Insight Brief

# How India Can Promote Nature-Based Solutions

*Lessons from Singapore, China, and the European Union*

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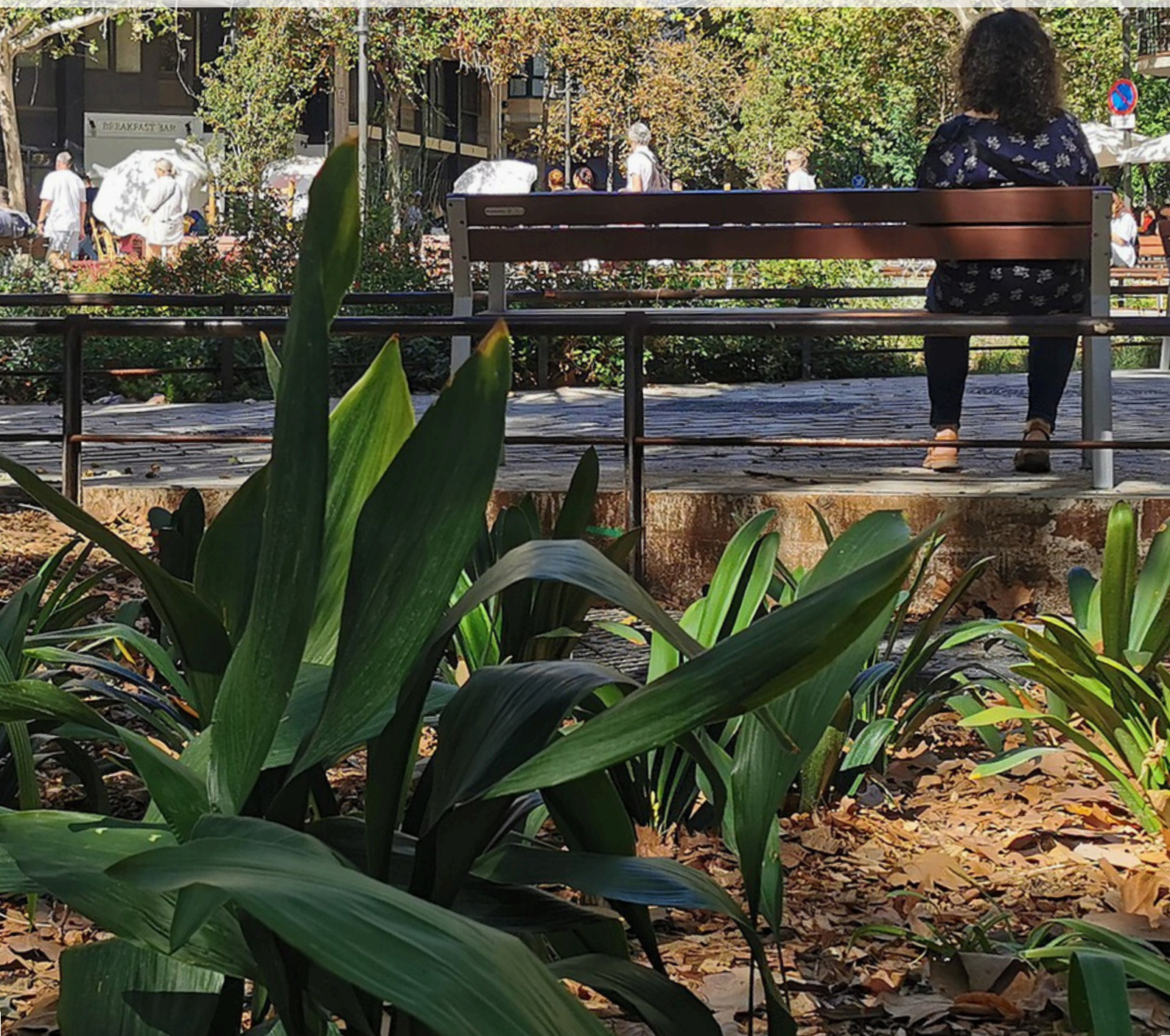

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## Context

Floods have become a recurring feature of Indian cities. In 2025 alone, Kolkata, Jaipur, Hyderabad, Mumbai, New Delhi, and Gurgaon, among others, were inundated, resulting in deaths and significant damage. While many floods were due to extreme weather events, poor urban planning exacerbates their impacts. Climate change and haphazard urbanisation are also responsible for extreme heat, water scarcity, air pollution, and biodiversity loss.

