

Occasional Paper

308

July 2020



Nature-based Solutions to Climate Change in Coastal Cities

SUMETEE GAJJAR

African perspectives
Global insights

Abstract

Presently, there is a unified message in the global policy discourse and internationally mandated scientific assessments that advocates nature-based solutions (NbS) as the basis for transforming society. NbS are underpinned by an ecosystem services understanding of humans and their relationship with nature. Such a transformation comes with the imperative to include a range of social actors, considering their past and current vulnerabilities, and at the same time contribute to nature preservation. This paper explores whether justice (environmental/climate/biodiversity) as an overarching goal can help meet the transformational promise and inclusive appeal of NbS, while addressing people's socially differentiated vulnerabilities to multi-faceted risks related to climate change and biodiversity loss. A review of urban NbS from India, South Africa, Seychelles and Tanzania, focusing in particular on NbS in the context of coastal cities, provides various insights relevant to international and national policymakers, urban actors (planners and development workers) and scholars of urban sustainability.

Introduction

In the future, most of the global population, economy and built environment will be concentrated in urban centres. Nearly 90% of the projected increase in urban population is expected in Asia and Africa.¹ In the coastal cities of South Asia and Africa sea-level rise, together with increasing storm frequency and intensity, poses serious threats to local populations and infrastructure. Climate change also threatens terrestrial and marine ecosystems. At the same time, research from a social ecological systems framework shows that the poor's vulnerability remains entrenched and resources for adaptation are limited. At the same time, migration or displacement owing to environmental, social or climate change factors does not always lead to reduced vulnerability or improved well-being.²

In this context of increasing vulnerability of people living in coastal urban areas, the potential of nature-based solutions (NbS) as an umbrella concept for transformative responses to ecological, disaster and climate risks has received significant policy attention. NbS are defined as 'actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits'.³ Initially, NbS were meant to contribute to climate change adaptation and mitigation agendas, promoting ecosystems-

1 UN, Department of Economic and Social Affairs, *Population Division, World Urbanization Prospects: The 2014 Revision* (New York: UN, 2015).

2 Sumetee P Gajjar et al., "Entrenched Vulnerabilities: Evaluating Climate Justice across Development and Adaptation Responses in Southern India", chap. 24 in *Climate Futures: Re-imagining Global Climate Justice*, eds. Kum-Kum Bhavnani et al. (London: ZED Books, 2019).

3 Emmanuelle Cohen-Shacham et al., eds., *Nature-Based Solutions to Address Societal Challenges* (Gland: International Union for Conservation of Nature, 2016).

based adaptation (EbA) and ecosystems-based disaster risk reduction (eco-DRR). In the global policy discourse on climate change and biodiversity, NbS are well established as an umbrella concept for a range of interventions, including EbA, eco-DRR, blue and green infrastructure, and ecological and catchment systems engineering.

Coastal cities of the Global South are important for urban development, conservation and eco-tourism. Crucially, coastal cities are home to millions who depend on coastal and marine ecosystems for nutrition, livelihood and habitat, but are also exposed to particular climate risks owing to their location. Urban resilience is as much about human well-being as it is about protecting natural and built assets.⁴ At the same time, coastal cities are also emerging as places of opportunity, where responses to climate and disaster risks are establishing new good practice examples to enhance the resilience of coastal communities.

Coastal cities are home to millions who depend on coastal and marine ecosystems for nutrition, livelihood and habitat, but are also exposed to particular climate risks owing to their location

This paper argues that urban NbS may have to be reframed in the context of South Asia and Africa, as well as other regions of the Global South, as they grapple with socio-economic vulnerabilities, climate risks and the need to respond to the challenges of biodiversity loss. The Global South has a history of sustainable practices such as community-based and regenerative resource use and water harvesting, as well as a culturally-imbued relationship with nature (sacred groves and temple ponds). The concept of NbS is not new to the Global South. NbS practices have existed in diverse ways, and enabled past civilisations to live sustainably alongside natural assets such as rivers, waterbodies and forests. Novel, more resilient socio-ecological systems may thus arise in coastal cities and regions by integrating diverse knowledge sources on human-nature co-thriving.

Coastal cities are emerging as places of opportunity, where responses to climate and disaster risks are establishing new good practice examples to enhance the resilience of coastal communities

⁴ Sumetee P Gajjar et al., *A Framework of Urban Resilience Planning* (Bangalore: Indian Institute for Human Settlements, 2013), <http://iihs.co.in/knowledge-gateway/a-framework-of-urban-resilience-planning/>.

