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Stakeholder Engagement Workshop

Synthesis Note

Developing an Ecosystem-based Adaptation Feasibility Tool (DEFT) for Indian Cities: A Case Study of Hebbal

25 June 2025 | Hyatt Centric Hebbal, Bengaluru

Edited and designed by CSTEP

Disclaimer

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1. Introduction

Cities across India are facing the impacts of rapid urbanisation, ecological degradation, and intensifying climate risks. As heatwaves, flooding, water scarcity, and ecosystem decline increasingly threaten urban lives and infrastructure, the need for strategic, nature-based adaptation planning has never been more urgent.

To address this challenge, the Developing an Ecosystem-based Adaptation Feasibility Tool (DEFT) project is being undertaken by the Center for Study of Science, Technology and Policy (CSTEP), with support from the Global EbA Fund. Spanning a 2-year timeline, DEFT aims to equip key beneficiary groups with a decision-support tool based on geographic information system (GIS) to mainstream ecosystem-based adaptation (EbA) into urban, peri-urban, and rural development planning.

At its core, DEFT is envisioned as a long-term, replicable platform to help Indian cities identify climate risks, visualise blue-green infrastructure (BGI), and evaluate feasible NbS interventions. The tool is designed to support evidence-based decision-making for resilience planning—particularly in fast-growing, climate-vulnerable urban regions (Figure 1).

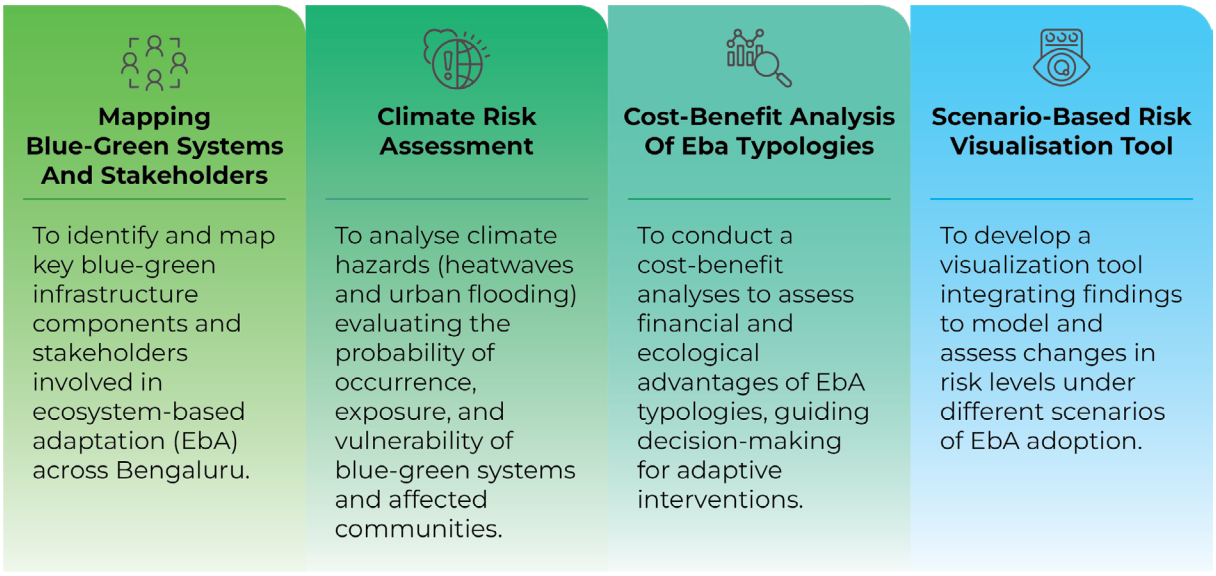

Figure 1: DEFT project progress – logic

Bengaluru Urban District was selected as the anchor city, given its evolving urbanisation patterns, mounting climate pressures, and rich blue-green systems—such as lakes, wetlands, open spaces, and remnant biodiversity corridors. Despite its ecological endowments, the city continues to witness increasing heat stress, seasonal flooding, and fragmentation of green cover, all exacerbated by uncoordinated urban development.

