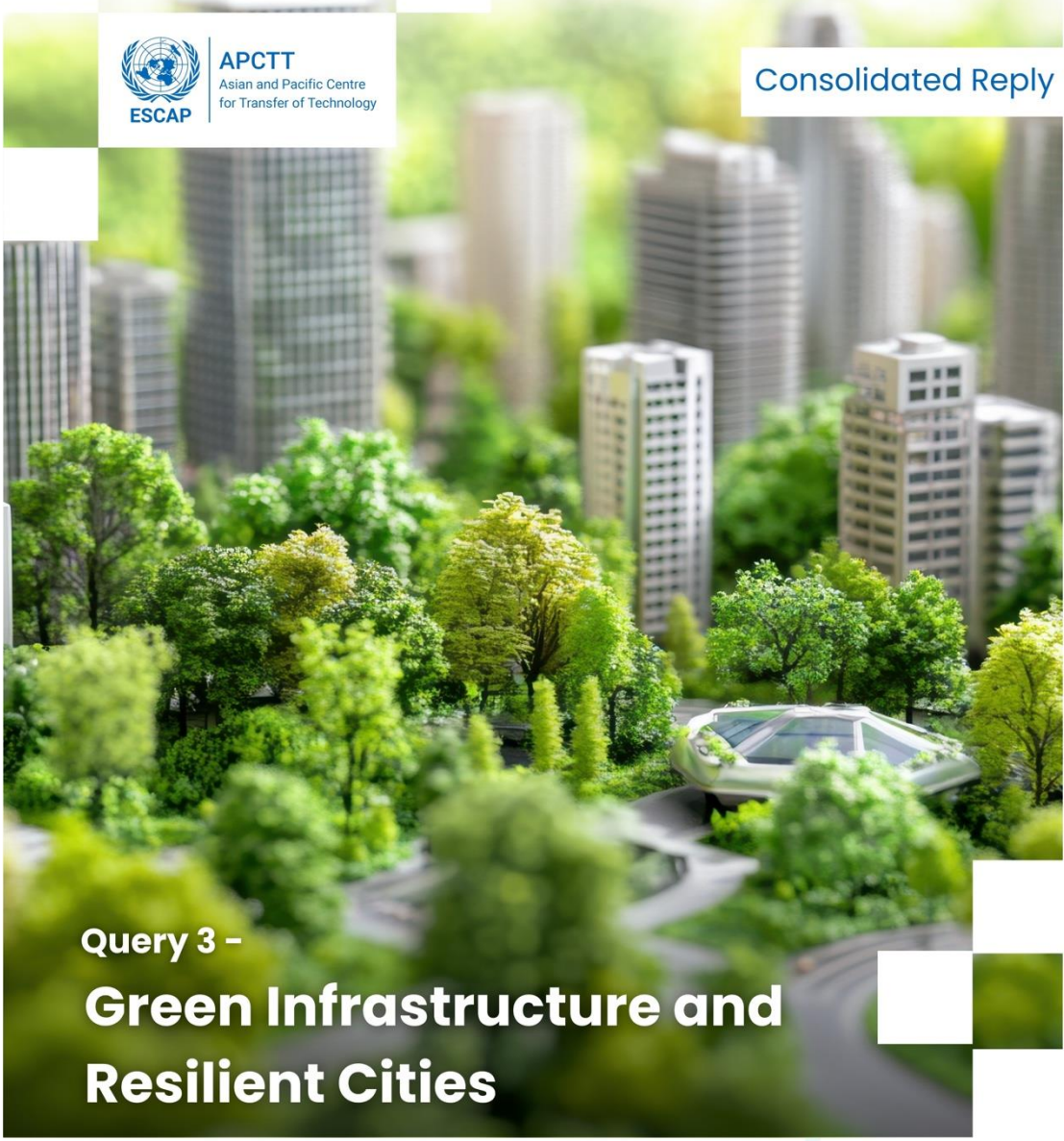
APCTT
Asian and Pacific Centre
for Transfer of Technology
ESCAP

Consolidated Reply



Query 3 -

Green Infrastructure and Resilient Cities

Community of Practice (CoP) on Climate Technologies

APCTT
COMMUNITY OF PRACTICE
ON CLIMATE TECHNOLOGIES

Community of Practice (CoP) on Climate Technologies

Shared Experiences, Smarter Solutions for Climate Action and Resilience

The Community of Practice (CoP) on Climate Technologies launched by the Asian and Pacific Centre for Transfer of Technology (APCTT) is dedicated to addressing the multifaceted challenges posed by climate change in the Asia-Pacific region through technology solutions. By leveraging the region's rich innovation capacities and good practices, the CoP aims to enhance access to critical knowledge on climate technologies. The Community connects professionals engaged in delivering technological solutions to climate change.

The objective of this Community of Practice is to:

- Promote collaborative problem-solving and policy-relevant dialogue
- Support the localization and transfer of innovations suited to national priorities
- Enhance institutional capacities for climate technology governance
- Enable matchmaking between solution providers and implementers

The Community is driven by a participatory and adaptive model that combines knowledge generation, engagement, and access to resources through the following mechanisms: monthly Query-Response Consolidated Reply (CR) cycle, webinars and interactive discussions, knowledge repository and much more.

Original Query by: Dr. Hitesh Vaidya (Director, National Institute of Urban Affairs, NIUA), India and Dr. Sharda Kosankar (Principal Scientist, National Environmental Engineering Research Institute, NEERI), India

Posted: 25th September 2025

Cities in Asia and the Pacific are on the frontline of climate change, with infrastructure systems increasingly stressed by floods, storms, and heatwaves. More than 90% of disasters in the region are climate-induced, and cities account for nearly 70% of related economic losses[1]. These challenges underscore the need to rethink infrastructure planning and resilience. At the same time, green[2] and blue infrastructure[3] and nature-based solutions [4] are emerging as cost- effective strategies to reduce urban heat, manage floods, restore ecosystems, and improve livability.

To build on the experiences of our members and explore practical pathways forward, we invite your contributions on the following questions:

1. What are some specific climate change impacts on urban infrastructure members have observed, and how are nature-based solutions and green/blue infrastructure enhancing resilience in your experience? What principal lessons can facilitate scaling such approaches regionally?

---

[1] ESCAP (2023). *Asia-Pacific Disaster Report 2023: Extreme Weather and Resilient Development*. Bangkok: United Nations ESCAP

[2] *Green infrastructure* refers to natural systems like parks, green roofs, and vegetation that manage stormwater and improve urban resilience.

[3] *Blue infrastructure* relates to water-based systems such as rivers, lakes, wetlands, and drainage networks that store and transport water, helping control floods and maintain ecological balance.

[4] *Nature-based solutions (NbS)* use natural processes and ecosystems to address environmental challenges while providing co-benefits for climate resilience and human well-being.

2. Which new technologies or innovative concepts have the greatest potential to develop climate-resilient cities in Asia-Pacific, and who are the important implementation partners required?

Your insights will contribute to regional knowledge sharing and inform inclusive strategies for building safer, more climate-resilient cities in the Asia-Pacific region and would be greatly appreciated.

Dr. Hitesh Vaidya
Advisor to Multinational
& Think Tanks, India

Dr. Sharda Kosankar
Principal Scientist, NEERI,
India

Contents

1. Summary of Responses

Cities across Asia and the Pacific are under increasing pressure as climate change accelerates. More frequent and devastating floods, deadly heatwaves, strong droughts, and dangerous air pollution show how the old "grey" infrastructure drainage, water, transportation, and energy built for a more stable climate is increasingly vulnerable. A regional consensus is building that to achieve truly resilient cities requires placing ecological systems forests, wetlands, rivers, and permeable surfaces at the heart of the design. Such green and blue infrastructures, along with Nature-based Solutions (NbS), are vital to restore ecological balance, enhance adaptation capacity, and provide multiple and essential co-benefits to health, biodiversity, and livelihoods.

Countries across the Asia-Pacific are increasingly integrating NbS into national policies, city master plans, and climate adaptation programmes. Such projects include China's Sponge City Initiative, which pioneers wetlands, green rooftops, and permeable pavements that absorb and reuse stormwater in flood-prone areas, while Chulalongkorn Centenary Park in Bangkok, Thailand, has successfully combined flood retention with public recreation within a single green space.

India demonstrates various NbS initiatives: wetland restoration in Chennai and Mumbai, mangrove buffers in Maharashtra, and Miyawaki urban forests in Delhi and Bengaluru to reduce heat and improve ecosystem health. City-level assessments in Nashik, Nagpur, and Chhatrapati Sambhaji Nagar have triggered the implementation of semi-permeable pavements, rainwater harvesting, and green corridors, monitored by digital systems. The Indian experience with biodiversity parks, wetland rejuvenation, and AI-GIS-based monitoring underlines the meeting point of data and ecology for integrated management of floods, heat, and pollution.

In other subregions, innovation is the answer. Iran's efforts to decrease fossil-fuel consumption, recycle wastewater, and optimize water usage meet the dual goals of drought and air pollution simultaneously. Similarly, Pakistan's "My Waste, My Responsibility" campaign aims at waste segregation and climate literacy, while Karachi's AI-based forecasting systems enhance preparedness for heat and floods. In Indonesia, the development of bamboo and rattan-based infrastructure offers a sustainable and low-cost solution to handle floods while sequestering carbon, complemented by AI and GIS-based land-use planning.

International experiences further reinforce these lessons. The experience of Nigeria in integrating NbS with social protection includes stormwater management, watershed restoration, and climate-resilient housing. Parametric insurance models allow for rapid recovery financing when triggered by predefined disaster thresholds. Mauritius stresses the role of green-blue infrastructure in urban durability and invokes rigorous performance-based metrics, maintenance frameworks, and innovative financing. The Hawai approach underscores the critical role of institutional coordination, education, and systems thinking in embedding resilience within governance structures.

These different examples support the fundamental finding that nature-based and hybrid solutions work best when combined with innovative technologies, solid governance, and enabling finance. Experts base their recommendations for hybrid "green-grey" infrastructure systems on the deployment of frontier technologies such as IoT sensors, AI-driven digital twins, and real-time climate monitoring platforms. These tools enable cities to monitor rainfall, heat, and drainage performance with high precision. This, combined with blended financing and performance metrics, helps incorporate NbS into regular municipal planning and budgeting. Scaling such approaches across the region will depend on aligning local innovation with regional knowledge-sharing platforms, sustained funding, and adaptable design standards that respond to diverse urban contexts.