Cities can address these challenges by integrating nature-based solutions (NbS), that is, the use of ecosystems and ecological processes to provide environmental and socioeconomic benefits, with traditional infrastructure. For example, rain gardens allow for natural infiltration and significantly reduce surface runoff, thereby helping control flooding. Along with an efficient drainage system and climate-sensitive zoning, NbS such as rain gardens allow urban areas to better absorb climate shocks.

While there are NbS projects across India, their uptake is limited compared to Singapore, China, and the European Union, which have extensively integrated NbS across diverse landscapes. This has been possible due to their dedicated budgets for NbS, research investments, responsive governance, and community-engagement efforts.

*In this insight brief, we examine their innovative strategies to promote NbS and how India can emulate them.*

## Singapore: The "City in Nature" Model

**Despite Singapore's rapid urbanisation since the 1950s, half of its land comprises natural or cultivated greenery.**

This was the result of strategic policy planning over decades, beginning with the ambitious Garden City vision, launched in 1967. Its latest initiative is the Singapore Green Plan 2030, which aims to plant a million more trees across Singapore and increase nature parks' area by over 50% from the 2020 baseline, so that every household is within a 10-minute walk of a park.

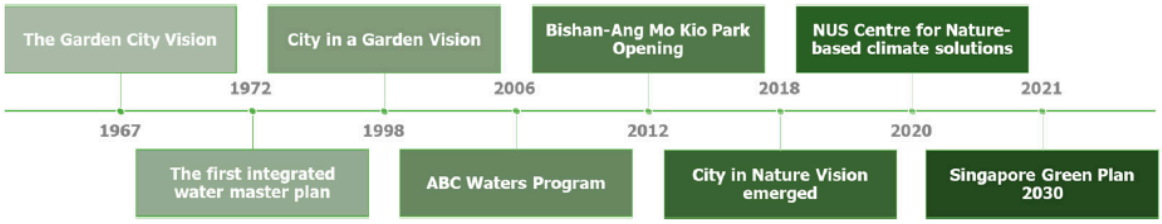



*Figure 1: Selected milestones in the emergence of NbS in Singapore. Source: Cui et al. (2021)*

**Singapore's public-sector programmes are the key driver for NbS adoption in the city-nation.**

These include:

1. Landscaping for Urban Spaces and High-Rises (LUSH) Programme
   Launched in 2009, it encourages property developers to incorporate greenery into buildings and the built environment through both mandates and incentives. The programme has created green spaces equivalent to the size of over 600 football fields.

2. Active, Beautiful, Clean Waters (ABC Waters) Programme
   Established in 2006, it seeks to foster beautiful and clean streams, rivers, and lakes, and improve the quality of water and life. It has helped manage stormwater and developed 974 ha of reservoirs and 95 km of waterways as public and recreational spaces.

*Figure 2: Bishan-Ang Mo Kio Park was a flagship project of the ABC Waters Programme in Singapore. Photo by Wikimedia Commons, CC BY-SA 3.0*

3. Skyrise Greenery Incentive Scheme (SGIS)
   The scheme, launched in 2009, provides up to 50% funding for the installation of rooftop and vertical greenery, and has benefitted more than 200 buildings. As of 2023, Singapore had achieved 155 hectares of skyrise greenery against the 2030 target of 200 hectares.

**Active engagement with the private sector has been central to Singapore's green transformation.**

The government offers strategic incentives, such as increased Gross Floor Area (GFA) allowances (up to

10% in some cases) for developers who integrate NbS into their projects. Developments achieving the Green Mark Platinum certification can receive up to a 2% bonus GFA. As of 2022, over 840 buildings have been certified under the scheme. As a result of government-led initiatives and engagement with the private sector, more than 40% of Singapore is now covered in greenery.