Within Bengaluru, the Hebbal region was chosen as a pilot site to troubleshoot the project methodology before scaling up across Bengaluru Urban District. Hebbal is a climate-vulnerable urban region, marked by flood-prone low-lying areas, heat islands, and ecological hotspots, such as the Hebbal–Nagavara lake ecosystems. The ward also presents a diverse socio-economic landscape and has demonstrated community interest in green space preservation and waterbody restoration, making it a strong candidate.

2. Workshop Overview

On 25 June 2025, the project team hosted a Stakeholder Engagement Workshop at Hyatt Centric, Hebbal as a key milestone in the DEFT project's development phase. The event aimed to co-reflect on the DEFT pilot conducted in the Hebbal ward and gather practitioner-driven insights to strengthen the tool's next iteration.

The workshop had four core objectives:

- Share and validate key findings from the Hebbal pilot study.
- Gather stakeholder feedback on DEFT's methodology, interface, and usability.
- Identify pathways for integrating EbA into ongoing initiatives.
- Facilitate dialogue on data harmonisation, governance linkages, and policy feasibility.

Thirty individuals representing 18 organisations attended, spanning nine beneficiary groups (see Appendix). Their contributions highlighted both systemic challenges and field-level innovations in flood mitigation, biodiversity conservation, and participatory planning.

> ***There are extensive exotic species in Hebbal Lake, but biodiversity presence alone doesn't make it EbA***
>
> Dr Jagdish Krishnaswamy, Dean, School of Environment and Sustainability, IIHS

3. Workshop Highlights

The Hebbal pilot focused on mapping blue-green features and identifying localised hotspots for flooding and heatwaves, two of Bengaluru's most urgent climate risks. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR5), the pilot study overlaid the probability of occurrence of both hazards and their exposure on land use and land cover (LULC) with socio-economic and socio-ecological vulnerabilities to help prioritise EbA options.

The workshop featured the following aspects:

- Methodology deep dives into climate and ecological layers
- A demonstration of the DEFT mock-up tool interface
- Interactive discussions on data challenges, urban microclimate mapping, native biodiversity, and ongoing community-led restoration projects
- Some thematic insights are as follows:

3.1. Blue-green mapping

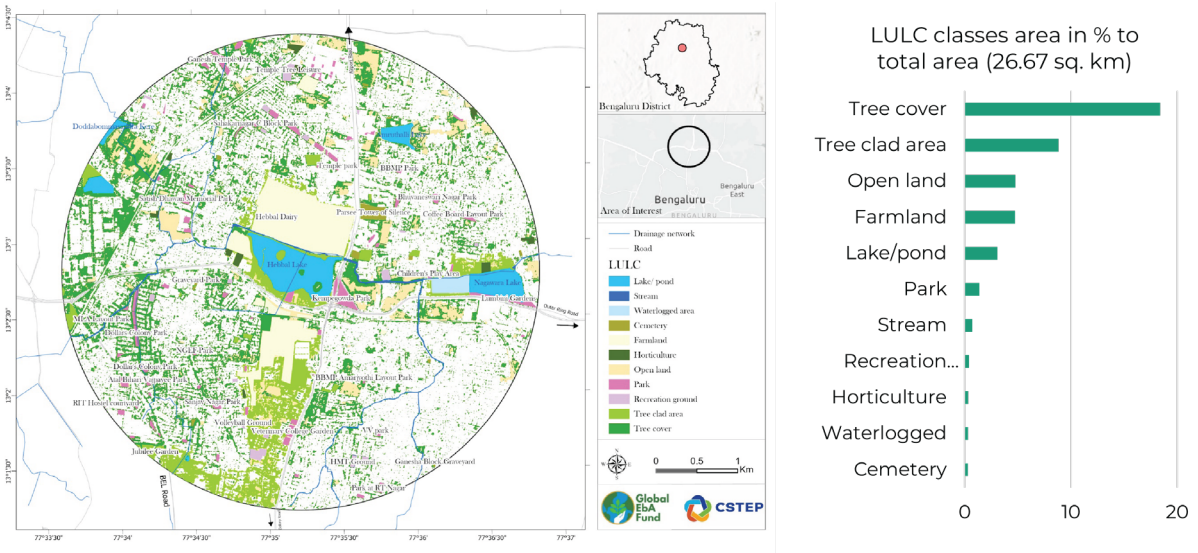

Figure 2: Blue-green classes of the Hebbal pilot region (source: Cartosat 2E [January 2025])

Participants emphasised the need to move beyond surface-level blue-green mapping by embedding biodiversity values, adopting species-level differentiation with a focus on native flora, improving the spatial and temporal quality of datasets, and leveraging existing high-resolution institutional data to avoid duplication (Figure 2).