NbS in South Asia and Africa

This section looks at NbS in selected coastal cities: Mahé and Praslin islands in Seychelles; Dar es Salaam in Tanzania; Panaji in Goa, India; and eThekweni in South Africa. These cases are designed to help minimise the most severe impacts of climate change on coastal cities and regions while addressing social equity, environmental justice and native biodiversity conservation.

Goa, India

The Jawaharlal Nehru National Urban Renewal Mission, initiated in 2005, is the first of several nationally formulated urban development missions in India. The concept of resilience has become important in these urban interventions, with the role of blue and green infrastructure gaining prominence in policy circles and development rhetoric. Two of the latest such policies are the Smart Cities Mission and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), aimed at improving the governance and sustainability of the growing number of large Indian cities through infrastructure and management reforms. While the Smart Cities Mission focuses on e-services and digitisation, AMRUT is divided into eight components: water supply, sewerage, septage, storm water drainage, urban transport, green spaces and parks, administrative reforms and capacity building. The built environment components of these city missions could launch NbS. For example, the water supply component includes the rejuvenation of water bodies for drinking and recharging groundwater. This can be extended to acknowledge the role that urban water bodies play in maintaining biodiversity and regulating urban floods.⁵ Similarly, green spaces and parks can be leveraged to conserve urban nature and ecological systems, and increase the resilience of cities. Five years into their launch, the two missions have been combined in several prominent cities, including Panaji, in Goa. Panaji and the surrounding peri-urban land of Goa showcases three diverse examples of NbS, each at a different stage of implementation, using myriad strategies and contributing in various ways to the resilience of the coastal region.

Coastal land in Goa consists of an intricate web of freshwater and saline estuaries and reclaimed agricultural land. These coastal zones have witnessed significant development in the last 40 years and the result is regular flooding during monsoons. The challenge when defining climate impacts in urban areas and designing appropriate adaptation strategies is often the fact that vulnerability is co-created through non-climatic impacts (such as urban growth or resource overexploitation) and climate impacts. The latter include changes in precipitation and temperature, as well as, in the case of coastal cities, sea-level rise, ocean warming and acidification, and more frequent and intense extreme weather events. Panaji is the capital city of Goa. Like other coastal cities and towns of India, it faces risks such as coastal erosion owing to sea-level rise, land degradation owing to urban expansion, and

5 Sumetee P Gajjar, "More than 'AMRUT': Indian Cities Need Nature-Based Solutions to Revive Themselves", *The Wire*, June 17, 2016, <https://science.thewire.in/society/urban/despite-focus-on-resilience-nature-based-solutions-are-underutilised-in-indian-cities/>.

loss of biodiversity owing to habitat conversion into other land uses. Ecological features of Panaji such as Khazan lands face extreme impacts of infestation, growth of invasive species, intensive agriculture, mining, and pollution from industrial and domestic waste.⁶ Khazan lands are reclaimed mangroves, characterised as ‘community managed, integrated agro-fishery-saltpan ecosystems’, and are particularly important for disaster risk reduction as they have been developed over centuries. Their erosion can lead to severe flooding in surrounding areas.

St Inez Creek is a 6km-long waterbody that originates in the marshland of Taleigao village in the peri-urban area of Panaji and is replenished by rainwater run-off from neighbouring hills. The creek connects with the Mandovi River close to where it runs into the Arabian Sea, and was an ecologically functional tidal waterbody until recently. It had social, cultural and heritage significance and was rich in biodiversity. However, the ecological functionality of the creek was severely compromised through a combination of natural degradation and anthropogenic influences. These included sedimentation, collapsed embankments, eutrophication, weed growth, pollution, the release of raw sewerage from neighbouring informal settlements and dumping of construction debris.

In 2017 a floating bioremediation island was created by Vishal Rawlley, an artist-environmentalist working on a community art project with the people of Camrabhat ward to restore a section of the creek. Along with local youth and experts such as geologist Arnaldo Do Carmo Lobo and architect-environmentalist Talulah D’Silva, several initiatives were undertaken to restore the creek. Attempts were made to prevent garbage and sewage from entering it, clean-up drives were carried out using a boat and nets, the creek edge was transformed into a community garden and waste recycling programmes were introduced. These interventions sought to create a model for citizen-led restoration programmes that could be implemented along the length of the creek with different stakeholders. Their efforts were recognised by the local people and the local press. The informal citizens’ group was invited by various consultants to the Panaji Smart City Mission to make presentations about their process and plans to scale the operations.⁷

An array of local stakeholders led by Imagine Panaji Smart City Development Limited, including the Corporation of the City of Panaji, Public Works Department, Water Resources Department, Goa State Pollution Control Board, Greater Panaji Planning and Development Authority and the Taleigao Village Panchayat, are busy rehabilitating the St Inez Creek. Proposals have been submitted to attract international funds towards these efforts. In keeping with the aims of the Smart Cities Mission and the AMRUT programmes, the urban and rural authorities hope to improve the health of the waterbody and address associated public health and biodiversity concerns.