*Nature-based solutions at Kent Vale, Singapore. Photo: Pavan Srinath, WELL Labs*

**Research partnerships and responsive governance have helped align scientific innovation with policy action.**

The National University of Singapore's Centre for Nature-based Climate Solutions (CNCS) collaborates with public and private institutions to develop science-based methodologies grounded in robust data. One such collaboration is with the National Research Foundation on Carbon Integrity SG.

The 5-year research project, launched in 2022 with S$15 million funding, seeks to boost the integrity and credibility of the global carbon marketplace, and maintain a reliable supply of nature-based carbon offset credits from Southeast Asia. It focuses on forest protection and reforestation. Such research and development partnerships between the government and academic institutions ensure evidence-based NbS adoption.

**Singapore has various national programmes to facilitate community involvement in NbS. These foster a sense of ownership, thereby improving project maintenance and long-term sustainability.**

Community in Bloom is a community gardening initiative to encourage collective greening outside of homes. The Allotment Gardening Scheme provides dedicated gardening spaces for individuals who are not part of a community group.

These not only help achieve urban greening targets but also turn residents into active stewards. This, in turn, improves maintenance, reduces costs, fosters social cohesion, and secures the long-term viability of the City in Nature vision. Community involvement and ownership yield significant social benefits too: a study found that community gardeners in Singapore reported significantly higher levels of subjective wellbeing, resilience, and optimism.

### Impact

1. **Flood Reduction**
   Singapore has reduced flood-prone areas from 3,200 hectares in the 1970s to less than 30 hectares in 2022 through a holistic stormwater management strategy, which includes NbS.

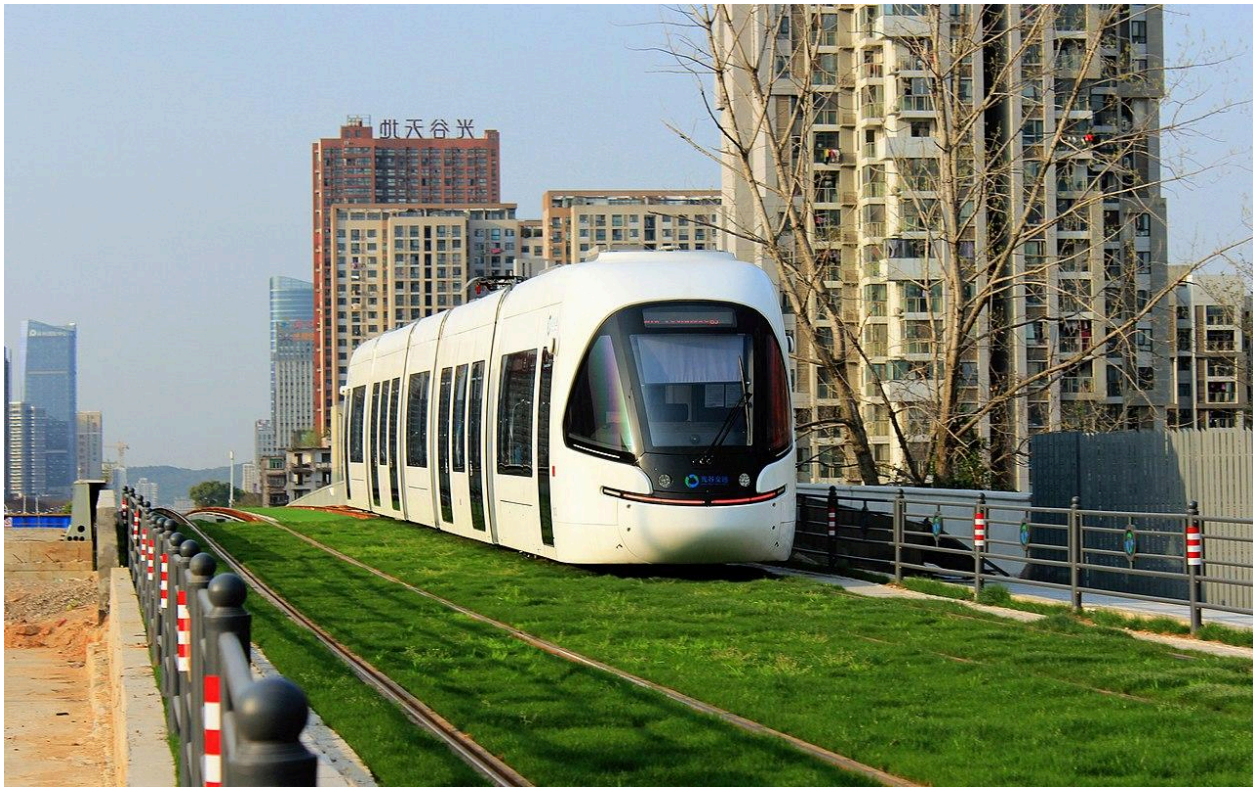
2. **Temperature Regulation**
   A study of parks in Singapore found that they reduced temperatures (measured as "mean park cool island intensity") by 1.69– 2.21°C.