> ***Bangalore's boundaries shift with public demand. A decentralised approach may work better, and the tool should reflect that.***
>
> Nidhishree N Kumar, Associate, Janaagraha

No.	Stakeholder insight	Action point
1	Blue or green spaces with invasive species do not qualify as EbA unless they support native biodiversity.	Incorporate species diversity and biodiversity layers as indicators for ecosystem health of blue-green systems. Source species-level data from institutions such as the Indian Institute of Science (IISc), Indian Institute of Human Settlements (IIHS), and Bengaluru Sustainability Forum (BSF) for integration.
2	The presence of biodiverse species alone (e.g., at Hebbal Lake) is not enough—ecological function matters.	Evaluate the ecological role and function of biodiversity, not just species count.
3	Green cover must distinguish native from exotic species and include understory flora, such as moss and grass species.	Refine typologies to represent functional biodiversity.
4	Stakeholders also highlighted that exotic species (e.g., Rain Tree and Singapore Cherry) offer significant ecosystem services such as shade, carbon sequestration, and habitat value.	Use a gradient approach—prioritise native species but acknowledge beneficial exotics.
5	Canopy data may reflect seasonal bias if based on single-date imagery.	Use seasonal composites and long-term datasets to improve vegetation accuracy.
6	Unsupervised classification results need validation against trusted references.	Cross-validate with benchmark datasets, such as the European Land Data Assimilation System (ELDAS), and integrate other available institutional data to strengthen the backend.

Earlier, floods were rare. Now we get no warning—it just happens. We need better systems, especially in low-lying areas.

Vidya Goggi, Member, Residents Welfare Association, RT Nagar

What we build here shouldn't stop at Hebbal. The methodology must be robust enough to replicate across other cities and contexts.

Dr Manish Kumar, Group Head, Adaptation and Risk Analysis, CSTEP

3.2. Risk and vulnerability assessment

Stakeholders highlighted key considerations to improve risk assessment capacity. The discussion centred around refining exposure parameters (Figure 3) for urban contexts, contextualising hydrology shifts over time for flood assessments and embedding built environment and materiality factors in heatwave analysis. A recurring theme was the need to ground EbA in dynamic risk realities and avoid maladaptive outcomes.