6 Divya Sharma, Rozita Singh and Raina Singh, “Climate Resilience Infrastructure Services: Panaji” (Case Study Brief, Energy Research Institute, New Delhi, 2015).

7 Vishal Rawlley (Principal, Bombay Arts), interview by Sumetee P Gajjar, March 2020.

A mix of approaches have been proposed, including:

- sensors to monitor water quality;
- natural remediation;
- low-cost interventions such as traps and dragnets to filter solid waste at regular intervals along the creek;
- eco-friendly sanitation to prevent sewage from entering the water; and
- landscaping solutions to stabilise the banks and improve pedestrian access to public green spaces along the creek.⁸

The concept of a People's Biodiversity Register (PBR) was developed to address the loss of traditional knowledge systems related to medicinal use of plants, agriculture and animal husbandry, and to inform access to and benefit sharing of biological resources. The preparation of PBRs in India is mandated under the Biological Diversity Act of 2002, and undertaken by local Biodiversity Management Committees.⁹ A PBR is a legal document that contains detailed information on local biological resources, including medicinal or any other traditional knowledge associated with them. In recognition of the regional impacts and ecological footprints of cities, technical consultants were appointed by the Goa State Biodiversity Board to support the preparation of PBRs in 10 Goan villages, with extensive biodiversity surveys. Along with traditional ecological knowledge of various species, cultural practices with an emphasis on nature were also documented, as well as trends related to daily human-nature interactions.¹⁰

The Convention on Biological Diversity has long acknowledged the need to record traditional knowledge of biodiversity to inform environmental justice considerations and the planning of human settlements. The potential of incorporating traditional knowledge of flora and fauna into urban and coastal landscape design is immense, with the dual aim of increasing the climate resilience of restored habitats and the use of natural resources by local residents. Such community efforts prepare cities and city regions for when funds and land become available and political will supports urban and peri-urban forestry or ecosystem regeneration, and can be incorporated into the design of future NbS initiatives.

Dar es Salaam, Tanzania

More than 30% of Tanzania's population lives in urban areas, with the vast majority living in informal settlements that increasingly face water scarcity, flooding and extreme heat

8 Imagine Panaji Smart City Development Limited, *City Challenge: Panaji* (Funding Proposal, Imagine Panaji Smart City Development Limited, Panaji, 2019), <https://www.climate-kic.org/wp-content/uploads/2019/01/City-Challenge-Panaji.pdf>.

9 Goa State Biodiversity Board, *Glimpses of Biodiversity in Panaji* (Panaji: GSSB, 2020), <https://gsbb.goa.gov.in/wp-content/uploads/2020/02/GLIMPSES-OF-BIODIVERSITY-IN-PANAJI-6.pdf>.

10 Sahana Ghosh, "A 24-Year-Old Woman Is Leading the Way to Catalogue Biodiversity of a Small Goan Island", *Mongabay*, March 8, 2019, <https://india.mongabay.com/2019/03/a-24-year-old-woman-is-leading-the-way-to-catalogue-biodiversity-of-a-small-goan-island/>.

events. The port city of Dar es Salaam dominates the Tanzanian coastal zone, in terms of both population size and economy. It is one of the fastest growing metropolitan areas in the world, with approximately 6 million residents, expected to grow to 10 million by 2030.¹¹ An estimated 70% of urban development in Dar es Salaam is unplanned and more than a quarter of its population lives in the Msimbazi River basin and along its tributaries. The natural functions of the river have been severely compromised by urbanisation and accompanying impacts such as deforestation in the upper river basin, soil erosion and sedimentation, solid waste dumping and inadequate sanitation. As a result, provisioning of drinking water and agriculture on the fertile floodplains has been lost, and each successive flood leads to a greater loss of lives, nature and infrastructure.

