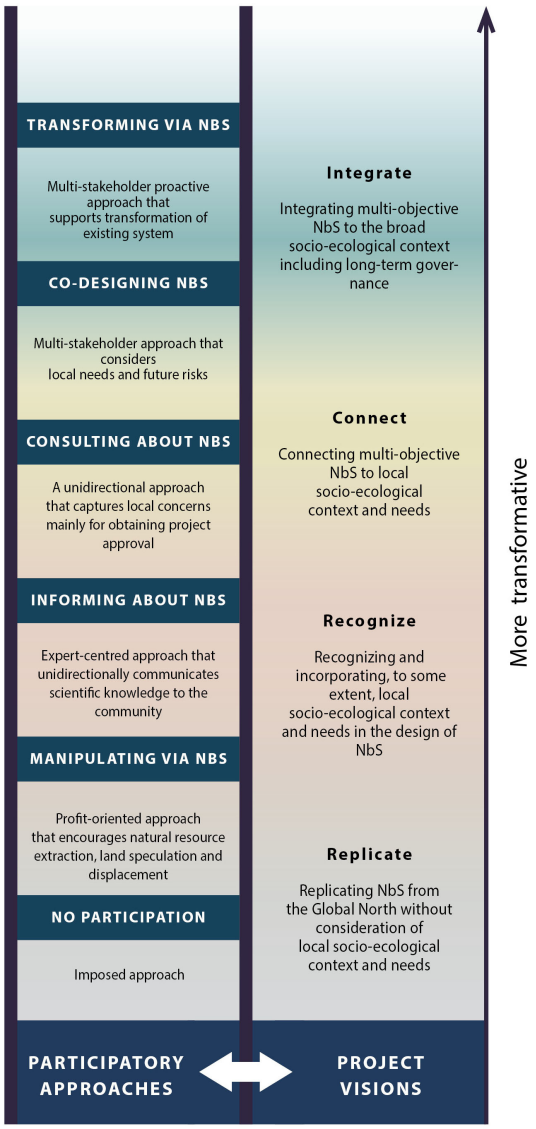

FIGURE 1
The relationship between participatory approaches and project visions for the implementation of NbS in the context of informal settlements.

of benefits and risks. The controversial implementation of the "Room for the river" strategy developed in the Netherlands in several megacities in Southeast Asia serves as an example of this situation (Yarina, 2018).

In an effort to "climate-proof" coastal megacities, local governments often relied on international expertise to "upgrade" urban waterfronts in Southeast Asia. Several proposals for the future of Jakarta, for example, replicate Dutch infrastructural systems using a combination of NbS, dikes and concrete embankments (World Bank, 2019). These projects have led to mass eviction and displacement of local residents of informal settlements (Yarina, 2018). These residents are perceived as the root causes of the land subsidence and their presence is framed as a hinderance to the success of the riparian revegetation projects proposed (Padawangi and Douglass, 2015; Goh, 2019). Often privately funded, projects with low levels of participation have been denounced for often resulting in to land speculation and for not prioritizing the most vulnerable communities in the city (Goh, 2019).

From informative to consultative approaches

To achieve a higher degree of participation, most projects implementing NbS in informal settlements now claim to employ informative, consultative or co-designed approach (Melanidis and Hagerman, 2022; Seddon, 2022), recognizing the limitations of simply replicating an NbS from another context.

Informative approaches are still primarily centered on external experts but indicate a recognition of the need to communicate with communities to anticipate gaps in the implementation. *Consultative approaches*, often prompted by an institutional requirement to consult the community, represent a transition between initiatives that recognize local contexts and initiatives that start to connect site-specific aspects in the design of NbS. This degree of participation requires platforms for communications: workshops, focus groups, surveys, and more recently "serious games", which can connect with local livelihoods in projects addressing the needs of residents of informal settlements.