However, challenges persist, mainly in the incomplete valuation of ecosystem services, fragmented governance, and limitations in capacity and long-term financing. Closing these gaps must be grounded in national standards for the investment of NbS, integration of ecosystem valuation in cost-benefit analyses, and enhanced local capacity via technical partnerships. Establishing dedicated climate-resilience funds would go a long way in underpinning NbS, while full integration into the urban master plan and maintenance through public-private partnerships are needed to sustain and scale progress. Building multi-stakeholder partnerships across governments, research institutions, private enterprises, and communities will be essential to sustain innovation, accountability, and long-term ownership.

The collective experience affirms that the integration of blue-green and grey infrastructure with Nature-based Solutions is not just an environmental duty but a multidimensional development approach. It marries ecological restoration together with technological innovation, participatory governance, and economic inclusion. In this way, countries are translating urban resilience from a policy aspiration into a concrete reality through cross-sector partnerships and community-led implementation. Evidence shows that by bringing natural systems and technological intelligence together under inclusive governance, cities can do more than just survive climate shock they will be able to actively regenerate, innovate, and prosper in harmony with their environment.

This discussion reflected a growing regional consensus: the cities of the future will not just resist climate change; they will regenerate, innovate, and thrive within it.

2. Relevant Experiences

Australia

Australia has integrated ecosystem-based adaptation through large-scale wetland restoration, coastal-reef protection and urban green-space networks that link parklands with stormwater-retention basins. Cities such as Sydney connect green corridors, bioswales[5] and permeable pavements to reduce urban heat and manage intense rainfall. The approach illustrates how green infrastructure is embedded in national adaptation and urban planning frameworks.

Bangladesh

Dhaka is restoring canals, wetlands, and flood-retention parks to revive natural drainage and reduce monsoon inundation, while improving public amenities. These blue-green measures are being coupled with ICT-enabled water management under the "Sustainable Smart Bangladesh 2041" vision. Together they strengthen climate resilience in a rapidly urbanizing delta.

Bhutan

Thimphu's eco-city planning emphasizes green belts, slope afforestation, and nature-based stormwater management to prevent landslides and flash floods. Bhutan's carbon-negative pathway supports low-impact urban growth and clean transport. Green infrastructure underpins resilient services and biodiversity.

Cambodia

Coastal provinces (Koh Kong, Kampot) are scaling mangrove rehabilitation and sustainable aquaculture to stabilize shorelines and buffer storm surges. Financing through the ASEAN Catalytic Green Finance Facility accelerates resilient wastewater and coastal projects. NbS deliver both adaptation and livelihood co-benefits.

---

[5] *Bioswales* are shallow, vegetated channels designed to slow, filter, and absorb stormwater runoff in urban areas. (https://www.mmsd.com/what-we-do/green-infrastructure/bioswales?)

China

China's national Sponge City initiative is designed to transform urban landscapes into permeable systems that absorb, store and reuse rainwater reducing flood risk, recharging aquifers, and improving water quality. Cities such as Wuhan and Chongqing integrate wetlands restoration, rain gardens, bioswales, green roofs and permeable pavements as part of hybrid blue-green and grey infrastructure. These nature-based solutions (NbS) underpin over 30 pilot cities and form a large scale policy shift. The model demonstrates how urban water-management strategies can pivot from rapid discharge to retention and infiltration.

Fiji

Suva's integrated coastal protection combines mangrove and coral-reef restoration with resilient housing and planned relocations. These measures reduce cyclone and tidal-surge risks while preserving fisheries and tourism values. Fiji illustrates holistic small island developing states (SIDS) adaptation linking NbS and social protection.

India

Indian urban centres like Chennai, Pune, Kochi and cities in Maharashtra (e.g., Nagpur, Nashik) are adopting blue-green infrastructure: revived canals and ponds, permeable pavements, urban forests, and densely planted Miyawaki forests[6] to moderate floods, reduce heat stress and enhance groundwater recharge. These nature-based solutions are increasingly integrated into national Smart Cities frameworks and highlight the importance of community engagement and ecosystem-specific design.

Indonesia

Jakarta and Surabaya advance flood-management, eco-drainage, and transit-oriented development alongside renewable-energy uptake. National "green infrastructure investment opportunities" outline pipelines and financing to scale these solutions. Integrated planning cuts pollution and improves urban resilience.

---

[6] Miyawaki urban forests *are small, dense green patches created using a Japanese afforestation method,* in Delhi and Bengaluru are reducing floods and heat stress (https://www.researchgate.net/publication/351372104_Sustainable_Solution_for_Urban_Environment_Miyawaki_Forest)

Iran

Urban resilience priorities include wastewater reuse, air-pollution reduction, and water-efficiency measures to address drought and heat stress. UN-Habitat's programme supports risk reduction, governance, and resilient urban services in partnership with municipalities across Iranian cities. In arid regions, **nature-based solutions (NbS)** such as **constructed wetlands, urban green corridors, and water-harvesting landscapes** complement conventional grey infrastructure by improving water retention and reducing surface runoff.

Japan

Japanese cities such as Yokohama and Kitakyushu are pioneering compact-city planning combined with green transportation, renewable-energy systems and green infrastructure features such as green roofs, tree-lined streets and permeable surfaces. These interventions reduce heat-island effect, enhance disaster resilience particularly against floods and heatwaves, and promote circular economy principles in urban settings.

Kazakhstan

Astana and Almaty are expanding urban forests, green belts, and efficient public transport to mitigate dust, heat, and winter smog. UNDP's Green Urban Development initiatives back energy-efficient buildings and water-saving infrastructure. These actions enhance health and climate resilience.

Lao People's Democratic Republic

Vientiane is building green corridors, reinforcing riverbanks, and upgrading climate-resilient drainage while disclosing progress via Carbon Disclosure Project-International Council for Local Environmental Initiatives (CDP-ICLEI) Track. Transparent finance and planning through open reporting, participatory budgeting, and disclosure of climate expenditures help the city attract external funding, ensure accountability, and align investments with nature-based solutions. These practices enable better coordination between municipal agencies, development partners, and communities to reduce flood risk and improve environmental performance. NbS are integral to the strategy.

Maldives

Malé's resilience strategy restores coral reefs and seagrass beds to protect coasts from erosion and sea-level rise, paired with solar adoption for tourism facilities. This supports a low-carbon blue economy and urban climate security for atoll cities.

Mongolia

Ulaanbaatar is deploying large-scale urban afforestation, green belts, and electric-bus corridors to counter extreme temperatures and air pollution. Energy-efficient retrofits and nature-based buffers improve livability and public health. These measures strengthen resilience in a continental climate.

Myanmar

Yangon is embedding wetlands, vegetated channels, and green setbacks into drainage upgrades to manage intense monsoon flooding. Carbon Disclosure Project-International Council for Local Environmental Initiatives (CDP-ICLEI) reporting and guidance help the municipality align finance with nature-based projects. The approach couples NbS with capacity building and transparency.

Malaysia

In Kuala Lumpur the SMART Tunnel serves as a dual-purpose facility: functioning as a large-scale flood-water conduit and an expressway, exemplifying multi-functional infrastructure for resilience. The country's participation in the ASEAN Catalytic Green Finance Facility shows how blended-finance mechanisms such as concessional loans, green bonds, public-private partnerships (PPPs) and viability gap funding are mobilised to accelerate green infrastructure in urban development.

Nepal

In the Kathmandu Valley vegetative slope stabilization, peri-urban afforestation and green belts are being implemented to manage landslide risk, improve air quality and stabilise hillside zones near expanding settlements. These interventions link nature-based design with hazard mitigation in mountainous urban settings.

Pakistan

Coastal cities like Karachi and Gwadar are utilising mangrove-based green belts and reclaimed wetlands, complemented by improved drainage networks, to reduce monsoon-flood risk and protect coastal infrastructure. These nature-based and hybrid interventions also provide employment in ecosystem management, thereby supporting socio-ecological resilience.

New Zealand

Wellington and Auckland apply water-sensitive urban design (bioswales, rain gardens, green streets) to curb stormwater overflows and urban flooding. Living roofs and native-vegetation corridors bolster biodiversity and cooling. These measures integrate adaptation with emissions reduction in planning.

Papua New Guinea

Port Moresby combines hybrid seawalls with restored mangrove buffers to reduce storm surges and coastal erosion. Urban tree-planting and community stewardship address heat stress and ecosystem loss. This hybrid model links engineered protection with NbS.

Philippines

Metro Manila and Cebu are scaling hybrid flood control engineered retention paired with wetlands and green corridors to manage heavy rainfall and heat. Compact, walkable districts reduce exposure and emissions while enhancing livability.

The Republic of Korea

Seoul's Cheonggyecheon restoration replaced an elevated roadway with a river corridor, lowering local temperatures and improving air quality. Nationwide, Smart Green City projects add sensors, green roofs, and water gardens for adaptive urbanism.

Samoa

A ridge-to-reef approach restores upstream forests and downstream mangroves/coral to control runoff, erosion, and storm impacts on settlements. Traditional resource governance underpins long-term maintenance of NbS.

Singapore
Singapore's "City in a Garden" and ABC Waters Programme convert traditional canals and drainage systems into landscaped waterways with rain gardens, rooftop greenery and nature-based retention systems. These interventions address urban heat islands, stormwater management and urban livability in a high-density context. Singapore sets a global benchmark for combining compact urban development with ecological performance.

Solomon Islands
Honiara's ecosystem-based adaptation combines slope revegetation, drainage improvements, and Committee for Development Policy (CDP) guided finance to manage flash floods. The strategy strengthens municipal capacity while scaling NbS in vulnerable neighborhoods.

Sri Lanka
Colombo's Metro Urban Development Project re-establishes urban wetlands as flood-retention and recreation areas. The green-blue network reduces risk for dense neighborhoods and improves biodiversity and public space.

Thailand
In Bangkok the Chulalongkorn University Centenary Park acts as a large-scale sponge park: the design includes a green roof, wetlands, detention lawns and retention ponds capable of holding over a million gallons of water during heavy rainfall. By reclaiming an 11-acre site within the city, the project demonstrates how public space can serve dual functions of recreation and flood protection in a low-lying, high-risk environment. It illustrates how NbS can be embedded in dense urban settings to address multiple urban-climate hazards.