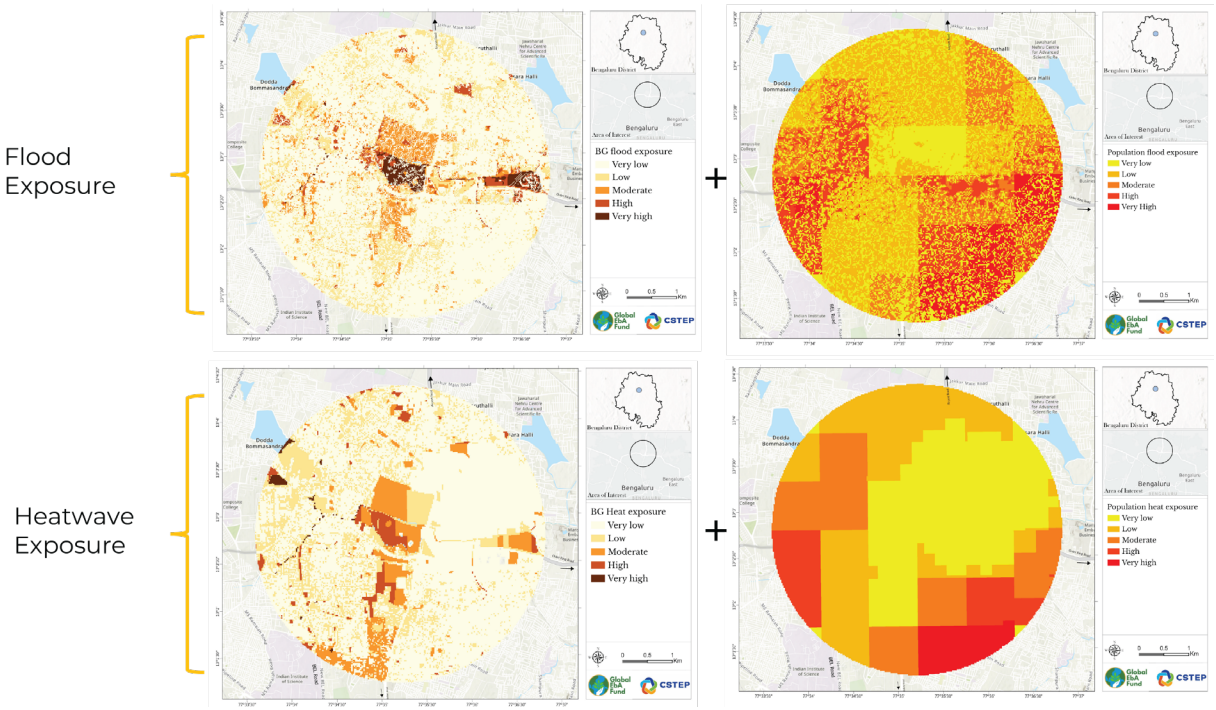

Figure 3: Exposure mapping of the Hebbal pilot region: (a) flood exposure to blue-green (BG) systems, (b) flood exposure to population, (c) heatwave exposure to blue-green systems, and (d) heatwave exposure to population

No.	Stakeholder insight	Action point
7	Urban flood exposure needs to consider drainage issues and evolving population densities, especially for vulnerable ground-floor communities.	Add drainage patterns and population density as dynamic exposure layers.
8	Karnataka State Natural Disaster Monitoring Centre's (KSNDMC's) urban monitoring system already uses flood sensors and telemetry-linked rainfall thresholds to identify risk zones.	Integrate datasets from KSNDMC and Bengaluru Traffic Police (BTP) to enrich flood modelling.
9	Vegetation-rich areas showing high heat stress (as per Environmental Management and Policy Research Institute [EMPRI]) indicate the influence of built materials and surface reflectivity.	Include built environment and materiality parameters in heat vulnerability assessments.
10	Historical hydrological shifts (e.g., changed lake overflow patterns) need to be reflected.	Incorporate rainfall variability data and historical hydrology to contextualise risk.

3.3. EbA planning

Conversations around EbA planning highlighted the need for a shift from reactive interventions to anticipatory, phase-wise strategies.