The Msimbazi Opportunity Plan (MOP) was conceived and designed by a team of stakeholders, including government officials, scientists, planners, the private sector, non-governmental organisations (NGOs) and civil society members in 2018. The two main concerns highlighted through this process were flood attenuation and ecological restoration. Transformation of the Msimbazi River basin is part of the Tanzania Urban Resilience Program, funded by the World Bank and the UK's Department for International Development. Four core strategies are envisioned:

- mitigation (of the severity of flood hazards);
- protection (against floods by resettling people and businesses);
- transformation (by converting the most flood-prone areas into a city park, yielding new public spaces); and
- governance (to avoid uncontrolled urbanisation).¹²

The MOP targets upstream reforestation; making room for the water by widening the river channel and dredging (through civil engineering techniques); improving land use planning and solid waste management; and restoring wetlands and mangroves in the lower basin. The urban adaptation solutions include using dredged material to build terraces and clearing the flood plains to create land for commercial, recreational and housing purposes, free of recurrent flooding. Of the 12 000 housing units planned, 2 500 are dedicated to affordable housing, in order to accommodate the households currently in informal settlements in the lower basin, which will be resettled in Stage 1 of the programme. The long-term horizon for the MOP is 2050, with the first three stages to be achieved by 2030. The collective spirit of preparing the MOP is to be retained. Early wins include collecting hazard-related meteorological and hydrological data, and mapping built, infrastructure and community assets along the river. The upstream reforestation of Pugu-Kazimzumbwi natural forests articulated in the MOP connects with the Trillion Trees and AFR100 projects.

11 World Bank, *Dar es Salaam Case Study Overview: Climate Change, Disaster Risk and the Urban Poor – Cities Building Resilience for a Changing World* (Washington DC: World Bank Group, 2012).

12 World Bank, *The Msimbazi Opportunity: Transforming the Msimbazi Basin into a Beacon of Urban Resilience. Volume A: Strategy and Management Framework* (Washington DC: World Bank Group, 2019).

eThekwini, South Africa

eThekwini began planning city-wide climate-related efforts as early as 2004 through its Municipal Climate Protection Programme (MCP).¹³ A forerunner in climate adaptation planning and implementation, the city used the Durban Metropolitan Open Space System to identify priority biodiversity and ecosystem service areas. It then planned a range of EbA strategies, such as acquiring land and waterbodies for preservation and entering into agreements with the owners of vacant plots or degraded land.¹⁴ By preserving indigenous biodiversity and associated ecosystems, the MCP aims to increase the adaptive range of the city. In the absence of provincial or national guiding policies or legislation on climate change, the city adopted an incremental and non-linear approach to respond to specific climate change impacts such as increased storm-water run-off, the urban heat island effect, water conservation and sea-level rise. Over the next decade, the MCP, with the establishment of dedicated cells such as the Environmental Planning and Climate Protection Department, evolved to develop key components. These include a pathway for a green economy, community-based ecosystem adaptation, and adaptation plans in the water, health and disaster management sectors. Given high levels of inequality and disempowerment owing to South Africa's apartheid past, solutions that also generated societal co-benefits such as jobs, economic returns and/or community ownership of conservation efforts garnered considerable support among different social groups. Thanks to a knowledge partnership with the University of KwaZulu-Natal, several of the components of the MCP have benefitted from cross-learning between practitioners, scientists and scholars. The evolution of specific components has been captured as case studies in book chapters or journal articles, two of which are discussed below.¹⁵

An alliance between eThekwini's Environmental Planning and Climate Protection Department and the eThekwini Water and Sanitation Department (EWS) was established by 2014. This became possible once the EWS expanded its engineering mandate to include water provision and water security. With support from the South African National Biodiversity Institute, this partnership resulted in the establishment of the uMngeni Ecological Infrastructure Partnership (UEIP), which includes multiple state and civil society organisations.

The Aller River Pilot Project (ARPP) was initiated as part of Durban's resilience journey in 2016, supported by international donors and designed by the eThekwini Conservation Forum. The ARPP uses the knowledge and networks of the conservancy movement to devise a community-based approach to river rehabilitation. In alignment with the Durban Climate Change Strategy, the ARPP pursues control of pollution and environmental

13 Patrick Martel and Catherine Sutherland, "Governing River Rehabilitation for Climate Adaptation and Water Security in Durban, South Africa" in *The Geography of Climate Change Adaptation in Urban Africa*, eds. Patrick B Cobbinah and Michael Addaney (Cham: Palgrave Macmillan, 2019), 355-387.

14 Debra Roberts et al., "Exploring Ecosystem-Based Adaptation in Durban, South Africa: 'Learning-by-Doing' at the Local Government Coal Face", *Environment and Urbanization* 24, no. 1 (2012): 167-195.