3. **Biodiversity Boost**
   The ABC Waters Programme in Bishan-Ang Mo Kio Park has increased biodiversity by 30%. The park now supports nearly 100 species of birds and dozens of butterfly and dragonfly species.

## China: Embracing "Ecological Civilisation"

**Chinese cities have embraced NbS in response to the threats of flooding, air pollution, and environmental degradation.**

In 2014, China established the "Sponge City" concept, that is, using natural landscapes to control flooding and manage urban water issues. The 2018 constitutional incorporation of "Ecological Civilisation", a national development strategy emphasising environmental protection and sustainable development, has provided further impetus to NbS. The 13th and 14th Five-Year Plans (2016–2020 and 2021–2025, respectively) also prioritise green development over traditional engineering approaches.



*Sponge cities in China have incorporated blue-green[1] infrastructure in their built spaces. The image above is of a tram track with vegetation in Wuhan. Photo: Painjet, Wikimedia Commons*

**China bridges its national vision for NbS with local action through a tiered governance approach and strong coordination across various government levels.**

A systematic analysis by Ling-Sang Sheng et al. (2025) of 168 NbS initiatives in China found that they are mostly top-down and led by the national government, followed by projects managed by the local government, and those run by multiple stakeholders. It adds that while government-led initiatives comprise a majority, there is significant stakeholder involvement, pointing to a collaborative approach that boosts the legitimacy and sustainability of NbS projects.

Top-down governance is a feature of large-scale projects spanning multiple provinces, while regional initiatives focus on local needs. In many cases, national goals are broken down into regional initiatives to achieve locally specific goals and promote accountability. Under the Sponge City Programme, performance evaluation systems for local-level officials use quantitative indicators for "water ecology, water environment, water resources, water security, institutional capacity building, and execution effectiveness" to ensure accountability and effective implementation.

[1] *Blue infrastructure refers to waterbodies, green to vegetation, and grey to concrete, built-up spaces.*

A key innovation is the River Chief System, launched nationwide in 2016. It established a five-layer governance framework (province, city, county, township, and village) and encouraged community members to enrol as “river chiefs” for the management of rivers and lakes in their territories. As of 2021, there were more than 1.2 million river chiefs in the country. The initiative has reduced transboundary water pollution.

### China has established evidence-based, region-specific policies that incorporate global insights and best practices.

Ling-Sang Sheng et al.’s analysis also showed that about two-thirds of NbS projects in China were supported by enabling policies. In June 2021, China’s Ministry of Natural Resources collaborated with the International Union for Conservation of Nature (IUCN) to release the Chinese version of the “IUCN Global Standard for Nature-based Solutions” in its quest to promote NbS across the country.

The "Guidelines for Ecological Protection and Restoration Projects in Mountain, Water, Forest, Field, Lake, and Grass", jointly issued by various ministries, incorporated international NbS concepts and standards, and adapted them to the Chinese context. The guidelines provide systematic, scientific approaches to implement NbS appropriate for diverse landscapes.