Timor-Leste
Dili advances mangrove replanting, flood-basin rehabilitation, and efficient lighting as part of a city resilience package. CDP frameworks support financing readiness and monitoring for nature-based urban projects.

Tonga

Tonga's community-led coastal reforestation and flood-basin upkeep help towns manage sea-level rise and extreme rainfall. Municipal-finance transparency (via CDP guidance) attracts investment for NbS and resilient services.

Vanuatu

Port Vila is restoring urban mangroves, re-vegetating slopes, and improving drainage to manage extreme rainfall and reduce landslide risk. Community-led stewardship maintains green buffers that also protect fisheries and coastal livelihoods. Urban greening and risk-sensitive planning are integrated with disaster preparedness to strengthen essential services. These measures illustrate how NbS can be scaled in small island cities with limited land and high exposure to storms.

Viet Nam

Cities such as Ho Chi Minh City and northern provinces deploy vegetated riverbanks, mangrove belts and tidal barriers to reduce coastal erosion and flood risk. Nature-based infrastructures such as retention ponds and green corridors are now embedded into city masterplans, protecting livelihoods and reinforcing ecosystems in rapidly urbanising flood-prone zones.

3. Related Resources

Relevant Documentation

Ahmedabad Heat Action Plan (India) - Cooling & Green Infrastructure: Pioneering city HAP integrating cool roofs, shade, and greening to reduce heat mortality. Provides protocols for early warning, outreach, and design standards.
(https://www.nrdc.org/sites/default/files/ahmedabad-heat-action-plan-2018.pdf)

Asian Development Bank (ADB) - Sponge Cities: Integrating Green & Gray Infrastructure to Build Climate Resilience (PRC) – Explains China's national "sponge city" approach using permeable surfaces, rain gardens, wetlands, and storage basins to detain and reuse stormwater. Summarizes pilots, governance models, and financing instruments for scaling. Highlights performance metrics and lessons for other APAC cities. (https://www.adb.org/sites/default/files/project-documents/56159/56159-001-tacr-en.pdf)

ADB - Nature-Based Solutions for Climate Resilience in Asia and the Pacific: Regional guidance on selecting, costing, and financing NbS for cities. Covers governance, co-benefit valuation, and pipeline development for investment programs. (https://www.adb.org/publications/nature-based-solutions-asia-pacific)

ADB - River Restoration & Urban Flood Risk (Guidance/Case Notes): Approaches to integrate river corridors, wetlands, and parks into city flood strategies; includes procurement/financing notes.
(https://www.adb.org)

Auckland Council - Te Auaunga / Oakley Creek Restoration: Urban stream daylighting and floodplain restoration combined with parks, paths, and habitat improvement. Reduces flood risk while creating high-quality public realm and ecological corridors.
(https://www.sciencelearn.org.nz/resources/3330-restoring-te-auaunga-oakley-creek)

C40 Cities - Nature-Based Solutions in Cities (Case Library): Curated city actions on urban forests, sponge streets, coastal buffers, and heat mitigation. Includes implementation steps, benefits, and KPIs from APAC members.
(https://www.c40knowledgehub.org/s/article/Nature-based-solutions-How-cities-can-use-nature-to-manage-climate-risks?language=en_US)

C40 Knowledge Hub - Heat Resilient Cities: Measuring benefits of urban heat adaptation: It presents an Excel-based tool (with Ramboll) to quantify the benefits of urban heat adaptation—trees/vegetation, cool roofs/surfaces, parks and water features. It estimates avoided heat-related deaths, energy savings, and productivity gains to help cities build a business case and prioritize investments. (https://www.c40knowledgehub.org/s/article/Heat-Resilient-Cities-Measuring-benefits-of-urban-heat-adaptation?language=en_US)

Chulalongkorn University Centenary Park (Bangkok) - Floodable Park Case: Documents design of a 1.6-hectare park with green roof, wetlands, sloped lawns, and retention ponds holding ~1 million gallons. Demonstrates dual recreation–flood mitigation functions in a dense, low-lying city. (https://www.urbanagendaplatform.org/best-practice/chulalongkorn-university-centenary-park)

City of Bengaluru - Efficacy of Rejuvenation of Lakes in Bengaluru, India: Assesses how well recent restoration works have improved urban lake health amid rapid urbanization and sewage inflows. Compares pre- and post-rejuvenation conditions (e.g., water quality, storage, ecological functions) at selected lakes and outlines governance/maintenance steps needed to sustain benefits. (https://www.researchgate.net/publication/343054468_EFFICACY_OF_REJUVENATION_OF_LAKES_IN_BENGALURU_INDIA)

City of Colombo - Wetland Management Strategy: Proposes a coordinated, multi-agency framework to safeguard the Metro Colombo Wetland Complex, aligning with Sri Lanka's National Wetland Policy (2006) and the 2016 Wetland Management Strategy. Emphasizes community engagement, designated wetland managers, adaptive plans, and monitoring to curb ongoing wetland loss while enhancing flood protection, cooling, and biodiversity. (https://cgspace.cgiar.org/server/api/core/bitstreams/c87e0776-3971-4b4c-8b4a-5dc3078157dc/content)

City of Melbourne - Urban Forest Strategy: Long-term canopy, greening, and water-sensitive design targets to reduce heat and improve liveability. Provides asset management, species selection, and monitoring methods. (https://www.melbourne.vic.gov.au/community/greening-the-city/urban-forest/Pages/urban-forest-strategy.aspx)

City of Sydney - Urban Forest Strategy: It provides the roadmap to expand canopy cover, cool hotspots, and build climate resilience in streets and parks. Additonally, it also includes spatial targeting and community engagement approaches.
(https://www.cityofsydney.nsw.gov.au/strategies-action-plans/urban-forest-strategy)

DPWH Philippines - Iloilo River Esplanade: River rehabilitation with greenways, riparian planting, and flood storage zones. Demonstrates water-sensitive urban placemaking and community stewardship.
(https://www.researchgate.net/publication/393218324_Blue-Green_Infrastructure_Tourism_Leisure_and_Lifestyle_Changes_A_Case_Study_of_the_Iloilo_River_Esplanade_Development)

International Council for Local Environmental Initiatives (ICLEI) South Asia - ACCCRN Integrated Action Planning Toolkit: Step-by-step municipal guide for climate risk assessment, stakeholder engagement, and identifying bankable green-grey resilience projects. Includes tools/templates for APAC local governments.
(https://southasia.iclei.org/wp-content/uploads/2021/08/ICLEI-ACCCRN-Process-IAP-A-toolkit-for-Local-Governments.pdf)

Indonesia National Slum Upgrading Program (KOTAKU/NSUP) - Green Drainage & Kampung Upgrades: Community-driven, multi-level program (2016–22) advancing the 100-0-100 target to deliver healthier, safer neighborhoods. Operating in 153 cities (~7,800 ha), it benefits ~9.5M people with access gains: roads/drainage (3.1M), clean water (440k), sanitation (360k), solid waste (1.8M), supported by web-based monitoring and a high-resolution grievance system.
(https://www.thegpsc.org/sites/default/files/indonesia.pdf)

IUCN - Global Standard for Nature-based Solutions (Urban Use): it showcases criteria/indicators to design, implement, and verify NbS quality and ensures biodiversity outcomes while delivering urban risk reduction and social co-benefits.
(https://www.iucn.org/our-work/nature-based-solutions/global-standard-nbs)

IUCN - Global Standard for Nature-Based Solutions: Sets out an 8-criterion, indicator-based standard to **design, verify, and scale** high-quality NbS, covering challenge alignment, scale, biodiversity net gain, economic feasibility, governance, adaptive management, and trade-off management. Includes guidance for **self-assessment and monitoring** to ensure credible outcomes for people, climate resilience, and nature
(https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf)

NIUA (India) - C-Cube Cooling for Cities: Set up at NIUA to mainstream climate action across Indian cities, C-Cube builds municipal capacity through policy guidance, planning toolkits, research, tech/data solutions, training, and partnerships (e.g., CSCAF, Cool Cities Hub). Its aim is a one-stop hub helping cities design, implement, and monitor resilience actions.
(https://niua.in/c-cube/content/climate-centre-cities-c-cube)

OECD - Financing Water-Related Nature-Based Solutions: Policy toolkit to mobilize public/private capital for urban NbS. Covers instruments (green bonds, land value capture) and enabling reforms.
(https://www.oecd.org/environment/financing-water-related-nature-based-solutions-ff06d5aa-en.htm)

PUB Singapore - Active, Beautiful, Clean (ABC) Waters Design Guidelines: National standard for water-sensitive urban design (WSUD) in Singapore. Details bio-retention, wetlands, swales, and waterfront public realm that double as detention/retention systems. Includes certification pathways and built case studies.
(https://www.pub.gov.sg/-/media/PUB/PDF/ABC_Waters_Design_Guidelines.pdf)

PUB Singapore - ABC Waters Projects Compendium: Built portfolio of estates, campuses, and corridors integrating water-sensitive urban design (WSUD). Provides drawings, performance notes, and maintenance guidance.
(https://www.pub.gov.sg/Professionals/Working-on-ABC-Waterways/ABC-Waters-Design-Guidelines)

Ramsar Convention - Wetland City Accreditation (Colombo & APAC Cities): Recognizes cities for exemplary urban wetland stewardship. Provides a framework for integrating wetlands into urban plans for flood mitigation, biodiversity, and nature-based recreation.
(https://www.ramsar.org/activity/wetland-city-accreditation)

Resilient Cities Network (100RC) - City Resilience Framework & Playbooks: The City Resilience Framework (CRF) sets out a holistic, evidence-based structure for what makes a city resilient, delineating **four core dimensions I.e.** Health & Wellbeing; Economy & Society; Infrastructure & Environment; and Leadership & Planning and mapping them across 22 resilience-goals. It is designed to help cities identify weaknesses, prioritise adaptation and investment, and integrate resilience thinking into planning at city-wide and precinct levels.
(https://resilientcitiesnetwork.org/downloadable_resources/UR/City-Resilience-Framework.pdf)