Serious games are defined as games to engage communities to deliver specific objectives (e.g., pedagogical, or problem-solving purposes) and operating beyond the realm of entertainment (Abt, 1970). In the case study of Kin Dee You Dee ('Eat well, live well') in Thailand, serious games have have been used to engage local communities in the discussion of climate change adaptation strategies (Marome et al., 2021). The experience revealed that serious games can serve as a method to sensibly consider local needs in the context of informal settlement upgrading projects. Residents who engaged with serious games expressed acquiring new knowledge that encouraged climate preparedness (Marome et al., 2021). While indicating that the use of games gave them more space to co-design collective solutions, the residents also expressed that this method offered opportunities to connect adaptation strategies to their values and immediate needs. This example demonstrates that the implementation of informal settlement upgrading projects requires the creation of "safe space" that can offer visibility to underrepresented livelihoods (Marome et al., 2021).

In this case study, while serious games were primarily used for co-identifying individual and collective assets (e.g., financial

assets, infrastructure and services, and natural capital) they also offered a platform to discuss urban farming options by exploring the perceptions of the residents toward their environments. This approach gave researchers a better understanding of what NbS, such as green spaces, meant for local livelihoods and whether they are regarded as valuable communal assets or not. The findings show that planting vegetables were commonly recognized as a strategy to improve food security and diversify income sources through new planting techniques such as hydroponics (Archer et al., 2019). This suggests that the use of serious games could be applied to overcome epistemological differences and create opportunities to discuss NbS as valuable strategies aligned with the needs of local stakeholders. In brief, such participatory platform could aid in facilitating more inclusive and equitable NbS implementation, and contributes to the active community of practice working on approaches and tools to engage residents of informal settlements as active agents in the design of local solutions (Toxopeus et al., 2020; Tozer et al., 2020).

From consultative to co-designed approaches

Innovative engagement practices, such as citizen science, can create opportunities to expand consultative projects by engaging residents in discussions about NbS that would otherwise be restricted to experts. The term "citizen science" is commonly used to refer to initiatives that "invite" non-scientists to participate in research activities such as monitoring biodiversity, temperature or water level variations (Haklay et al., 2018). The use of citizen science as part of a co-design process is not meant to be unidirectional but, instead, an approach that acknowledges communities as proactive actors in understanding future scenarios and preparing for climate adaptation. *Co-design approaches* in this context, allow multiple stakeholders to plan for uncertain future conditions by integrating local priorities and existing everyday challenges in the design of NbS.

Co-design approaches are characterized by the involvement of multiple stakeholders in ways that require deeper commitment and negotiation in the development of projects. One example of the use of this engagement practice in the design of NbS was developed within the Revitalizing Informal Settlements and their Environments (RISE) program, an initiative constructing wastewater-treatment wetlands in informal settlements (Brown et al., 2018). The constructed wetlands in RISE serve as an example of a NbS with a single objective (to address water contamination) that was further expanded as a result of the use of a co-design approach (French et al., 2021). As part of the engagement practices, the program used citizen science as a platform to involve communities to participate in the design of NbS.

In this program, researchers conducted a flood-monitoring project in partnership with communities living in informal settlements to inform the design of NbS (Wolff, 2021). Residents acting as citizen scientists collected photos of floods that helped researchers within RISE to better understand the local hydrology in the peripheries of Suva (Fiji) and Makassar (Indonesia). Between 2018 and 2020, this project collected a comprehensive archive of more than 5,000 photos of flood levels that informed the design of the constructed wetlands (Wolff et al., 2021). This project illustrates that, while co-designed approaches allow a deeper engagement with communities it also introduces new responsibilities that need to be negotiated with participants.

Beyond the dataset, interviews with the residents also suggested that the use of citizen science created opportunities for residents to proactively reflect on local floods and upgrade their houses accordingly. This case study reveals that co-designed approaches require more time and resources to engage the communities but, in turn, can lead to more transformative ways of designing and implementing NbS beyond single objective goals by responding to local needs and priorities (ADB and RISE, 2021).