### Government financing, blended finance, and voluntary carbon trading have ensured stable funding for NbS.

China has established dedicated funds for NbS programmes, including the “Ecological Protection and Restoration of Mountains, Rivers, Forests, Farmlands, Lakes and Grasslands”, under the 13th Five-Year Plan. Since 2016, it has deployed 25 projects with an investment of approximately CNY 283 billion for ecological protection and the restoration of various ecosystems.

Innovative financial systems, such as Payments for Ecosystem Services[2], have been widely implemented. The Conversion of Cropland to Forest programme has invested over CNY 299.2 billion since 1999 to reduce flooding, soil erosion, and poverty.

Market-based mechanisms include voluntary carbon trading marketplaces. China's first farmland-based carbon trade was completed in Nanjing County in July 2022. The Qiandao Lake Water Fund raised USD 1.5 million from 2018 to 2022 through green investments and private sector participation under a “polluters pay” scheme. Payments from the fund incentivised farmers to follow sustainable practices, which helped reduce nitrogen, phosphorus, and sediment pollution in the lake.

[2] *Payments for ecosystem services refer to arrangements where communities receive compensation from businesses or governments for providing environmental services, such as water conservation or climate change mitigation.*

### Impact

1. **Flood Reduction**
   Thirty pilot Sponge Cities have seen significant flood reduction since 2015. As a result of the programme, the maximum duration of waterlogging in Wuhan shortened from 1 month to 6 hours and the area of waterlogging points reduced significantly.

2. **Improved Quality of Life**
   The Loess Plateau Restoration Project in Northwestern China doubled the perennial vegetation cover; increased food supplies, employment rates, and incomes; and lifted 2.5 million people out of poverty.

3. **Ecological Restoration**
   The Three-North Shelterbelt Forest Program, also known as the Great Green Wall, has prevented desertification and conserved soil and water by planting windbreak trees and more than doubling the forest cover. Launched in 1978, the project is expected to be completed by 2050.

## European Union (EU): Investing in Research and Innovation

**With its legally binding goals and robust research and innovation infrastructure, the EU has positioned itself as a global leader in NbS implementation.**

More than 80% of Europe's habitats are in poor condition. The EU Biodiversity Strategy 2030 has recognised the need for nature restoration to build resilience to climate change impacts, food insecurity, and disease outbreaks. It is part of the European Green Deal, a range of climate mitigation and adaptation measures launched in 2019 to make Europe the first climate-neutral continent.

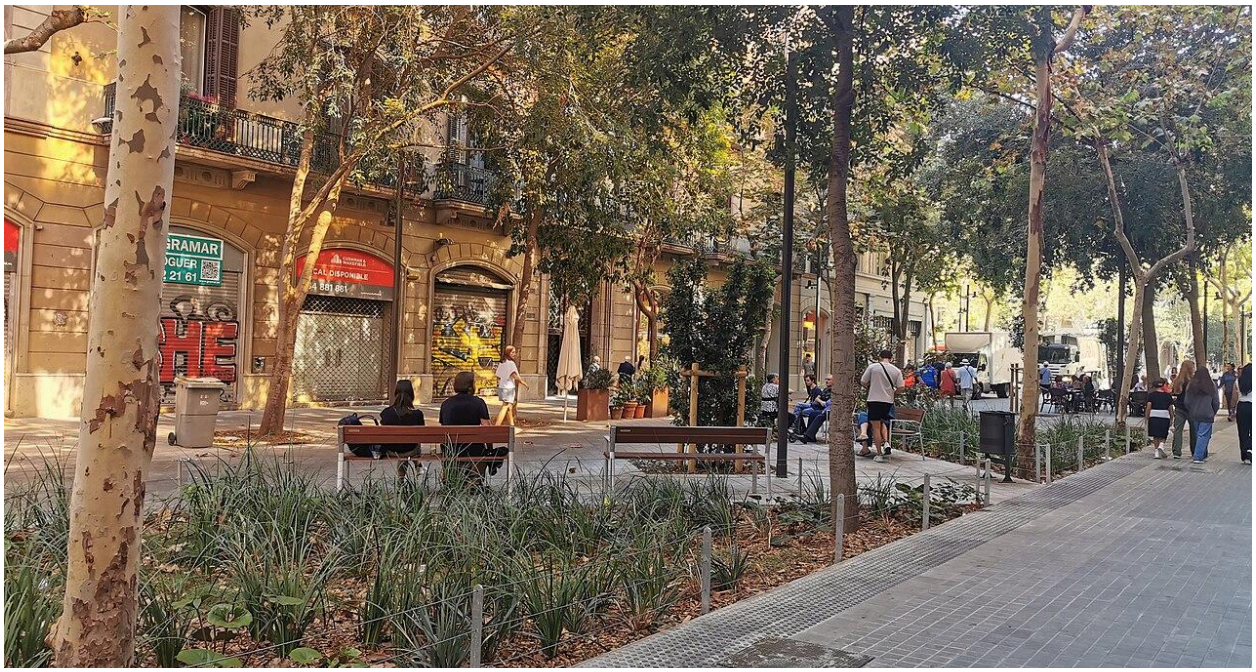
**The EU's NbS policy framework operates through legally binding requirements rather than voluntary guidelines, which sets it apart from those in other regions.**