Resilient Cities Network - Playbook: Financing Urban Nature: This document emphasizes that from a green-infrastructure and resilient-cities perspective, cities must **mobilise new capital flows** (including private finance, blended instruments, and insurance-linked products) to fund nature-based and blue-green infrastructure projects such as green corridors, stormwater wetlands, and urban forests. It argues these green-blue investments create dual benefits such as reducing climate risks (floods, heat islands) and generating economic returns (through job creation, health gain, increased land value), thereby making green infrastructure investable and mainstream in urban resilience portfolios.
(https://resilientcitiesnetwork.org/investing-in-cities-strengthening-urban-resilience-finance/)

River of Life (Kuala Lumpur) - Urban River & Waterfront Regeneration: It highlights large-scale river rehabilitation with green corridors, public spaces, and water quality improvements in the city core. (https://www.researchgate.net/publication/337104587_Environment_and_Social_Impact_Analysis_of_Riverfront_Regeneration_River_of_Life_RoL_Kuala_Lumpur_City_Hall)

Seoul Metropolitan Government - Cheonggyecheon Stream Restoration: Landmark urban river daylighting that replaced an elevated highway with a linear green-blue corridor. It cites flood capacity, urban cooling, and public space regeneration with measurable social-economic benefits.
(https://www.landscapeperformance.org/case-study-briefs/cheonggyecheon-stream-restoration-project)

SPREP / Pacific R2R - Ridge-to-Reef for Resilient Coasts: It presents a holistic framework linking upland, freshwater and coastal ecosystems. It supports pilot interventions, national capacity-building, and mainstreaming of green-blue infrastructure to strengthen resilience of island cities and communities to land-based and marine risks.
(https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.pacific-r2r.org/sites/default/files/2020-08/Regional_PIMS%25205221%2520Regional%2520R2R-IW-Prodoc%252013Feb2015.pdf&ved=2ahUKEwid-8malMSQAxWGyTgGHRf2JMsQFnoECCIQAQ&usg=AOvVaw17seFnU0ZO1RhdF1paD9lY)

Thammasat University Urban Rooftop Farm (Bangkok) - Stormwater-Harvesting Green Roof: One of Asia's largest educational rooftop farms integrating retention, food production, and cooling. Demonstrates multi-benefit retrofits on large roofs.
(https://worldlandscapearchitect.com/thammasat-university-the-largest-urban-rooftop-farm-in-asia/?v=13b5bfe96f3e)

UNDRR - Making Cities Resilient 2030 (MCR2030) Scorecard: Diagnostic tool for local governments to baseline and plan resilience, including green-blue infrastructure actions and investment pathways. (https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.unisdr.org/campaign/resilientcities/assets/home/documents/MCR2030%2520in%2520English.pdf&ved=2ahUKEwiRr6yImcSQAxXdxjgGHWhSIlUQFnoECBoQAQ&usg=AOvVaw2QHvd0BuFsiWSqcQ7Q_LZU)

UNEP FI - Financing Nature-Based Solutions (Guidance): Financial sector guidance to structure and scale NbS in urban contexts. Details risk/return, KPIs, and case transactions relevant to cities. (https://www.unepfi.org/nature/nature/nature-based-solutions/)

UN-Habitat - City Resilience Profiling Tool (CRPT): Systems-based diagnostics to map urban risks and prioritize resilience actions. Supports integrating NbS, land-use policy, and infrastructure planning across departments. (https://urbanresiliencehub.org/wp-content/uploads/2018/02/CRPT-Guide.pdf)

UN-Habitat - Urban Ecosystems & Biodiversity (Guidance): Tools to embed biodiversity and green infrastructure into statutory planning and development control. (https://uccrn.ei.columbia.edu/sites/uccrn.ei.columbia.edu/files/content/pubs/ARC3.2-PDF-Chapter-8-Ecosystems-and-Biodiversity-wecompress.com_.pdf)

Wellington City Council - Water Sensitive Urban Design Guidelines: Practical WSUD guide for streetscapes, developments, and public realm. Emphasizes retention, treatment, and biodiversity in an urban setting. (https://wellington.govt.nz/-/media/environment-and-sustainability/water/files/wsud-guide.pdf)

World Bank - Colombo's Wetlands: Nature-Based Solutions for a Resilient City: Shows how conserving and managing urban wetlands in Colombo reduce flood risk, cool the city, and enhance biodiversity. Presents governance, valuation of co-benefits, and integration with urban planning. (https://www.worldbank.org/en/news/feature/2022/12/12/cities-look-to-nature-for-climate-solutions)

World Bank - Grey and Green Infrastructure: A Nature-Based Approach to Risk: Explains combining engineered and ecological systems for flood risk management. Offers methods to value co-benefits and integrate into capital planning. (https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://openknowledge.worldbank.org/server/api/core/bitstreams/a4268e66-df37-58ce-8aa5-2fa95e45f5df/content&ved=2ahUKEwjFw8Pdn8SQAxUO1TgGHWy3LW8QFnoECBkQAQ&usg=AOvVaw2ObmNsWQ8mCNv_XzIBTRyE)

World Bank - Ho Chi Minh City Flood Risk Management: Program combining drainage upgrades with detention areas and nature-based buffers. Shows hybrid designs and financing modalities in a delta megacity. (https://shorturl.at/6XNzz)

World Bank - Metro Colombo Urban Development Project: Combines wetlands protection with pumping/tunnels and open-space enhancement. A model hybrid system for flood risk reduction and amenity. (https://documents1.worldbank.org/curated/en/879721593012971719/pdf/Disclosable-Restructuring-Paper-Metro-Colombo-Urban-Development-Project-P122735.pdf)

World Bank - Nature-Based Solutions for Disaster Risk Management: It presents how urban green-blue infrastructure such as wetlands, bioswales, coastal mangroves and green corridors can reduce flood and heat risks while delivering ecosystem, social and economic co-benefits. It highlights how resilient cities can integrate these solutions alongside conventional infrastructure, and outlines enabling conditions such as integrated planning, co-benefit valuation and adapted finance. (https://shorturl.at/Woffb)

World Bank - Retaining Dhaka's Waterways: This report analyses how the rapidly expanding Greater Dhaka Area is increasingly vulnerable to extreme rainfall, water-logging and flood hazards under climate change, and quantifies the potential reductions in inundation, damage and costs through structural and non-structural adaptation measures. It offers local-scale (ward/thana) flood modelling, economic damage estimates and prioritised adaptation strategies to help urban managers build resilience in one of the world's most flood-prone megacities.
(https://documents.worldbank.org/en/publication/documents-reports/documentdetail/683381468001782892/urban-flooding-of-greater-dhaka-in-a-changing-climate-building-local-resilience-to-disaster-risk)

Relevant Organizations

Blue-Green Cities Alliance - A global coalition promoting the integration of blue-green (water and vegetation) infrastructure in urban planning to manage flooding, reduce heat, and build community resilience. *(*http://www.bluegreencities.ac.uk/research/learning-and-action-alliance.aspx*)*

C40 Cities
A network of nearly 100 major cities leading climate action through nature-based and hybrid infrastructure projects, focusing on heat mitigation, flood resilience, and sustainability. (https://www.c40.org/)

Canadian Urban Institute (CUI)
A national institute dedicated to research, advocacy, and capacity building for equitable, resilient, and green urban infrastructure across Canadian and global cities.(https://canurb.org/)

Cities Climate Finance Leadership Alliance (CCFLA)
A multi-stakeholder alliance supporting access to finance for sustainable, low-carbon, and resilient infrastructure projects including nature-based systems in urban areas.
(https://citiesclimatefinance.org)

Ecocity Builders - A U.S.-based non-profit advancing "ecocities" settlements in balance with nature through regenerative urban design, ecosystem restoration, and green infrastructure.
(https://www.ecocitybuilders.org/)

Emerald Cities Collaborative - A U.S. initiative linking sustainability, economic inclusion, and climate resilience through green infrastructure retrofits and local capacity-building programs.
(http://www.emeraldcities.org/)

Global Infrastructure Basel Foundation (GIB)
A Swiss-based foundation promoting sustainable and resilient infrastructure through the SuRe® Standard, integrating nature-based approaches into city development.
(https://www.gib-foundation.org/)

OECD Forum on Green Finance & Investment - A specialized platform focused on financing instruments, blended capital models, and green bonds to fund urban nature-based infrastructure and resilience projects.
(https://www.oecd.org/en/networks/forum-on-green-finance-and-investment.html)

Green Infrastructure Facility - An emerging global forum helping cities mobilize funding for green and blue infrastructure through policy innovation and multi-sector partnerships. (https://www.globalinfrafacility.org)

Green Infrastructure Partners (GIP) - An investment and implementation alliance encouraging large-scale adoption of green and hybrid infrastructure systems for resilient and sustainable cities. (https://gipi.com)

Greener Cities Partnership (UNEP / UN-Habitat) - A UN partnership promoting integration of nature-based solutions, green public spaces, and sustainable water systems into city development policies. (https://unhabitat.org/greener-cities-partnership)

ICLEI Local Governments for Sustainability - A global network of 2,500+ local governments driving sustainable urban transformation through nature-based solutions, biodiversity protection, and resilience planning. (https://iclei.org/)

International Coalition for Sustainable Infrastructure (ICSI) - A global coalition of engineering, finance, and city actors co-developing sustainable infrastructure frameworks that integrate climate and nature resilience. (https://sustainability-coalition.org/)

Land Conservation Network - An international non-profit network promoting conservation and restoration of urban forests and green spaces to enhance biodiversity and city climate resilience.
(https://landconservationnetwork.org/)

Nature-Based Solutions for Urban Resilience Network (NBS-URBNET) - A knowledge-sharing platform connecting academia, cities, and practitioners to mainstream nature-based solutions and ecosystem-based urban resilience. (https://natura-net.org)

Resilient Cities Network (R-Cities) - A city-led global network strengthening urban resilience through systemic action on health, environment, infrastructure, and governance.
(https://resilientcitiesnetwork.org/)

Terreform ONE - A New York-based non-profit combining architecture, design, and ecological science to prototype urban biodiversity corridors and adaptive green infrastructure.
(https://www.terreform.org/)

Town & Country Planning Association (TCPA) - A UK-based independent charity advocating for garden-city planning, integrated green infrastructure, and healthy, climate-resilient communities. (https://www.tcpa.org.uk/)