15 Martel and Sutherland, "Governing River Rehabilitation", 167-195.

degradation in order to safeguard ecosystem services. This has been achieved by encouraging intensive community involvement through the capacity building of ‘eco-champs’, conservation and climate change awareness campaigns, and a collaborative, partnership-based approach with the University of KwaZulu-Natal. ‘Eco-champs’ act as intermediaries between the local government and the community. They mobilise support for action and funding from concerned local departments, work with eco-clubs in local schools, and organise community events and clean-up drives. A form of community-based monitoring is conducted regularly through river walks.

The Palmiet River Rehabilitation Project (PRRP) operates in the short, steep catchment in Durban’s urban core. The river catchment sees intense flooding events, exacerbated by the different land uses along the river, including high-income residential areas, an industrial zone, the Palmiet Nature Reserve, informal settlements and a university campus. An initial decision by the EWS to pursue engineering solutions at the informal settlements was withdrawn on the recommendation of the UEIP’s research partners. This recommendation was based on a recognition of the lack of trust between the EWS and community members from the informal settlement. A socialist constructivist approach was adopted in the PRRP, recognising socially constructed knowledge on community issues and the community’s relationship with the Palmiet River. Although the PRPP fits in well with the larger vision and the water and biodiversity themes of the Durban Climate Change Strategy, trust needed to be established among stakeholders with highly divergent worldviews.

Mahé and Praslin, Seychelles

Seychelles has benefitted from the successful and ongoing implementation of several projects across diverse coastal habitats, including coral reefs, mangrove forests, sandy beaches, coastal forests and freshwater wetlands. These projects vary in size and focus, with some adopting and conserving entire islands (Aride Island by the Island Conservation Society and Cousin Island Marine Protected Area by Nature Seychelles) and others restoring reefs and habitats with support from neighbouring hoteliers and volunteers (run by local NGOs). Yet others focus on terrestrial restoration (wetlands and forestry) involving local communities that are dependent upon these ecosystems for livelihoods and subsistence. International adaptation funds are attracted to ecosystem restoration to reduce risks from climate impacts by focusing on coastal and marine conservation. These, in combination with local funding sources such as the Seychelles Conservation and Climate Adaptation Trust; private sector funds and taxes; and government funds (via the Environment and Climate Change Ministry), have supported a sizeable number of NbS projects in Seychelles. Worth noting is the progression of project scope from individual initiatives across the diversity of island habitats to a view of the entire island as a social-ecological system, comprising people, ecosystems and biodiversity, vulnerable to the impacts of climate change, species extinction and land degradation.

The Ecosystem-based Adaptation through South-South Cooperation (EbA South, 2013–2019) project is a global initiative funded by the Global Environment Facility (GEF) through

its Special Climate Change Fund. In Seychelles, EbA South's overall goal is to build the climate resilience of vulnerable local communities through demonstrative interventions in mangrove ecosystems.¹⁶ It restored a 300ha degraded landscape at Anse Royale in southern Mahé by replanting mangroves, removing invasive species and desilting channels to increase the water-storage capacity of wetlands. The actual implementation, including mangrove replanting, was undertaken by volunteers from the community and private sector. Knowledge on mangrove ecosystem rehabilitation techniques was consolidated, while public awareness drives on the interconnectedness of habitat restoration and climate change adaptation were also conducted.

The Ecosystem-based Adaptation to Climate Change in Seychelles project (2014–2020) is a national initiative, financed by the Adaptation Fund and implemented by the Ministry of Environment, Energy and Climate Change.¹⁷ It aims to reduce the vulnerability of the people of Mahé and Praslin to water scarcity, and of the built environment to recurrent flooding. The project responds to the risks generated by sea-level rise and increased storm surges (linked to cyclonic activity in the Western Indian Ocean) by restoring the ecosystem functionality of degraded catchment areas and eroded coasts. Project activities include creating wetlands, clearing waterbodies and rehabilitating coastal wetlands, enabling improved water flow and retention capacity, and aiding the recovery of coral reef habitat.¹⁸ Local civil society bodies are deeply involved in rehabilitation activities, and watershed committees comprising local residents have been established. Before the actual land restoration, capacity-building initiatives were held covering forestry management, plant identification and safe methods to control invasive alien species. This training of volunteers from local communities enables their employment in EbA implementation activities in subsequent phases of the programme.

