UN environment programme

Briefing Paper No. 3: Global South Innovations in Water-responsive Urbanism: Case Studies for Urban Africa

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Three examples from the Global South, Medellín (Colombia), São Paulo (Brazil) and Bangladesh, offer critical insights into how water-responsive urbanism can emerge under complex social, economic and environmental constraints. Selected for their diversity and relevance to African contexts, these examples reveal how communities, municipalities, and national agencies can collaborate to deliver practical, inclusive and climate-resilient solutions.

In Medellín, community-led green corridors link informal settlement upgrading with slope stabilization and flood mitigation. São Paulo illustrates the challenges of transitioning from engineered flood control to nature-based river restoration, balancing ecological goals with the realities of informality and resettlement. Bangladesh shows how local knowledge and adaptive design enable low-cost, community-centred responses to extreme flooding and unstable terrain.

Together, these experiences highlight key lessons for African cities: the importance of participatory planning, institutional coordination, incremental implementation, and respect for local adaptive practices. They underscore that effective water-responsive urbanism depends as much on governance and social equity as on technical design.

Content

1 Medellín, Colombia

The Green Belt

Medellín, Colombia's second-largest city, has transformed one of the most violent cities in the world into a model of inclusion and urban sustainability.[1] Local government initiatives have increasingly used green infrastructure to address landslides, flooding and informal land occupation.[2] Shaped by the Aburra river and steep surrounding mountains, the city faces significant hazards; an estimated 180,000 households (mostly informal settlements) are vulnerable to mudslides and other climate related risks.[3] Decades of rural violence drove large numbers of people to settle on the mountainsides of Medellín, accelerating the expansion of informal settlements.[4]

The 2012 Metropolitan Green Belt is best represented by its pilot project, the 75km-long park Jardin Circunvalar on the slopes of the Aburra Valley.[5] In 2015, the Municipality launched the Green Corridors Project to further harmonize the city with its natural environment by connecting parks, waterways, and green spaces through a network of urban vegetation corridors. The green belt included three zones:[6]

- A Protection Zone with ecological restoration of the hillsides;
- A Transition Zone with highest concentration of residents living in informal settlements, with metropolitan parks, farming projects, education gardens and risk-mitigation measures.
- A Consolidation Zone with linear parks, structural intervention and habitat-improvements.

The program's design philosophy mirrors Sponge City principles by creating multi-layered vegetation corridors that mimic natural forest structure, and using native species selected for their capacity to absorb pollutants. Green corridors follow both transportation arteries and stream beds, reconnecting fragmented ecosystems from hillside peripheries to the valley centre.

This approach replaced impermeable concrete surfaces with bioswales and soft landscaping, transforming stormwater management from rapid conveyance to infiltration and retention.

The greenbelt project required difficult decisions about relocating thousands of households living in self-built homes on unstable terrain and in officially designated high-risk, non-recoverable areas.[7] The policy intention was to support affected families to move into the Zone of Consolidation and other safer locations across the metropolitan region. However, some residents expressed concern that the extent of the risk was being over-estimated, potentially enabling wide housing clearance and targeted redevelopment linked to the Green Belt programme.[8] These dynamics underline the need for robust trust-building, clear communication, and transparent decision-making between municipal authorities and informal communities to ensure that NbS interventions are both socially legitimate and protective of residents' rights.

Implications for Urban Africa

Medellín demonstrates that steep topography and informal settlements need not be barriers to nature-based water management. African cities, such as Freetown, Kampala, and Kigali, can draw on this example to design their own green corridors that stabilize slopes, manage stormwater, and create new public spaces. The key lies in embedding NbS within urban development frameworks and risk management plans, ensuring community co-design and prioritizing in-situ upgrading wherever feasible. Where relocation is unavoidable, it should be managed transparently and in partnership with affected communities to the fullest extent possible. For resource-constrained contexts, Medellín's emphasis on native vegetation, low-maintenance systems and incremental implementation provides a practical pathway. Municipalities and national agencies could pilot hillside green corridors as part of city masterplans, linking them to employment creation, youth training, and climate-adaptation programmes.