Trees & Us Urban Nature Network - An emerging coalition promoting green corridors, urban forests, and public participation in creating equitable, climate-ready cityscapes. *(*https://the-urban-nature-network.mn.co*)*

Trees for Cities - A UK charity improving air quality, health, and resilience by planting trees and developing urban forests in partnership with local communities.
(https://www.treesforcities.org/)

UNESCO, NBSINFRA Project - A UNESCO initiative integrating nature-based solutions into infrastructure planning across Europe to protect cities from environmental hazards.
(https://www.unesco.org/en/fieldoffice/brussels/nbsinfra)

Urban Forest Coalition - A global alliance advancing urban forestry as a climate adaptation strategy through canopy restoration, carbon sequestration, and habitat connectivity. *(*https://shorturl.at/illMX*)*

Urban Nature Atlas (UNA) - Europe's largest open database of 1,000+ urban nature-based projects showcasing green roofs, sponge parks, and wetland restorations for resilient cities. (https://una.city/)

World Green Building Council (WorldGBC) - A global network of 75 plus national Green Building Councils advocating for sustainable building materials, urban greening, and zero-carbon infrastructure. (https://www.worldgbc.org/)

World Green Infrastructure Network (WGIN) - A global body promoting the science, policy, and economics of green roofs, walls, and ecological infrastructure in urban development. (https://worldgreeninfrastructurenetwork.org/)

Relevant Websites

CityGreen: Explains how urban planners can integrate green infrastructure such as green roofs, trees, and rain gardens to enhance resilience, reduce heat, and improve livability in cities. It also offers insights for policy and design adoption. (https://citygreen.com/green-infrastructure-in-urban-planning/)

Energy-Base: Highlights how green infrastructure strengthens cities' sustainability and resilience by addressing the climate crisis through ecosystem-based urban design and planning approaches. (https://energy-base.org/news/the-power-of-urban-green-infrastructure-enhancing-the-sustainability-and-resilience-of-cities/)

European Environment Agency/Climate-ADAPT: Features real-world examples from Mediterranean cities demonstrating how structured green-space management can reduce heat stress, prevent floods, and improve urban well-being. (https://climate-adapt.eea.europa.eu/en/mission/solutions/mission-stories/urban-green-infrastructure-story-18)

Frontiers in Sustainable Cities: Reviews key enablers and barriers to urban greening, including governance, land availability, and financing, while suggesting integrated planning approaches for resilience. (https://www.frontiersin.org/journals/sustainable-cities/articles/10.3389/frsc.2025.1595280/full)

IISD: Outlines practical, evidence-based actions cities are taking globally such as green corridors, blue infrastructure, and renewable energy to build resilience against climate impacts. (https://www.iisd.org/articles/building-a-climate-resilient-city)

MDPI: It Examines neighborhood-level resilience achieved through community-based green infrastructure projects that enhance adaptive capacity and environmental quality and provides a scientific review of how urban vegetation and green roofs mitigate heat stress, reduce energy use, and contribute to climate-adaptive urban design.
(https://www.mdpi.com/)

NAbSA Climate Dialogues: Explores how nature-based infrastructure fosters urban resilience through inclusive planning, ecosystem restoration, and local stakeholder engagement.
(https://nabsaclimate.org/dialogue/green-infrastructure-for-urban-resilience/)

Nature: Presents research on designing urban green infrastructure for multifunctional benefits such as cooling, recreation, stormwater retention, and biodiversity.
(https://www.nature.com/)

SmartCitySS: Argues that green infrastructure is not merely aesthetic but essential for managing heat, floods, and biodiversity loss in rapidly urbanizing cities.
(https://www.smartcityss.com/resources/beyond-aesthetics-how-green-infrastructure-drives-resilience-in-growing-cities)

State of Green: Showcases successful city projects that integrate nature-based design and green infrastructure to enhance resilience and sustainability worldwide.
(https://stateofgreen.com/en/news/12-examples-of-climate-resilient-city-solutions/)

Sustainability-Directory: Highlights strategies for ensuring equitable access to green infrastructure so that all communities benefit from its environmental and social services.
(https://prism.sustainability-directory.com/scenario/climate-resilient-urban-green-infrastructure-for-all/)

4. Responses in Full

1. Sagar Gubbi, Disaster Risk Professional, Nigeria
2. Saeed Eshraghi, Head of Technology, Valuation and Documentation, Iranian Research Organization for Science and Technology, Tehran, Islamic Republic of Iran
3. Md Selim Reza, System Analyst, Ministry of Finance, Bangladesh
4. Sohail Akhtar, Senior Scientist, PCSIR Lab Complex, Karachi, Pakistan
5. Irum Tariq, Member Standing Committee (SC) for Smog and Climate Lahore Chamber of Commerce and Industry (LCCI), CEO at Exodus Green Pvt. Ltd., Pakistan
6. Shubhanshu Jain, Research Scholar, University of Hawai'i, U. S. A.
7. Alex Tsakiridis, Disaster Risk Specialist, France
8. Enriko Siahaan, Nbs Expert, Sintang Regency Border Infrastructure, Indonesia
9. Suhail S., Co-Founder, Voltaics Alpha Programme, India
10. Sumedh Patil, Disaster Management Professional, India
11. M. Mudassir, City Program Coordinator, UNDP, Maharashtra, India
12. Imran Ul Haq, Research Analyst, Wood Mackenzie, India
13. Dr. Ramanand Nand, Director of Centre of Policy Research and Governance (CPRG) - a Delhi-based Think Tank, India
14. Dr. Aashish Xaxa, Sociologist & Development Scholar, India
15. Ms. Akanksha Pandey, DRR Specialist & Assistant Professor (Disaster Management), Rashtriya Raksha University, Lucknow Campus, MHA, GoI
16. Ambika Dabral, Disaster Risk Management Professional, India
17. Dr. Sujata Kodag, Founder - Design Consortium & Eco Logic Foundation, Climate & Disaster Resilience Expert, India
18. Dr. Sanjaya Pradhan, Independent Consultant, India
19. Anirban Middey, Scientist, CSIR-NEERI, India

20. Rushaa Badaloo, Analyst (Advocacy Economy Department) at the Mauritius Chamber of Commerce and Industry (MCCI), Research Scholar in Applied Statistics, Mauritius
21. Inputs from APCTT, India

Responses:

1. Sagar Gubbi, Disaster Risk Professional, Nigeria

Thanks for the query! In addition to nature-based solutions (NbS), we think **enhancing stormwater drain capacities combined with NbS**, solid waste management, watershed management, building potable water resilience and affordable/climate resilient social housing, and climate risk/parametric insurance can have significant positive impact on building climate resilience of cities in Asia and Africa. *Enhancing stormwater drain capacities combined with Nature-based Solutions (NbS) such as bio-swales, retention ponds, green corridors, and permeable pavements helps increase water absorption and slow surface runoff during heavy rainfall. This hybrid approach reduces urban flooding, minimizes waterlogging, and improves groundwater recharge. By integrating natural filtration and storage processes with engineered systems, cities can better manage rainfall extremes, maintain cleaner water flows, and strengthen overall urban climate resilience.*

2. Saeed Eshraghi, Head of Technology, Valuation and Documentation, Iranian Research Organization for Science and Technology, Tehran, Islamic Republic of Iran

Proposed plans for green cities and urban resilience include air pollution reduction schemes such as decreasing the use of fossil fuels and methods for reducing the production of particulate matter. Furthermore, measures to combat drought, such as increasing rainfall via artificial rain-making, cloud-

seeding and large-scale afforestation, managing water resource usage, treating and recycling wastewater, and optimizing the fertility of agricultural products by adopting precision irrigation, soil-moisture monitoring and climate-smart agriculture can be attractive options for creating better urban infrastructure and enhancing urban resilience.

3. Md Selim Reza, System Analyst, Ministry of Finance, Bangladesh

Bangladesh is actively advancing its vision for green and resilient urban development through integrated approaches that combine sustainable infrastructure, smart technologies such as IoT-based flood monitoring, GIS-enabled urban planning, smart grids and digital twin systems, and climate adaptation measures. The country's ongoing initiatives such as Sustainable Smart Bangladesh 2041, Green Building Codes, and urban resilience projects under the Ministry of Finance and ICT Division are promoting energy-efficient systems, renewable energy integration, and digital monitoring for environmental sustainability.

We recognize that green infrastructure is not only an environmental goal but also a foundation for resilience, equity, and economic stability. By embedding ICT-enabled solutions such as smart grids, digital water management, and e-waste reduction systems, Bangladesh aims to ensure that cities are both sustainable and disaster-resilient.

In line with global commitments and guided by Qur'anic and Prophetic principles of stewardship and balance, our approach seeks harmony between human development and the environment contributing to peace, security, and shared prosperity for all.

4. Sohail Akhtar, Senior Scientist, Pakistan Council of Scientific & Industrial Research (PCSIR) Lab Complex, Karachi, Pakistan

For working on green infrastructure, especially in urban areas and climate-resilient cities, it is essential to analyze meteorological data related to the Air

Quality Index (AQI) and climate-induced disasters that disrupt everyday life, such as extreme heat leading to heatstroke or severe cold below –20°C.

The collected dataset would be used to apply AI and ML algorithms to predict future catastrophes and support informed decision-making for urban living and habitat adaptation. This approach would aid in achieving development goals such as designing heat-resistant walls, implementing efficient water management systems, and optimizing the use of essential resources like electricity and gas.

5. Irum Tariq, Member Standing Committee (SC) for Smog and Climate Lahore Chamber of Commerce and Industry (LCCI), CEO at Exodus Green Pvt. Ltd., Pakistan

As urban centers continue to expand, cities face growing environmental challenges, from rising temperatures to mounting waste and increasing greenhouse gas (GHG) emissions. To respond to these urgent concerns, the Green Infrastructure and Resilient Cities Initiative has launched an impactful campaign titled "My Waste, My Responsibility." This initiative focuses on waste segregation at the source, a simple yet powerful step to reduce GHG emissions from landfills and move towards sustainable, climate-resilient urban living.

It promotes responsible production and consumption patterns by encouraging households and businesses to segregate their waste, separating recyclables, organics, and non-recyclables. This behavioral shift directly contributes to reducing methane emissions from unmanaged landfills, which are a significant source of GHGs driving climate change. The project actively engages youth and women, recognizing their essential role as changemakers in households, communities, and workplaces. Through awareness sessions, training, and hands-on activities, participants learn how small, consistent actions, such as properly sorting waste or minimizing plastic use can create a measurable climate impact. This participatory approach not only fosters climate literacy but also promotes environmental

leadership among local communities, especially among women who are often the primary managers of household resources.