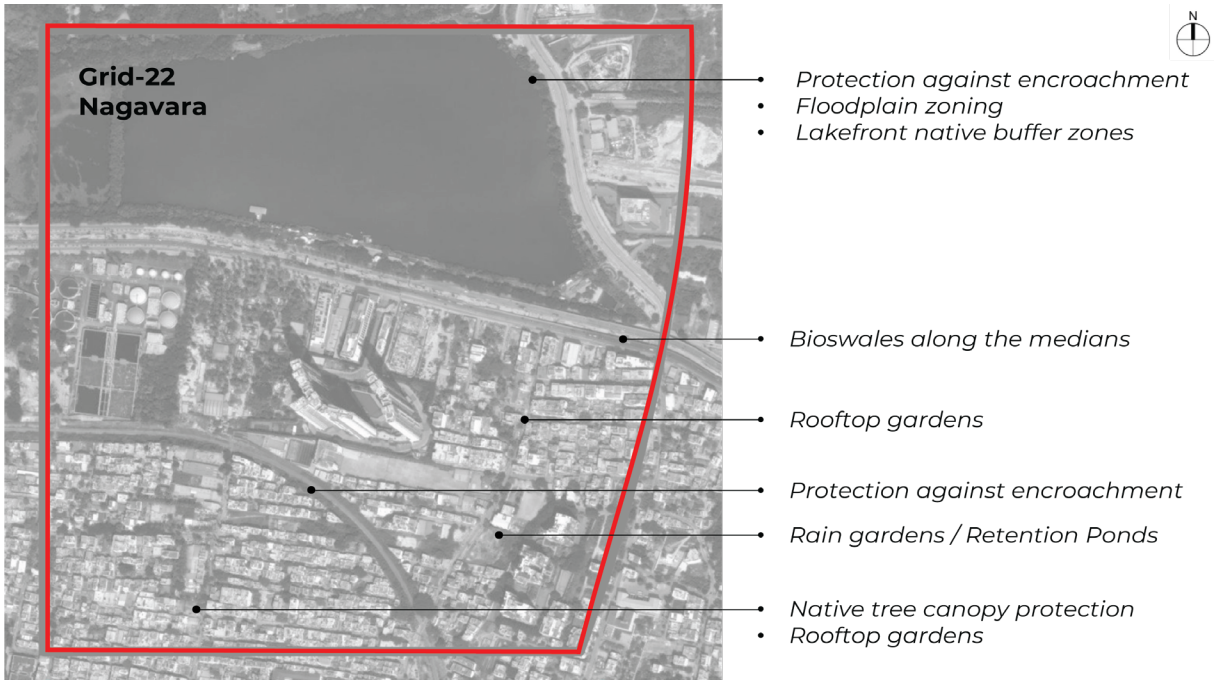

Figure 4: List of EbA interventions of the 1 x 1 km grid, Nagavara

No.	Stakeholder insight	Action point
11	EbA should be framed across all phases—before, during, and after risk events—for greater resilience.	Use geospatial layers and biodiversity indices to guide phase-wise and nature-based flood solutions.
12	Participants flagged the risk of maladaptation from poorly contextualised EbA..	Screen for maladaptive pathways in proposed EbA interventions.
13	Urban expansion has disconnected governance from community knowledge	Actively engage peri-urban and village communities in EbA planning.

Microclimatic influence needs to be assessed across seasons—not just spatially, but temporally too.

Bhanu Khanna, Senior Program Associate, WRI India

3.4. Context, governance, and community integration

Stakeholders emphasised the need to be adaptable to diverse urban contexts and user groups. Key themes included the importance of context-sensitive modelling using ecological boundaries and the integration of community knowledge, governance structures, and early warning systems.