The Ridge to Reef project (2020–2025) is funded by the GEF. It incorporates sustainable land management into development planning by raising the conservation status of areas outside formally protected areas, reducing land-based impacts on marine ecosystems, and engaging local communities as guardians of their natural resources.¹⁹ It connects local restoration efforts (by arresting and reversing ecosystem degradation) to conservation of globally significant biodiversity and the effective management of large marine ecosystems (including coastal and near-shore marine ecosystems). Practices such as sustainable land management, sustainable forest management and agroforestry will be used to preserve different habitats in Seychelles, with the possibility of future eco-tourism. The project includes areas on Praslin and Curieuse islands, while involving local partners such as the

16 Elvina Henriette, *Progress Reports 2017–2018: Enhancing Capacity, Knowledge and Technology Support to Build Climate Resilience of Vulnerable Developing Countries, Seychelles Pilot Project, Ecosystem-based Adaptation through South-South Corporation* (Victoria: Government of Seychelles, 2018).

17 Adaptation Fund, *Ecosystem-Based Adaptation to Climate Change in Seychelles: Project Document* (Washington DC: Adaptation Fund, 2014).

18 Jude Bijoux, "Marine and Coastal EbA for Enhanced Resilience in Southern Africa: Country Review Seychelles" (Special Report, Appendix 1, South African Institute of International Affairs, Johannesburg, 2019), <https://saiia.org.za/research/marine-and-coastal-eba-for-enhanced-resilience-in-southern-africa-country-review-seychelles/>.

19 Global Environment Fund, *GEF-6 Project Identification Form (PIF): Project: A Ridge to Reef Approach for the Integrated Management of Marine, Coastal and Terrestrial Ecosystems in the Seychelles* (Washington DC: GEF, 2017).

Seychelles National Parks Authority and Terrestrial Restoration Action Society of Seychelles, an NGO with several decades of work in restoring degraded land. Other partners include local schools for community outreach and the University of Seychelles.

A novel practice promoted through this project is the establishment of temporal protected areas in the south of Mahé, building on previous work done by the Marine Conservation Society Seychelles. Highly mobile marine vertebrates are protected by delineating transient critical habitats used for nesting and foraging (by turtles) or accessing zooplankton blooms (by whale sharks). Through analysis of historical and current data on seasonal, environmental and physical cues, criteria have been established to determine the time and location of temporal protected areas.

Recommendations

Urban areas are first and foremost concentrated habitations of humans. Therefore, NbS in urban areas must necessarily engage with and involve people, and build upon their interactions with nature. NbS interventions in response to the impact of climate change, as reviewed in this paper, are designed in response to the socio-economic, ecological, policy, planning and development contexts within which they will be implemented. Sometimes they emerge in the absence of supporting policy frameworks. Given the heterogenous forms and context-specific dynamics of NbS initiatives, it is not possible to simply transfer solutions across different locations or contexts. However, there are principles that can be distilled from these cases, especially in terms of social justice and inclusivity.

Maximising learning and aligning the goals from parallel policy processes

The four countries examined in this paper are signatories to both the UN Framework Convention on Climate Change and the Convention on Biological Diversity, and in some cases also to the Ramsar Convention and the UN Convention to Combat Desertification. In response they have prepared national biodiversity strategies and action plans (and, in the case of South African cities, local biodiversity strategies and action plans as well) and have committed to Nationally Determined Contributions (in the context of the Paris Agreement) to achieve biodiversity and climate change targets. The existing research and records of consultation work undertaken towards these processes should be aligned (and, if possible, merged) in order to achieve climate adaptation, carbon sequestration and biodiversity conservation targets simultaneously. This will ensure a coherent and integrated response.

Situating cities in their larger ecological context for sustainability goals

The human and near-ecological interactions through which residents of cities of the Global South use natural resources from their hinterland are rarely accounted for in ecological footprint and carbon footprint methodologies. Such methods are of little relevance to cities

of the Global South, where resource cycles are predominantly local for a large proportion of the population. A socio-ecological frame for understanding and targeting local flows of ecosystem services is therefore most appropriate. Strategies to conserve forestland around Dar es Salaam and Panaji are informed by urban residents' need for fuelwood and other forest products. The conservation of biodiversity is a co-benefit – these reserves help provide habitat corridors near or through the city, while land stabilisation prevents socio-ecological disasters further downstream. Similarly, restoration of river systems in eThekweni, Panaji and Dar es Salaam will have social benefits for local residents living in catchment areas or connected to their water flows through direct use.