It extends beyond homes, reaching into corporate sectors to encourage organizations to take responsibility for their waste streams. By introducing office segregation systems and sustainable procurement practices, companies can significantly cut down on their carbon footprints and contribute to citywide GHG reduction targets. In doing so, "My Waste, My Responsibility" links individual action to collective transformation, creating a bridge between household habits and institutional sustainability goals.

A Step Towards Climate-Resilient Cities: As climate change accelerates, cities must become hubs of innovation and resilience. Waste management is one of the most direct and impactful entry points. Every kilogram of waste diverted from landfills saves emissions, reduces urban heat, and preserves valuable materials for reuse.

Through this initiative, the Green Infrastructure and Resilient Cities program aims to demonstrate that resilience begins at home, with a single bin, a simple choice, and a shared sense of responsibility.

6. Shubhanshu Jain, Research Scholar, Univerisity of Hawai'I, U.S.A.

Drawing from my experience living in Hawai'i at the very heart of the Asia-Pacific, I've come to view climate change and urban infrastructure as deeply intertwined challenges of scale and governance. My doctoral research in Urban and Regional Planning at the University of Hawai'i examines how institutions in the United States, India, and Indonesia operationalize resilience through planning, education, and disaster-risk reduction. Having worked with Federal Emergency Management Agency (FEMA), Indonesia's Badan Nasional Penanggulangan Bencana (BNPB), and in post-Hurricane Maria recovery in Puerto Rico, I've seen how systems thinking, community engagement, and intergovernmental coordination are essential to sustainable

urban transitions. I believe strengthening capacities for integrated planning, financing, and training is crucial for both metropolitan and island contexts.

7. Alex Tsakiridis, Disaster Risk Specialist, France

Drawing from PreventionWeb sourced knowledge, climate change is intensifying pressures on urban infrastructure across Asia and the Pacific, with cities facing more frequent flooding, coastal erosion, heat stress, and cascading failures in critical services such as transport, power, and drainage. Nature-based solutions (NbS) are helping cities adapt by restoring wetlands and mangroves to buffer floods and storm surges, expanding urban forests and green roofs to reduce heat, and creating hybrid "green-grey" systems that combine natural and engineered infrastructure for greater resilience.

Beyond protection, these approaches deliver multiple co-benefits such as improved air quality, biodiversity, and livelihoods making them attractive investments when their full value is accounted for.

Lessons from successful initiatives highlight the importance of integrating NbS into formal planning and budgeting, standardizing performance metrics to build confidence, and developing blended finance models that leverage public, private, and development funding. City-to-city learning networks and inclusive governance are also key to scaling, ensuring community ownership and long-term stewardship.

At the same time, new technologies are transforming how cities can build climate resilience. Internet of Things (IoT) sensors, AI-driven digital twins, and real-time data platforms help monitor rainfall, drainage, and heat to inform faster decision-making. Advanced early warning systems, resilient building materials, and fintech innovations such as resilience bonds further strengthen preparedness and investment.

To implement these solutions effectively, partnerships among local and national governments, development banks, UN agencies, city networks, private technology firms, academia, and community organizations are essential. Together, these actors can co-design projects, share knowledge,

and mobilize finance to accelerate the transition toward climate-resilient, inclusive, and sustainable cities across the Asia-Pacific region.

8. Enriko Siahaan, Nbs Expert, Sintang Regency Border Infrastructure, Indonesia

I would like to highlight that the concept of **green infrastructure** is increasingly vital for creating **climate-resilient cities**, especially in the face of rapid urbanization, ecological degradation, and rising climate risks. This approach directly contributes to **Sustainable Development Goals (SDGs) 9, 11, and 13** and aligns with **UNEP Resolution EA.5/Res.8**, which emphasizes sustainable, pollution-preventive infrastructure development.

The initiative focuses on integrating **bamboo and rattan-based infrastructure** as part of **nature-based solutions (NbS)**in collaboration with the **International Bamboo and Rattan Organization (INBAR)** and **UNESCAP**. These natural materials provide environmentally friendly and cost-effective alternatives for addressing challenges such as **floods, heatwaves, and pollution** while simultaneously promoting ecological restoration and community well-being.

Bamboo's extensive root systems help **stabilize soil, prevent erosion, and absorb excess water**, reducing the risks of flooding and landslides. Its dense canopy and evapotranspiration capacity contribute to **natural air cooling**, mitigating urban heat island effects and decreasing the need for energy-intensive air conditioning. Additionally, bamboo plays a crucial role in **carbon sequestration**, capturing significant amounts of CO_2 and improving air quality. It also functions as a **natural water and soil purifier**, drawing out heavy metals and contaminants from polluted environments.

Similarly, **rattan**, a fast-growing climbing palm, contributes to **heat mitigation and flood resilience** by supporting healthy forest ecosystems and promoting watershed stability. It also offers a renewable alternative to high-emission construction materials such as steel and concrete, with the added benefit of being biodegradable and low-impact in processing.

The initiative proposes the application of **AI and GIS-based tools**, including **Google Earth AI**, **real-time flood monitoring systems**, and **heat mapping technologies**, to strengthen decision-making and land-use planning. These technologies can predict environmental hazards, identify vulnerable areas, and optimize resource allocation for water, electricity, and energy management.

Implementation can be supported through **national and local government budgets**, as well as collaboration with **UN agencies, NGOs, and CSOs**. The approach emphasizes **community empowerment**, promoting local participation in bamboo and rattan cultivation and enhancing **cultural knowledge, traditional practices, and livelihoods**.

In conclusion, adopting bamboo and rattan within the **green infrastructure framework** presents an innovative, sustainable, and inclusive pathway to address urban climate challenges. By combining natural resilience with digital intelligence, this model advances both environmental and socio-economic sustainability while strengthening community-led adaptation and ecological balance. Please find the link below of the document on nature based solutions here:

(https://community.unescap.org/posts/cop-on-climate-technologies-green-infrastructure-and-resilient-cities)

9. Suhail S., Co-Founder, Voltaics Alpha Programme, India

Cities in the Asia-Pacific region are increasingly experiencing the impacts of climate change, which have severe consequences for urban infrastructure. The observed impacts include:

- Flooding: Heavy rainfall and rising sea levels are leading to more frequent and intense floods, particularly in coastal and low-lying cities.

- Heatwaves: Urban heat islands (UHI) exacerbate heat stress, particularly in densely populated cities, contributing to health issues and damage to infrastructure.

- Storm Surges: More intense storms threaten coastal infrastructure, such as roads, bridges, and energy systems, especially in cities located along the coastlines.

Nature-based solutions (NBS), including green infrastructure (such as urban parks, green roofs, and tree planting) and blue infrastructure (such as wetlands, rivers, and coastal mangroves), play a crucial role in enhancing resilience and addressing these climate risks. They contribute to:

- Flood Mitigation: Vegetation and permeable surfaces help absorb excess rainwater, reducing surface runoff and the risk of flooding.
- Heat Resilience: Green spaces, including tree canopies, provide shade and cooling, helping to mitigate the UHI effect.
- Ecosystem Restoration: Mangrove forests and wetlands act as natural barriers, reducing the impact of storm surges and protecting coastal infrastructure.

The principal lessons for scaling up nature-based solutions regionally include:

- Community Participation: Involving local communities in the design and implementation of green infrastructure ensures sustainability and long-term success.
- Multidisciplinary Collaboration: Collaboration between urban planners, environmental scientists, and disaster management experts is essential for integrating nature-based solutions into urban development.
- Policy Support and Financial Investment: Governments need to prioritize green and blue infrastructure through policy, regulatory frameworks, and sustained funding for maintenance and monitoring.

Innovative Technologies for Climate-Resilient Cities:

In addition to nature-based solutions, new technologies and innovative concepts hold great potential for enhancing resilience in Asia-Pacific cities:

- **Smart Flood Monitoring Systems: Real**-time data from sensors can predict flooding events and trigger early warnings, enhancing preparedness and response.

- **Resilient Urban Planning Tools:** Digital tools like Geographic Information Systems (GIS) and climate models can help cities integrate climate risk assessments into infrastructure planning.

- **Green Roofs and Vertical Gardens:** These innovative approaches to utilizing urban space provide stormwater management and reduce heat effects, while supporting biodiversity.

- **Nature-Based Coastal Protection:** Eco-engineering solutions like coral reef restoration and mangrove rehabilitation offer sustainable, cost-effective ways to reduce storm surge impacts on coastal cities.

To implement these solutions effectively, key partners include:

- **Government Agencies:** To develop policies, regulations, and financial support for climate resilience.
- **Academic Institutions and Research Organizations:** To provide technical expertise and innovative solutions for sustainable urban planning.
- **Private Sector:** Companies specializing in smart technology, construction, and green infrastructure design.
- **Local Communities and NGOs:** To ensure the local relevance of solutions and encourage broad-based support.

In summary, addressing climate change impacts on urban infrastructure in the Asia-Pacific region requires a combination of nature-based solutions and innovative technologies, along with strong partnerships across sectors. By

fostering collaboration, supporting community-driven approaches, and investing in resilient infrastructure, cities can mitigate disaster risks, reduce vulnerabilities, and enhance their overall sustainability and livability.

10. Sumedh Patil, Disaster Management Professional, India

It is evident from the recent trend that number of heat wave days and it's severity is increasing due the climate change. The impacts are worse in the urban areas due to concrete infrastructure with temperature soaring every passing year.

Miyawaki Forest is one technique of urban afforestation for cultivating fast growing native plants, with the dense, mixed planting intended to simulate the layer of a natural forest. This forest not only create a pocket for sustenance for native species but also helps to reduce pollution and extreme heat. As it contributes in creating healthier environment - corporations in India are adopting this technique as one of the measure to mitigate the risk of climate hazards.

11. M. Mudassir, City Program Coordinator, UNDP, Maharashtra, India

The multi-hazard risk assessment study for Nashik, Nagpur, and Chhatrapati Sambhaji Nagar in Maharashtra state of India found that climate change is intensifying floods, heat stress, and infrastructure damage. Frequent flooding in low-lying wards, rising temperatures, and water scarcity are major urban risks. Cities are recommended to responding through nature-based and green-blue infrastructure reviving canals and ponds, using semi-permeable pavements, greening riverbanks, and promoting rainwater harvesting to manage runoff and heat.