The Nature Restoration Law, which came into force in 2024, establishes enforceable restoration targets for degraded ecosystems and requires member states to submit national restoration plans demonstrating compliance. The comprehensive legal framework has binding targets that aim to restore at least 20% of EU land and sea areas by 2030 and all ecosystems in need of restoration by 2050. The integration of NbS in mainstream policy and planning ensures that they are not seen as piecemeal, siloed interventions but as an integral part of how policymakers plan for sustainability, resilience, and wellbeing.

**The EU has made sustained investments in building long-term technical capacity and the knowledge base for NbS.**

It has allocated a minimum of 30% of its total 2021–2027 budget to achieve climate objectives. A significant portion of this budget is for NbS. For the same period, Horizon Europe, the EU's main funding programme for research and innovation, has a funding corpus of EUR 93.5 billion. Through these sustained investments, it aims to mainstream NbS across research, policy, and practice, and demonstrate their socioeconomic benefits, cost-effectiveness, and long-term sustainability.

Between 2011 and 2021, the EU funded 262 research and innovation projects on NbS through five major programmes: Biodiversa+, Horizon 2020, Seventh Framework Programme (FP7), Interreg, and LIFE. It has also translated NbS pilot data into standardised evaluation frameworks and made insights from research accessible through knowledge-sharing platforms, such as Climate-ADAPT, NATURVATION, and OPPLA.



*Nature-based solutions in Barcelona. Photo: Cataleirxs, Wikimedia Commons*

**For successful NbS integration, the EU emphasises participatory approaches to foster acceptance and ownership among various stakeholders.**

Initiatives such as Urban Agenda institutionalise the co-creation of developmental strategies by bringing together citizens, experts, and decision-makers. In 2015, Barcelona adopted a citizen-led approach for climate mitigation. EU-funded projects like CLEVER Cities have pioneered urban

innovation partnerships, where resident-led teams co-design nature-based interventions, thereby increasing their social acceptance and effectiveness.

## Impact

1. **Flood Mitigation**
   The Elbe River Levee Setback Project, a floodplain-restoration initiative in Germany, reduced flood peaks, created 80 hectares of floodplain forests, and led to the return of many bird species.

2. **Temperature Regulation**
   Green spaces cool European cities by 1.07°C on average and up to 2.9°C in some locations.

3. **Improved Biodiversity**
   An EU-funded urban green infrastructure project in Barking Riverside, UK recorded 148 species of higher plants on just 0.5 hectares, demonstrating significantly greater floral diversity than surrounding soft-landscaped areas.