Toward transformative approaches to NbS in informal settlements

In contrast with approaches that only seek to engage local communities through informative engagement practices or consultation, transformative approaches should strive to integrate NbS with the local needs and priorities, including long-term governance. Engagement practices that support the understanding of socio-ecological relationships are important in the contexts of informal settlements as they acknowledge the complex nature of the relationships established by the local residents with their environments. A deeper integration of NbS with social and environmental context is key to avoid polarizing views that frame NbS, such as riparian revegetation or tree planting, as barriers to addressing the needs of local residents.

The work of grassroots movements and local advocacy groups, such as NGOs can shed light on how the voices of local residents can be incorporated into the production of NbS. The NGOs Rame Rame Jakarta (Rame Rame Jakarta, 2021) in Indonesia and Kounkuey Design Initiative (KDI) (Konkuey Design Initiative, 2022) in Kenya, for instance, exemplify the efforts of emerging groups to give visibility to the local struggles of the urban poor. Using engagement practices such as emotional mapping and transect walks, the work of these NGOs emphasizes the relationships and knowledge sharing between stakeholders that can support a transformative design and implementation of NbS.

The work of Rame Rame Jakarta in Indonesia positions residents as the main actors in the process of understanding informal settlements and their needs (Rame Rame Jakarta, 2021). As such, the outcomes of their engagement practices identify the nuances of particular environments and the priorities of communities, revealing opportunities for institutional changes. The findings of their mapping processes draw on personal experiences of communities affected by floods, including children, and reveal essential insights into the local perceptions of the environment that can inform the production of more integrated and site-specific NbS.

Conclusions

In this Perspective article, we discussed examples of engagement practices that illustrate how consultative, co-designed and transformative approaches can be achieved. Drawing on lessons from the authors' own practices, we systematized our findings in the form of a framework, which adapts previous conceptual model of upgrading to the context of NbS (Sattherthwaite et al., 2020). This framework posits that transformative approaches should involve multiple stakeholders in order to foster positive changes in the institutional and socio-ecological systems. These approaches can be translated into connected and integrated visions of NbS if they are able to consider local priorities and environmental contexts.

Connecting with the needs of communities in their own terms should be a central aspect of transformative approaches toward NbS. Recent research on the topic indicates that this can be supported by the involvement of "gatekeepers" who promote that all voices are recognized and heard, and that local knowledge is integrated into project plans (Diep et al., 2022). The work of NGOs and grassroots movements can offer insights into how researchers and practitioners spearheading the use of NbS can overcome barriers that reinforce "power dynamics that restrict the participation of historically excluded actors" (p. 280; Woroniecki et al., 2020; Melanidis and Hagerman, 2022).

The examples highlight the importance of involving local actors who can champion deeply personal engagement practices to advance transformative approaches to NbS. The work of the NGO Rame Rame Jakarta in Indonesia, for example, is premised upon engagement practices that are not dictated by experts and technical requirements. Instead, by using emotional mapping, transect walks and other engagement practices with informal workers, their work offers opportunities for communities to play a key role in the process of mapping their environments and co-producing knowledge. These processes are key to accelerating institutional change and materializing new forms of multi-stakeholder governance of NbS (Frantzeskaki and Kabisch, 2016; Cousins, 2021).

The multi-stakeholder engagement practices in these projects were made possible through an iterative process that expanded beyond informative and consultive approaches and allowed NbS to be integrated with local needs and priorities that local stakeholders can relate to. Based on these examples, we argue that a transformative approach to NbS requires a different model of participation, one that is tightly connected to local ways of understanding the environment and its social relationships. Due to the multidimensional socio-ecological nature of NbS, it is important to highlight that manipulative and informative approaches are insufficient to support a just and site-specific implementation of these systems. Instead, a transformative practice should be premised on the understanding that community participation should inform the goals, values and expected outcomes of projects implementing NbS in informal settlements.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

EW oversaw the research, co-designed the framework, and edited the manuscript. HR wrote the initial draft, co-designed the framework, edited the manuscript, and designed the supplementary material. PH co-designed the framework, reviewed, and edited the manuscript. LD reviewed and edited the manuscript. BN and KK provided papers and information for the research. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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