Transitioning from discontinuous projects to a large-scale continuum programme

The Ridge to Reef project and the Msimbazi River restoration project are examples of long-term, large-scale endeavours that view the entire coastal landscape (in the first case) and the river through the city (in the second case) as continuous systems, with strong upstream and downstream interactions. Such approaches reflect an understanding of city-core and peri-urban areas as being connected to surrounding landscapes and associated resources. Coastal cities are particularly sensitive to these connections as they are often sites of biodiverse estuarine systems, and deforestation in upper catchments can have deleterious impacts on marine and coastal life. In densely populated coastal cities such as Dar es Salaam the human impact on ecological systems and the impact of climate change create tight feedbacks between natural and social systems, which need to be incorporated into NbS design.

Transitioning from local participation to local empowerment and ownership

In order to redress social injustices, NbS initiatives have to be aligned with the larger development agenda. In South Africa, the Strategic Framework for EbA and accompanying guidelines promote EbA as a central component of the country's programme of work on biodiversity and climate change, while generating local economic opportunities. In India, the Smart and AMRUT city missions could relaunch an ecological view of the city. In Tanzania and Seychelles, the involvement of local NGOs (during stakeholder consultation and implementation) is one way in which representation of local issues and interests is ensured in conservation and restoration projects. The nearly two decades of EbA work in

In order to redress social injustices, NbS initiatives have to be aligned with the larger development agenda

eThekwini, with innovative formats for engaging people ('treepreneurs' at the [Buffelsdraai Community Reforestation Project](#) and eco-champs in the ARPP), have evolved from generating livelihood opportunities to undertaking a more social constructivist approach.

Local people are closest to the ecology of the locale and therefore are well positioned to understand the key drivers of ecological degradation or environmental pollution

Local people are closest to the ecology of the locale and therefore are well positioned to understand the key drivers of ecological degradation or environmental pollution. They have a historical association with the area encompassing social, economic and ecological dimensions. Local people also stand to gain the most from preserving or rebuilding ecological integrity or, conversely, will lose the most from climate change impacts, biodiversity loss and land or ecosystem degradation. Horizontal governance arrangements, where power is shared equally among people with divergent worldviews and political status, are slower and more complex but ultimately more effective.

Identifying niches where NbS are pursued in the absence of supportive policies

In the case of Goa, where there is a paucity of nationally sponsored, state-funded, local government-initiated or internationally funded NbS, citizens are finding niches to experiment with cultivation, land conservation and creek rejuvenation. Unfortunately, the risk of failure is quite high in such endeavours, as progress relies almost exclusively on the collective will of local community members. Urban development impacts and extreme weather events can easily sabotage early investments. The chances of success can be improved through collaboration with local knowledge partners (universities, schools, etc.). Governments interested in undertaking urban NbS would do well to identify and support such efforts. Initiatives such as the citizens' collective for creek rejuvenation in Panaji, the documentation of traditional knowledge of indigenous tree species in Goan villages, and preparation for the MOP in Dar es Salaam are anticipatory in nature. They are not fully funded projects, but await financial support and institutional legitimacy at different governance scales. In the case of eThekwini, the early years of urban environmental planning, embedded in ecosystem conservation principles, were undertaken in the absence of national guidelines for the use of EbA in coastal management. However, the learning-by-doing strategy pursued by the eThekwini municipality has become an important example of good practice for many other cities of the Global South, and has informed the design of South Africa's EbA policy.

Collaborating with local knowledge partners such as universities and schools

Collaborative networks with local universities can help integrate scientific knowledge with community knowledge on local biology, hydrology, soil science and climate impacts; develop new ways of engaging communities through principles from social science; learn and develop new formats for citizen science and community monitoring (Durban); use spatial mapping and climate and ecosystem modelling tools to design NbS in conjunction with engineered or built solutions (Panaji); and record the evolution of governance mechanisms that can work over the long term (eThekweni). Learning networks – including school students from the community, college students, university learners and lecturers, and community members – can use NbS as case studies for learning and teaching purposes (Panaji and Durban). Integrating NbS into local teaching curricula can help ensure that innovation from practice updates academic learning, and vice versa.

Collaborating across cities of the Global South

eThekweni benefits from being part of the [C40 Cities Climate Leadership Group](#) and international collaboration networks such as [Local Governments for Sustainability](#), and is connected to several African cities, including Dar es Salaam. Research could delve deeper into how these collaborations have helped the South African city and the Tanzanian metropole. While NbS are defined by the local planning and policy context, they are also created through the dynamism of the urban context, where different social groups, with divergent worldviews, live close to each other and share ecological commons such as water, air and public land. This characteristic, in addition to a direct reliance on natural resources for livelihoods and subsistence, could enable cross-learning across unique cities of the Global South. The principles of democracy and justice are incorporated in such collaborations, whereby each city is recognised for charting its own pathway or journey, and for incorporating NbS in ways that are most suitable to its particular context.