2. São Paulo, Brazil

Tietê River Valley Park (PVT)

Located in the headwaters of the Tietê River Basin with a complex hydrological network, São Paulo historically buried streams or converted them into concrete channels, an approach that ultimately exacerbated flooding while degrading water quality.[9] Today, the metropolitan region's 18 million plus inhabitants face dual water challenges: annual flooding and increasing water scarcity.[10] Between 2011-2020, floods affected 170,000 people and caused losses exceeding $110 million.[11] It is a water crisis that is shaped by deep spatial inequality: flooding disproportionately impacts low-income communities concentrated in floodplains and along the edges of rivers and reservoirs.[12] In the early 2000s, São Paulo initiated a fundamental shift from its concrete-dominated approach, launching a linear park program to restore riparian corridors, enhance stormwater infiltration, and provide public amenities.[13]

Image: The Tietê River , Getty Images

Led by the Department of Water And Electrical Energy (DAEE), the flagship Tietê River Valley Park (PVT) is a 75km green corridor that attempts to reverse decades of channelization by restoring floodplain functions. However, this transition from grey to green infrastructure had to contend with the city's social and geographical reality. The very areas targeted for ecological restoration house thousands of vulnerable families who settled there due to exclusion from formal housing markets.[14]

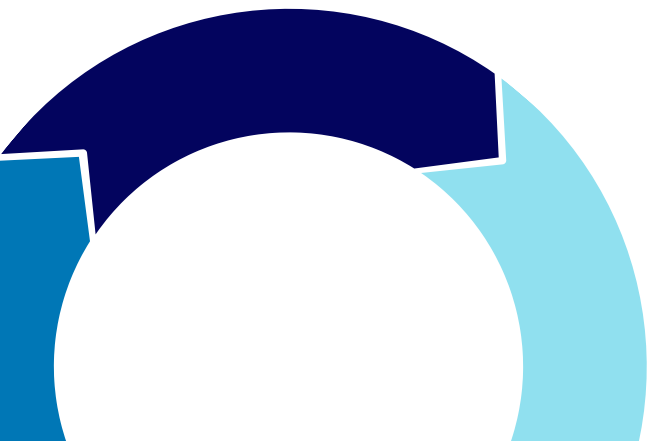
More than a decade after its announcement, the PVT demonstrates how large-scale Nature-based Solutions (NbS) intersect with existing urban inequality and complex governance realities:

- *Resettlement considerations:* The PVT called for the removal of around 40,000 people to return the Tietê riverbanks capacity for flood regulation.[15] Community responses were mixed: some residents welcomed the government offers of subsidized housing and the chance to re-locate from flood-prone areas, others express frustration over inconsistent state follow-through, unclear timeframes and limited project details.[16] This range of reactions underscores the difficulty of balancing ecological restoration with diverse community needs and expectations.
- *Uneven progress*: The project spans varied urban conditions. More than a decade after its launch, implementation has advanced only in fragments, hindered by land-tenure conflicts, resettlement costs, and fiscal constraints.[17] Progress is fastest in consolidated, administratively legible zones, while progress in flood-prone peripheral areas lagged due to informal land tenure, limited finance, and fragmented governance.[18] A further $100 million has since been allocated to extend the project into the eastern part of the basin.[19] The varying urban conditions create distinct implementation requirements across the project area.
- *Institutional coordination challenges*: The PVT sits at the intersection of water management, urban planning, housing, and social policy. Agencies maintain distinct mandates and operational procedures, requiring ongoing efforts to align objective and implementation strategies.[20] Managing these institutional interfaces while maintaining project momentum remains a core challenge.

Implications for Urban Africa

São Paulo's experience underscores that NbS transitions unfold unevenly, especially where informal settlements, fragmented institutions, and social inequality intersect. For African urban contexts key insights include:

- *Design for incremental implementation:* Given fiscal constraints, African urban contexts should plan NbS projects that can be implemented in phases over extended periods. In Kitui, Nakuru and Mwanza, smaller and modular NbS are demonstrating how flood mitigation can be socially embedded and financially feasible. Each phase should deliver tangible benefits to maintain political and community support.
- *Balancing ecological restoration and informality:* Many African cities are expanding along rivers and wetlands, where residents have developed their own adaptive strategies to recurrent flooding. In Nairobi's Mukuru settlements, and in Dar es Salaam's Msimbazi Valley, efforts to restore river corridors and create open green spaces face the same dilemma as Sao Paulo's: how to protect ecosystems without displacing the people most exposed to risk.
- *Build on existing practices*: many African informal settlements already demonstrate water-sensitive practices through permeable materials and respect for natural drainage. NbS should document and strengthen these practices rather than replacing them wholesale, working with community adaptions.
- *Institutional integration across fragmented systems*: The PVT's slow progress mirrors coordination challenges seen in Accra's GARID project. Aligning water management, housing and social policy requires metropolitan-scale governance and financing that can bridge ministerial and jurisdictional divides.