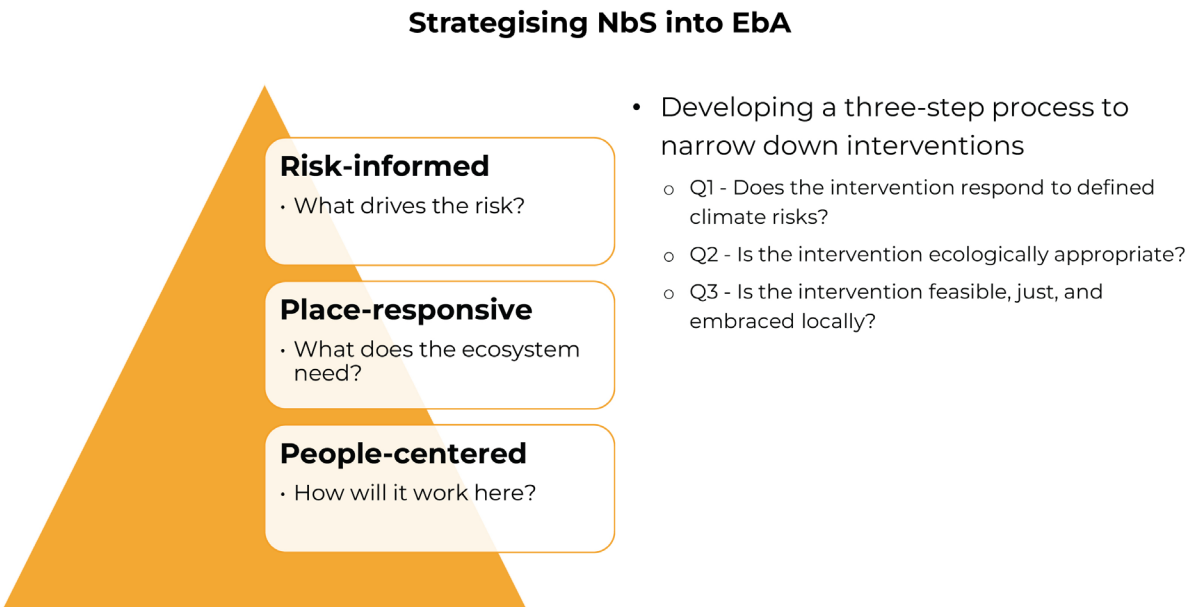

Figure 5: Contextualising EbA for risk-informed interventions

No.	Stakeholder insight	Action point
14	Who is this tool for? The intended users and their needs are not clearly defined.	Define user journeys for government officials, planners, and community members.
15	Bengaluru's urban characteristics vary across Bengaluru Urban District regions, making it difficult to apply a one-size-fits-all model.	Create modular, region-specific templates that adapt to the local context.
16	Sub-grid hydrology and fractional area analysis are needed for better granularity in modelling. Watershed and sub-basin boundaries are more relevant for biodiversity than revenue units.	Explore fractional modelling techniques and disaggregated data logic. Align grid models with hydro-ecological boundaries (e.g., micro-watersheds).
17	Nature transcends grids; administrative boundaries restrict ecological modelling.	Shift to ecologically defined boundaries where relevant.
18	Are micro-level walkthroughs being conducted? There is a gap in ground-truthing spatial data. Integrating field survey data into the tool remains a challenge.	Incorporate field surveys to validate satellite classifications. Define clear data pipelines and methodology for incorporating ground survey data.

4. Way Forward

The stakeholder workshop reaffirmed the critical role of collaboration in shaping tools that are not only scientifically robust but also socially grounded and contextually adaptable. As we move forward, these insights will inform improvements in usability, data integration, and policy relevance, ensuring that DEFT evolves into a responsive, replicable, and trusted decision-support tool for ecosystem-based urban adaptation. Continued engagement with this growing network of stakeholders will be central to advancing nature-based planning that is both inclusive and impactful.

5. Appendix

	Beneficiary groups	Tool use-case for beneficiaries	Organisation names	Participant names
Users/owners	Resident welfare associations	Advocate for EbA and track local climate risks	KEB Layout Residents Association, Sanjay Nagar	Geetha G Sheetal Shirali
			Residents Welfare Association, RT Nagar	Vidya Goggi
	Environmental NGOs	Support policy advocacy using risk data	Namma Bengaluru Foundation	Vinod Jacob
	Community activists/ influencers	Educate and mobilise communities on EbA benefits	Bangalore Sustainability Forum (BSF)	Manasi Pingle
			Janaagraha	Nidhishree N Kumar
Managers	Local government administration	Integrate EbA into urban planning and prioritise investments	Karnataka State Natural Disaster Monitoring Centre (KSNDMC)	Dr Shivakumar Naiklal Dr Rita Basanna
			Environmental Management and Policy Research Institute (EMPRI)	Dr Promod Katti Dr Pavithra Nayak Akhila K N
	Real estate developers	Inform land development based on BGI and evaluate climate risks	Absent	
Technical experts	City planners / landscape architects	Model risk-informed and integrated urban models	Public Landscape and Urbanism Studio (PLUS)	Amruta Vungarala Vishal P J
			Environmental Design Solutions (EDS)	Sandeep Doddaballapur
			Jana Urban Space Foundation (JUSP)	Gayathri Muthuramakrishnan
	Academic and research organisations	Analyse EbA uptake trends and support policy	Ashoka Trust for Research in Ecology and the Environment (ATREE)	Hymavathi P Dr Sagna A Dr Ashish Kumar
			World Resources Institute (WRI) India	Arun Manohar Bhanu Khanna
			Indian Institute for Human Settlements (IIHS), Bengaluru	Dr Jagdish Krishnaswamy

	Beneficiary groups	Tool use-case for beneficiaries	Organisation names	Participant names
Technical experts			National Institute of Advanced Studies (NIAS)	Dr Vazeed Pasha Shaik Prof. Vinay Kumar Dadhwal
	Ecosystem consultants	Improve EbA designs with data overlays	Public Landscape and Urbanism Studio (PLUS)	Amruta Vungarala Vishal P J
			Environmental Design Solutions (EDS)	Sandeep Doddaballapur
			Biome Environmental Trust	Kolla Srivalli Kiran
			WELL LABS	Kaylea Brase Menon Shashank Palur Anam Husain
	Financial partners	Identify investments based on EbA cost-benefit impacts	Absent	

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