Creating ecological jobs in an urbanising world

South Asia and Africa face a similar trend of growing levels of urbanisation, both through the migration of growing numbers of people from rural areas to peri-urban areas (thus expanding the city's geographical footprint) and from the conversion of villages into towns, and towns into urban centres. This transition is often marked by the absorption of the migrant labour force into secondary and tertiary economic sectors within urban economies. However, NbS hold significant potential to support livelihoods and generate employment in these settings; successful NbS, when aligned with the development agenda, can yield green jobs. From the cases reviewed, such environmental jobs take the form of reforestation services (of terrestrial and mangrove forests); river health monitoring (Aller River project) and water services (eco-sanitation in Panaji); urban farming on collective and/or public land; installation and management of rooftop gardens (eThekweni); maintenance and cleansing

Successful NbS, when aligned with the development agenda, can yield green jobs

of coastal wetlands; removal of invasive alien plants; and marine habitat and species conservation (Dar es Salaam).

Confronting the contestations associated with nature conservation

Countries of the Global South often share the legacy of a colonial past. In South Africa, because of conditions under apartheid, nature is seen by many to be preserved for nature's sake, rather than out of a recognition of human dependence on ecosystem services. The result is that conservation is perceived to be anti-poor and anti-development.²⁰ This dichotomy is carried across into modern designed cities of the Global South (such as in India), where nature in parks is reserved for recreational and health benefits, and the use of nature for domestic (water for consumption or cleaning, fuelwood), healing or subsistence purposes is discouraged. In such situations, access to nature such as forests, grasslands and river water becomes a matter of social justice, as does decision-making around how these resources can be used and by whom. While it may not be straightforward to resolve such contestations, by acknowledging their existence NbS can start to engage with divergent views on nature.

Conclusion

The cases of NbS reviewed in this paper offer insights into how biodiversity and ecosystem services can become part of the larger human well-being agenda in the coastal cities of South Asia and Africa. Some of the projects discussed are still in their early phases, and it remains to be seen how their objectives of adapting to a changing climate, sequestering carbon to reduce greenhouse gas emissions, conserving biodiversity and ensuring justice through local empowerment can be achieved. The cases highlight the agency of diverse actors, ranging from urban residents, municipal champions and national government departments to international development agencies. In each case, there is an attempt to integrate diverse knowledge frameworks, landscape continuity and, sometimes, policy directives. There is no universal definition of NbS, but what is emerging is that cities of the Global South have enough in common to learn from each other while adopting the principles of democracy and justice.

20 Anna Taylor, Anton Cartwright and Catherine Sutherland, "Institutional Pathways for Local Climate Adaptation: A Comparison of Three South African Municipalities" (Focales 18, Agence Française de Développement, Paris, 2014), https://www.africancentreforcities.net/wp-content/uploads/2014/06/FocalesN18_GB_WEB.pdf.

Author

Dr Sumetee Gajjar

works in policy advocacy for climate adaptation and sustainable development. She has written books on urban resilience planning, climate justice and transformative climate adaptation. She is currently based in Cape Town, and collaborates with multiple local and international institutions to further knowledge of NbS in reducing social-ecological vulnerability and bringing climate justice to the Global South.

Acknowledgement

SAIIA gratefully acknowledges the support of the Swedish International Development Cooperation Agency (SIDA) for this publication.

About SAIIA

SAIIA is an independent, non-government think tank whose key strategic objectives are to make effective input into public policy, and to encourage wider and more informed debate on international affairs, with particular emphasis on African issues and concerns.

SAIIA's occasional papers present topical, incisive analyses, offering a variety of perspectives on key policy issues in Africa and beyond.

Cover image

Chowpatty Beach from Kamala Nehru Park lookout on a clear autumn day (filed image/stock)

All rights reserved. Copyright is vested in the South African Institute of International Affairs and the authors, and no part may be reproduced in whole or in part without the express permission, in writing, of the publisher.



Jan Smuts House, East Campus, University of the Witwatersrand
PO Box 31596, Braamfontein 2017, Johannesburg, South Africa
Tel +27 (0)11 339-2021 · Fax +27 (0)11 339-2154
www.saiia.org.za · info@saiia.org.za