## How India Can Promote NbS

As extreme heat, droughts, and floods become more frequent and intense with climate change, India should treat NbS as essential infrastructure rather than defaulting to conventionally engineered solutions. At this critical juncture, we need to learn from global experiences and adapt them to India's diverse geographical, economic, and social contexts. Here are some steps we can take based on the experiences of Singapore, China, and the EU:

### Lessons from Singapore

1. Integrate greening principles and NbS for urban water management into national programmes like Smart Cities Mission and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT).
2. Mandate vertical greenery for new developments in space-constrained cities.
3. Set up collaborative programmes and enhance coordination between governments and researchers to ensure that policies incorporate scientific innovation.
4. Provide incentives to the private sector to incorporate NbS in construction and infrastructure projects.

### Lessons from China

1. Carry out landscape-scale ecological restoration rather than just standalone interventions or one-time pilots.
2. Strengthen coordination between governments at various levels (national, state, district, city, and village) by establishing an integrated governance framework with clear institutional mandates.
3. Enhance accountability through comprehensive monitoring and performance metrics for NbS projects and officials.
4. Ensure long-term, dedicated funds for NbS projects. For example, a portion of national and state Disaster Relief Funds could be used for NbS projects that build resilience against disasters, such as mangrove restoration and riparian buffers.

### Lessons from the EU

1. Distil insights from and recommendations of research studies to create an accessible NbS roadmap comprising planning, design, implementation, operations, maintenance, monitoring, and evaluation. This can serve as a national repository of best practices and standardised guidelines for site-suitability assessment and project design.
2. Integrate NbS interventions into India's Carbon Credit Trading Scheme.
3. Adopt participatory planning models to ensure community buy-in and locally relevant solutions.
4. Boost community engagement by involving citizens in monitoring and maintaining NbS through citizen-science initiatives and showcasing successful projects through the media, conferences, and awards.

*For a comprehensive list of recommendations to increase the uptake of NbS in India, read our report Barriers to Mainstreaming Nature-Based Solutions in Urban India.*

### India faces significant challenges in replicating global NbS initiatives due to its limited state capacity, which makes outcome-oriented implementation difficult.

Given the country's struggles with weak policy enforcement, technical capacity, and political imagination, projects default to conventional grey infrastructure even where NbS can deliver more impactful outcomes at lower costs. India's development priorities and limited resources also create intense competition for funding. Its dense urban areas and fragmented land ownership complicate the direct adoption of Singapore's vertical greenery initiatives and China's landscape-scale restoration approaches.

**For meaningful progress, recognising NbS as a national policy priority, integrating blue-green infrastructure with grey infrastructure, and establishing strong design and implementation standards are essential.**

Singapore, the EU, and to an extent, China, first built grey infrastructure at a large scale and incorporated NbS when the former proved insufficient to effectively build water and climate resilience. Most Indian cities still lack adequate grey infrastructure, such as sewerage networks and stormwater drains. This presents a unique opportunity: rather than deploying conventionally engineered solutions, the country can directly build integrated blue-green-grey infrastructure. Further, developing rigorous design and implementation standards can help promote context-specific solutions that account for India's diverse landscapes and unique developmental challenges.

## Learn More

WELL Labs' Urban Water programme is working extensively on NbS. Read our other publications on the topic:

1. Report | Barriers to Mainstreaming Nature-Based Solutions in Urban India | Read Here
2. Op-ed | Bring Back Nature to Bengaluru's Rescue | Published in *Deccan Herald* | Read Here
3. Op-ed | The Value of Green: Why Cities Must Invest in Nature-Based Solutions | Published in *Citizen Matters* | Read Here
4. Event Report | Unlocking Nature-Based Solutions | Read Here
5. Blog | Why Nature-Based Solutions Must Balance Ecology, Economy, and Community | Read More
6. Blog | Incorporating Nature-Based Solutions to Manage Flooding: Transforming Bengaluru's Manyata Tech Park | Read Here
7. Blog | Building Climate-Resilient Cities with Nature-Based Solutions | Read Here
8. Blog | A Visionary Architect and a New Growth Model: What's Behind the Rise of Sponge Cities in China? | Read Here
9. Blog | Soak Up the Rain: How a 'Sponge City' Makes Urban Areas Climate Resilient | Read Here