

A collaborative approach to green infrastructure planning, protection and use in the City of Tshwane, South Africa

Introduction

The Integrative Green Infrastructure Planning (GRIP) project is an interdisciplinary research project that aims to provide new knowledge on urban green infrastructure (GI) in South Africa. Urban GI includes the environmental features that are spread out across a city, from nature reserves and natural streams to parks, street trees and gardens. The research project focused on knowledge exchange and capacity building to improve the coordination, planning and maintenance of urban GI in the administrative capital of South Africa, the City of Tshwane. A systematic integration of GI concepts in urban planning shows promise in protecting biodiversity, reducing climate hazards and improving health as Tshwane faces rapid urbanisation and struggles to address the depletion and degradation of existing GI. Therefore, the research team aimed to co-develop context-specific proposals and actionable principles to realise multifunctional GI benefits in Tshwane together with public and private partners.

This research is the most comprehensive multidisciplinary study on GI in sub-Saharan Africa that the researchers are aware of. The project extended over a period of two years, with most of the fieldwork conducted between May 2021 and October 2022. The project considered both managed and unmanaged green space areas in the city, and how to improve their multifunctionality so that they can meaningfully contribute to improving social and ecological health, while reducing climatic risks.

Two municipal-owned 100-hectare study sites were co-selected with municipal stakeholders to consider unmanaged green spaces with social and ecological potential on river systems. On the ground, we conducted a community survey among 200 residents, a rapid assessment of multifunctional benefit provisions, and first-hand observations of local stormwater systems. At metro level, we reviewed 28 policy documents and conducted 18 semi-structured interviews with officials. Four design studios were held with landscape architecture students, as well as eight cross-sectoral co-creation workshops that explored GI benefits, spatial planning and design in the city. We examined the challenges, opportunities and local proposals for GI applications, and facilitated the uptake of GI principles in planning and management.

Results

We found that on-the-ground GI challenges include a complex mix of undefined ownership, low maintenance, invasive plants, safety risks and current informal and illegal uses. These challenges infringe on vulnerable ecologies through erosion, sewer leaks, blocked stormwater pipes and dumping, which can decrease ecological integrity and increase risks, such as flooding. Opportunities for GI enhancement include co-ownership and maintenance, which can be achieved by creating socio-economic incentives for stronger human-nature relations, multifunctional benefit provision and greater care for GI in local communities.

At the metro level, GI planning challenges include scarce resources, the low valuation of GI, competing interests, limited enforcement and cross-coordination, and the need for technical knowledge and skills. Opportunities to overcome these lie in collaborative investment and partnerships towards a shared vision to co-create multifunctional urban GI.

Conclusions

On the ground, there is a general conflict between human presence, the quality of nature and biodiversity in GI. However, the study proposes that interactive, creative research can facilitate increased local awareness, engagement and co-existence, with GI leading to greater benefits across stakeholders in time and space.

Access to GI benefits is physically constrained and socially determined by knowledge, networks and safety factors. However, there are current benefits and potential in unmanaged green spaces that could become accessible through design. This includes co-design with municipal departments and communities.

There is willingness and potential within current communities to co-manage green spaces. We therefore argue for socio-economic incentives that could encourage stronger human-nature relations, the provision of multifunctional benefits and greater care for GI in local communities across genders and generations.

GRIP managed to build capacity at various levels. At the metro level, it addressed GI planning and management by proposing and integrating GI guiding principles that target Tshwane's planning policy documents, while remote sensing and geospatial analyses led to a GI decision support tool to inform large-scale GI planning for the protection and upgrading of urban GI. The study improved the aptitude of students and researchers to engage with multifaceted GI design and planning problems across disciplines and develop socially just and environmentally sound multifunctional solutions. The study's creative outreach projects moved beyond typical one-way dissemination towards community dialogues that spoke to local capacities and the means to engage with residents on GI. GRIP also effectively expanded environmental potential by shedding light on GI benefits and enhancement for risk management across sectors and stakeholders involved.

Recommendations

Urban GI planning in Tshwane requires an emphasis on environmental protection, multifunctionality, multi-scaled approaches and safety. This could be achieved locally by encouraging and elaborating on a joint, metro-wide vision that includes collaborative governance, active citizenship and cross-sectoral partnerships.

A cross-sectoral co-development of policies is required to formalise and legalise activities that are enhancing GI locally. Socio-economic activities create local income, and together with other informal uses, such as pocket parks and urban gardening, create an incentivised basis for co-ownership and care, which preserve green spaces for different activities and uses. Existing policies have the potential to formalise such engagements if they are creatively adjusted.

Use and overexploitation must be balanced through educational activities and community initiatives, strengthening social connectivity and nature appreciation through enhanced ownership and care. South Africa faces a future with a higher risk of the heat island effect and severe flooding, where urban green spaces can be a part of nature-based solutions and increase resilience, making their protection and optimisation for multifunctionality an urgent matter.

GI's spatial planning and built fabric integration can mediate current habitat fragmentation and alleviate climatic hazards, which coincide with non-motorised transport routes where people can move safely while appreciating contact with nature. The spatial decision support tool developed by GRIP can aid the metro with sound decision making on the development, upgrading and upscaling of GI.

In South Africa, there is still a need for access considerations to be broadened to explicitly embrace both spatial and socio-political barriers that shape people's ability to benefit from GI. Physical access can be improved through design that specifically targets access, diversifies use and increases safety through visual access and surveillance.

The provision of benefits and access can be further enhanced through strategic and inclusive planning and design that builds upon trans- and interdisciplinary collaboration and the co-management of green space. Building on communities' inherent local knowledge and innovative power, effective participation must be expanded to include empowerment and the instilment of a sense of care and ownership. The follow-through requires the co-development process to continue, anchored and embedded in the metro.