Key lessons for scaling include integrating such solutions into city master plans, improving coordination among departments, and engaging communities and private partners for funding and maintenance. Innovative

technologies such as decision support systems, flood early warning systems, Integrated Command and Control Centres, and GIS-based risk mapping have strong potential for resilience. Implementation should involve municipal bodies, disaster management authorities, research institutions such as Indian Institute of Technology Madras (IITM), National Institute of Disaster Management (NIDM), Yashwantrao Chavan Academy of Development Administration (YASHADA), United Nations Development Programme (UNDP), and private sector partners to foster data-driven, climate-resilient urban development across the Asia-Pacific region

12. Imran Ul Haq, Research Analyst, Wood Mackenzie, India

In the Asia-Pacific region, urban infrastructure is acutely stressed by climate change, with observed impacts including increased flooding and storms that overwhelm traditional systems, prolonged urban heatwaves that stress power grids, and water stress that strains supply. To address this, Nature-Based Solutions (NBS) are proving to be effective, cost-efficient strategies for enhanced resilience. A prime example from the region is China's massive Sponge City Initiative, which explicitly integrates blue infrastructure like permeable pavements, rain gardens, and restored wetlands in cities like Chongqing to absorb and manage stormwater runoff, significantly mitigating flood risk. To ensure these approaches are successfully scaled regionally, key lessons must be adopted: integrate planning by shifting to hybrid (grey-green-blue) infrastructure, develop valuation and metrics to quantify the multiple benefits of NbS, invest in capacity building for municipal staff, and prioritize community engagement for long-term stewardship.

Developing truly climate-resilient cities requires a future-focused strategy that leverages the fusion of natural and digital systems. Innovative concepts hold the greatest potential, including "Smart-Green" Water Management that integrates sensors and AI with green infrastructure for optimized water retention, Climate-Informed Urban Design utilizing high-resolution climate projections to inform construction codes, and Advanced Material Science for developing high-albedo and self-healing materials. Scaled

implementation demands a multi-stakeholder partnership: National and Local Governments must set the regulatory framework and political will; Regional Bodies and Think Tanks (like ESCAP, NIUA, and NEERI) are vital for knowledge sharing and synthesizing regional lessons; the Private Sector is needed for developing and integrating smart technologies (as seen in the sustainable design of projects like the Shanghai Tower); Multilateral Development Banks (MDBs) must pioneer innovative financing mechanisms; and Academia and Research Institutions are necessary for continuous innovation and rigorous monitoring of NBS performance.

13. Dr. Ramanand Nand, Director of Centre of Policy Research and Governance (CPRG) - a Delhi-based Think Tank, India

Climate change is an undeniable reality, necessitating a comprehensive overhaul of urban infrastructure to address its challenges. South Asia's diverse geography, climate, and socio-economic conditions demand equally diverse urban infrastructure solutions. However, this is not the case. From one region to another, we observe a monotonous uniformity in infrastructure design, failing to account for local variations and needs.

To address this, city planning must integrate localized climate and environmental data including air quality indices, temperature trends, and flood risks into the design and implementation of infrastructure.

Incorporating nature-based and green infrastructure solutions, such as urban wetlands, green corridors, and climate-adaptive building materials, can significantly reduce heat stress, manage floods, and improve urban livability.

Furthermore, digital and geo-spatial tools such as GIS, AI/ML-based risk mapping and smart sensors can support the planning and monitoring of green infrastructure projects, helping cities better anticipate floods, heatwaves and pollution hotspots. Additionally, collaboration among government agencies, private developers, and local communities in the region shall also ensure that urban resilience planning reflects both scientific evidence and socio-cultural realities.

By moving away from one-size-fits-all urban models and adopting context-specific, data-driven, and nature-aligned approaches, cities can become truly climate-resilient and sustainable.

14. Dr. Aashish Xaxa, Sociologist & Development Scholar, India

Sharing my article, "Sustainable Urbanization in Tribal or Indigenous Peoples' Areas of India" in 'Encyclopedia of the UN Sustainable Development Goals. Sustainable Cities and Communities' (Springer, Cham); Edited by Walter Leal Filho, Pinar Gökçin Özuyar, Anabela Marisa Azul, Luciana Londero Brandli and Tony Wall (ISBN: 978–3–319–95716–6, DOI: https://doi.org/10.1007/978-3-319-71061-7_126-1 on 1st May 2021. [This volume is the largest editorial project on matters related to sustainable development ever undertaken.]

The article argues for re-envisioning of urban development in Indigenous areas of India in an orthogenetic manner, where land control is returned to the Indigenous Peoples rather than keeping it in the vestige of the state. The reason being Indigenous Peoples can use their traditional knowledge of the varied land ownership patterns to create a sustainable future for their communities and help mitigate climate change.

15. Ms. Akanksha Pandey, DRR Specialist & Assistant Professor (Disaster Management), Rashtriya Raksha University, Lucknow Campus, Ministry of Home Affairs (MHA), Government of India (GoI)

Urban infrastructure in the Asia-Pacific region is increasingly challenged by climate-induced risks making the need for effective adaptation strategies urgent. Cities across this region are advancing nature-based solutions and green/blue infrastructure approaches to enhance climate resilience and livability. Several cities including Singapore, Bangkok, Melaka, and Dong Ha have implemented green infrastructure such as water-sensitive urban design, urban green spaces, integrated stormwater management, and vertical forests to mitigate flooding, heat, and pollution.

In India, Bangladesh, and Nepal, urban wetlands restoration, urban forests, and peri-urban green belts have proven effective in absorbing excess rainfall, reducing urban heat, and providing co-benefits for biodiversity and community well-being. Integrative planning is essential: aligning infrastructure, ecosystem management, and social inclusion delivers stronger, lasting outcomes. Community engagement from inception fosters ownership and long-term maintenance, as seen in Freetown's Tree Town campaign and urban park initiatives in Bangkok and New Delhi. Cross-sector collaboration (governments, private sector, local communities, development partners) accelerates scaling and innovation, especially when tied to capacity building and shared financing mechanisms. Climate resilience must be embedded within development policy, leveraging new technology (GIS, smart systems), strengthened governance, and regional knowledge exchange.

Technological innovations like integrated urban water management, permeable pavement (sponge cities), urban GIS for disaster mapping, and solar microgrids are increasingly adopted. Nature-based solutions (NbS) backed by scientific research and practitioner-led pilots are amplifying impact, with international organizations (e.g., ICLEI, ADB, UN-Habitat, CDIA, local universities), NGOs, and municipal authorities as key partners for implementation and upscaling. Emphasizing participatory governance ensures projects address local contexts and priorities, while long-term technical and financial support is crucial for the resilience of these interventions.

16. Ambika Dabral, Disaster Risk Management Professional, India

Thank you for the query. The key climate-induced hazards that urban areas are witnessing include floods and heatwaves. Both hazards are now becoming increasingly common, even in urban areas that have not traditionally been prone to floods and heatwaves. With respect to the floods and urban floods, the experience from Indian cities suggests that, though induced by climate change and altered weather patterns, a lot of these risks are systemic in nature and are often aggravated by bottlenecks and lapses

prevailing in the planning and functioning of the critical urban infrastructure, such as drainage, storm water management, solid & liquid waste management, among others. Shrinking blue-green cover, coupled with poor urban waste management, including management of construction and demolition waste, household and commercial waste, is among the key causes of urban floods in these cities. The resultant impacts are multi-dimensional, including loss of lives, loss of livelihood (particularly impacting the informal workers and settlements), cascading public health impacts (disease transmissions), disruption in the functioning of critical infrastructure and basic services.

Nature-based solutions (NbS) (both pure and hybrid), such as floating waste treatment wetlands (leverage phytoremediation), permeable pavements, restoration of traditional blue spaces (water bodies), riparian buffers, sponge cities, mangrove plantations, terracotta silt traps (coastal cities), etc., are found to be effective for the management of urban floods. Similarly, for mitigation of urban heat impacts, green solutions such as green roofs, urban forests & biodiversity parks (both long-term interventions), urban sacred groves, agro-forestry, etc. have provided positive results.

However, a word of caution with respect to planning and implementing NbS is that these solutions are very site-specific and should not be replicated blindly. Understanding the critical characteristics (geo-climatic, geological, biophysical, etc.) of the ecosystem is of paramount importance. Further, the selection of the right design, material, and species is very critical to ensure that the solution is suitable for the given ecosystem and the local context. The approach of adaptive management with multiple stakeholders and multi-disciplinary experts can be very helpful in the right selection, designing, management and monitoring of such NbS. The critical partners in this regard include local communities, urban local bodies, scientists, researchers and practitioners on the concerned ecosystems (lakes, rivers, creeks, wetlands, mangroves, forests, etc.), along with a pool of experts (botanists, horticulturists, hydrologists, soil experts, geologists, among others).

17. Dr. Sujata Kodag, Founder - Design Consortium & Eco Logic Foundation, Climate & Disaster Resilience Expert, India

Green infrastructure assures reduction of risks in a natural way, increasing resilience of cities. However green Infrastructure alone does not guarantee resilience. Hence, there is no one solution in building resilience, multiple and context-based solutions are needed. Green infrastructure must be part of urban planning for various reasons. If urban settlements are not in harmony with nature, they are bound to be damaged and destroyed.

18. Dr. Sanjaya Pradhan, Independent Consultant, India

In India, climate change is exerting an increasingly visible and severe impact on urban infrastructure, particularly in major metropolitan areas such as Mumbai, Delhi, Bengaluru, Chennai, and Kolkata. The key areas of impact include:

Irregular monsoons and urban flooding: Intense, unpredictable rainfall events frequently overwhelm drainage systems, resulting in waterlogging, property damage, and disruption of daily life. Mumbai's recurring monsoon floods (2021, 2023) and Bengaluru's flooding in 2022 crippled mobility, halted public transport, and disrupted business operations.

Coastal flooding and saltwater intrusion: Cities such as Mumbai and Chennai experience frequent high tides, storm surges, and coastal inundation, which endanger housing, roads, and industrial zones in low-lying coastal belts.