3. Bangladesh

Bangladesh faces compound vulnerabilities that mirror challenges confronting African coastal and riverine urban areas: extreme urban density, annual flooding, large informal settlements and climate change intensifying monsoon unpredictability. Bangladesh's response combines traditional water management practices with contemporary architecture and engineering, creating NbS that maintain productivity and livelihood security during flood events.

Image: A Khudi Bari in the Kurigram District of Bangladesh
Photograph by Deen Sharp, April 2025

Khudi Bari (Little House)

Unlike conventional disaster response that evacuates populations or provides emergency shelter, Bangladesh has developed adaptive infrastructure enabling communities to live productively with recurring floods. This adaptive philosophy is exemplified by the *Khudi Bari* (little house), a modular bamboo structure that can be rapidly disassembled and reassembled, allowing temporary relocation during severe floods while preserving community ties and proximity to livelihoods.[21]

Integrated Development of Hatirjheel Area Including Begunbari Canal (HJP) (2008-2012)

This wetland restoration project addressed urban flooding and drainage congestion by reviving the natural drainage systems. The project increased green and open space, covering 311 acres of land in central Dhaka. Beyond flood management, it eased traffic congestion through new vehicular roads and bridges, operated water-based mass transit, retained monsoon water, managed wastewater and provided recreational facilities.[22]

Sheikh Rasel Nagar Park (SRNP) (2011-2022)

Located in Narayanganj, a historic river port near Dhaka, SRNP transformed an abandoned 18-acre dumping zone around Jimkhana Lake into a socially inclusive public space. The restoration demonstrates how degraded urban water bodies can be rehabilitated to deliver both ecological and social benefits.[23] The project illustrates principles of adaptive reuse relevant for African cities facing similar challenges of degraded water bodies serving as informal dumpling sites. Rather than expensive remediation followed by conventional development, the restoration maintained water functions while upgrading ecological and social value. This approach proves relevant where municipal budgets cannot afford comprehensive cleanup and redevelopment.

Critical Lessons

The wetland restoration projects succeeded through multi-sectoral coordination that aligned flood management with transportation, recreation, and ecosystem objectives. This integration secured political support and financing from multiple government departments, overcoming the fragmented budgets that typically constrain NbS. The projects' visibility in central urban areas generated public support and demonstrated government capacity, creating momentum for additional investments.

Despite proven effectiveness, several constraints limit wider replication. Wetland restoration faces political economy challenges as land speculation and development pressures create opposition from actors benefiting from wetland conversion to built-up uses. Restoration displaces informal settlements occupying wetland areas, requiring relocation and compensation programs that governments struggle to implement equitably. The HPJ project required the relocation of over 3,000 households, a process that generated conflict and implementation delays.

Implications for Urban Africa

Bangladesh's adaptive water management offers particularly relevant pathways for African urban contexts confronting similar vulnerabilities. It is possible to build resilience through incremental, productive, and community-centred interventions that work with existing socio-economic and ecological systems rather than replacing them. The Sheikh Rasel Nagar Park provides an important example for African urban contexts where waste-filled wetlands and polluted waterways represent both environmental hazards and untapped opportunities. Cities like Lagos or Nairobi, where canals and rivers serve as informal dumping grounds, could rehabilitate these spaces without expensive remediation by maintaining water functions while upgrading ecological and social value.

The modular adaptive infrastructure exemplified by the Khudi Bari aligns with African fiscal and institutional realities, particularly in peripheral urban areas experiencing rapid urban growth. Rather than requiring permanent relocation or expensive flood defences, this approach enables communities to maintain proximity to livelihoods while adapting to periodic inundation. Flood-prone settlements in Bwaise (Kampala) or Tandale (Dar-es-Salaam) could adopt similar modular housing that preserves community networks during flood events. While the Hatrijheel project's multi-sectoral integration offers a blueprint for overcoming the budget fragmentation that constrains African municipal action.

Notes

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Aknowldegements

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