Transport disruptions: Flooded roads, railways, and metro networks often bring cities to a standstill, affecting emergency response and essential services.

Water scarcity and groundwater depletion: Erratic rainfall has worsened

water shortages, especially in Delhi and Chennai. Chennai's 2019 crisis when reservoirs nearly ran dry, exposed the city's vulnerability to changing rainfall patterns.

Heatwaves and urban heat island effect: Rising temperatures, particularly in Delhi, intensify urban heat stress, leading to higher energy consumption and severe public health risks.

Cyclones, storms, and power outages: Extreme events such as Cyclone Amphan (2020) and Cyclone Tauktae (2021) caused widespread infrastructure damage along India's eastern and western coasts.
Public health and sanitation challenges: Flooding and poor waste management have contaminated water sources, increasing outbreaks of vector-borne diseases such as dengue, malaria, and leptospirosis.

Strengthening Resilience through Nature-based and Green-Blue Infrastructure:
Indian cities are increasingly turning to Nature-based Solutions (NbS) and green/blue infrastructure to enhance climate resilience:

Mangrove restoration and river rejuvenation in Mumbai (Mithi River, Thane Creek) help buffer flood risks and enhance biodiversity.
Wetland conservation and urban water parks in Chennai (e.g., Pallikaranai marsh restoration) improve flood control and groundwater recharge.

Urban forestry and green roof initiatives in Bengaluru and Delhi reduce heat stress and improve air quality.

Permeable pavements and bio-swales in Smart City projects strengthen stormwater management and reduce runoff.

Key Lessons for Regional Scaling:
Integrate NbS into urban planning: Embed climate adaptation and NbS strategies within city master plans and Smart City missions.
Enhance institutional coordination: Foster collaboration among municipal authorities, urban planners, environmental agencies, and community groups.

Ensure sustainable financing: Establish dedicated resilience funds and leverag Corporate Social Responsibility (CSR) and climate finance for implementation and upkeep.

Promote community participation: Utilize local ecological knowledge and citizen engagement to strengthen ownership and long-term sustainability.
Build technical capacity: Equip city institutions with the expertise to design and manage ecological-engineering hybrid solutions.

19. Anirban Middey, Scientist, CSIR-NEERI

Green Infrastructure promotes sustainable urban transformation by integrating nature into city planning. India's cities are confronting significant resilience challenges such as rising temperatures, urban floods, shrinking green cover, groundwater depletion, and deteriorating air quality. National missions such as the Smart Cities Mission, AMRUT, and NCAP have accelerated interest in climate-smart urban ecosystems.

Indian Experience and Examples include:

- Biodiversity Parks: Delhi, Bengaluru, Pune
- Wetland & Lake Restoration: Hyderabad, Kochi, Bengaluru, Kolkata
- Urban Forests: Delhi, Pune, Chennai, Chandigarh
- Green Mobility: Chennai pedestrian-first streets, Pune cycling infrastructure
- Green Roofs & Urban Farming: Mumbai, Bengaluru

Scientific Advancements Supporting Green Infra (GI) include:

- UHI mapping using remote sensing
- AI and GIS-based green cover monitoring
- Blue-green network modelling
- Heat vulnerability and pollution exposure indices

Emerging initiatives such as **Hydro-ecological zoning, blue-green network mapping, and heat risk vulnerability models** strengthen

scientific foundations. Thus, future Indian cities must embrace **landscape-scale restoration**, **urban biodiversity corridors**, **nature-positive infrastructure**, and **urban sponge city frameworks** adapted to monsoon realities.

In summary, India's growing experience with urban ecological restoration and nature-based solutions demonstrates the strong potential of GI to enhance climate resilience and livability. While the progress is encouraging, mainstreaming GI requires stronger regulatory frameworks, scientific-planning integration, sustained financing, and community-centred stewardship.

With coordinated action, GI can transform Indian cities into **cooler, biodiverse, flood-adaptive, and socially inclusive** urban systems aligned with national climate commitments and global resilience agendas.

20. Rushaa Badaloo, Analyst (Advocacy Economy Department) at the Mauritius Chamber of Commerce and Industry (MCCI), Research Scholar in Applied Statistics, Mauritius

Every country is feeling the weight of climate stress in its own way. While we talk about long-term adaptation, Jamaica is right now enduring the strongest hurricane in its history. Hurricane Melissa has left bridges collapsed, power grids crippled, and tens of thousands without shelter. The UNEP Adaptation Gap Report 2025 landed almost the same week, warning that developing nations will need around US$310–365 billion every year by 2035 to adapt, yet finance fell to just US$26 billion in 2023.

What we are seeing in Kingston today mirrors a wider pattern across cities from Manila to Port Louis: the quiet breakdown of infrastructure under conditions it was never designed for. Concrete swells and cracks in prolonged heat, asphalt softens, and ageing water mains burst repeatedly. In Dhaka and Ho Chi Minh City, road repair budgets have doubled in a decade but deterioration happens faster because materials and design standards have not caught up with the new climate

Nature-based and green–blue infrastructure offer a different kind of durability. Wetlands absorb stormwater that would otherwise flood homes, urban forests cool streets by a couple of degrees, and green roofs shield buildings from heat expansion. Kuala Lumpur's wetland parks now retain nearly a quarter of the runoff that once swamped business areas. Seoul and Singapore have shown how tree corridors can lower local temperatures and reduce energy demand. These are not decorative add-ons; they extend the life of the systems beneath them.

However, replication across the region is patchy. Too many projects fade once pilot funding ends. The cities that succeed are those that pair green design with strong upkeep. A bioswale without maintenance becomes a drain; a green roof without inspection becomes a leak. Linking each project to a ten-year maintenance plan funded through drainage fees or developer contributions would make a real difference.

Success also needs to be measured differently. Instead of counting the number of trees planted, we should be asking how much rainfall is retained, how much energy use has fallen, and how much heat has been reduced. That kind of data can be shared across cities through regional institutions so we learn faster and waste less money repeating failed experiments.

Technology is now part of this ecosystem. Cities such as Shanghai and Bangkok use digital twins to simulate rainfall and traffic, adjusting drainage in real time. Low-cost sensors in parks and rooftops feed data that helps governments monitor performance rather than rely on consultants once a year. Small island states are even testing modular solar-battery grids to keep power running through cyclones.

Financing remains the hardest piece. The Baku to Belém Roadmap points to US$1.3 trillion a year by 2035 if new providers join and if concessional and grant finance take precedence over loans. Private capital could bring about US$50 billion yearly with the right policy frameworks. Brazil's Tropical Forest Forever Facility is another encouraging example, linking forest protection with financial returns for more than 70 developing nations.

Urban resilience in Asia and the Pacific will not come from one grand plan but from many small, well-kept systems that age gracefully rather than collapse under the next storm. Investing in adaptation today is not an expense, it is the insurance premium of tomorrow.

21. Inputs from APCTT, India :-

1. On the 26 November 2024, the Asian and Pacific Centre for Transfer of Technology (APCTT) hosted a conference on climate-resilient infrastructure technologies, convening technologists and policymakers across the Asia-Pacific region. Experts from Iran, Nepal, India, and the Republic of Korea presented case studies and innovation in renewable energy, water management, and climate-resilient urban planning. The focus was on technology-based solutions and regional cooperation to ensure climate resilience.

The conference underlined the key role of technology, innovation, and inclusive planning in the development of climate-resilient infrastructure in prioritized sectors including water, energy, agriculture, and urban development. The participants stressed the need for utilizing frontier technologies such as artificial intelligence, machine learning, digital twins, data-driven risk analysis, and early warning systems to effectively manage climate risks and facilitate the estimation of loss and damage. Nature-based solutions and sustainable urban planning were identified as essential, in addition to local demonstration projects, capacity development, and community engagement. National examples from the Republic of Korea, Iran, India, and Nepal demonstrated tangible applications, such as smart agriculture, renewable energy integration, flood management, retrofitting, and green urban transformations. Constraints identified were high costs, technical shortages, poor policy environments, and limited data and funds.

The recommendations urged governments and institutions to enhance start-up ecosystems, facilitate innovation, and embrace future-oriented, locally appropriate climate resilience strategies. Stakeholder engagement and inclusive planning were emphasized as the building blocks for the creation of people-oriented solutions. Detailed vulnerability assessments through digital tools were also suggested by the conference in order to effectively

focus interventions. For the Asian and Pacific Centre for Transfer of Technology (APCTT), particular priorities involve encouraging cross-sectoral cooperation, improving South-South cooperation, ensuring technology transfer, and continuing to offer forums for best practice sharing and technological solution alignment to meet country needs.

The papers presented and the summary of the proceedings of the conference are available at:

(https://apctt.org/events/international-conference-technologies-climate-resilient-infrastructure)

2. The development and adoption of technologies for climate-resilient infrastructure is essential to build a safer, more sustainable Asia-Pacific region. These technologies play a crucial role in safeguarding lives, economies, and the environment by minimizing disaster impacts, ensuring business continuity, and supporting climate adaptation.

Key focus areas include smart energy systems, efficient water management, data analytics and AI for accurate forecasting, urban planning with nature-based solutions, and monitoring through IoT and GIS tools. To add to this, innovations in finance and insurance, disaster risk management, agriculture, transportation, and community engagement strengthen regional resilience and align with the Sustainable Development Goals (SDGs). Through these efforts, member countries can build inclusive, adaptive, and future-ready infrastructure.

This infographic that we designed at APCTT pragmatically captures all these technologies while giving you insights into real-world examples. (link-https://community.unescap.org/posts/cop-on-climate-technologies-green-infrastructure-and-resilient-cities)

Many thanks to all who contributed to this query!

The Community of Practice on Climate Technologies aims to foster technology cooperation and transfer through enhanced knowledge exchange and cross-border collaboration in Asia Pacific.

If you have further information to share on this topic, please send it at apctt@un.org.

This Consolidated Reply is a systematic compilation of all responses received and additional desk research. It has been compiled by the CoP Moderator Vinita Kumari, Consultant to APCTT.

ESCAP

APCTT
Asian and Pacific Centre
for Transfer of Technology

Asian and Pacific Centre for Transfer of Technology

APCTT Building,
C2, Qutab Institutional Area, New Delhi - 110016, India
apctt@un.org, +91-11-69013700

@unapctt |