

From Evidence to Planning: Interpreting Urban Data for Ecosystem-based Adaptation



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Workshop Synthesis Note

Developing an EbA Feasibility Tool (DEFT) for Climate
Adaptation in Indian Cities: A Study of Bengaluru, Karnataka

22 July 2026 | Courtyard by Marriott, Bengaluru

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Preface

Bengaluru, much as other rapidly growing cities, is experiencing increasing climate risks alongside complex changes in its ecological and built systems. Responding to these challenges requires not only better evidence but also approaches that can translate evidence into planning decisions grounded in urban realities.

The stakeholder workshop *From Evidence to Planning: Interpreting Urban Data for Ecosystem-based Adaptation*, held on 22 July 2026, brought together practitioners and experts from diverse disciplines to examine the ecological, climate-risk, and spatial evidence being developed for Bengaluru and explore how this evidence could support Ecosystem-based Adaptation (EbA) planning. The workshop marked an important stage in the Developing an EbA Feasibility Tool (DEFT) for Climate Adaptation in Indian Cities project.

The workshop was designed as a working space to test and refine the decision-support tool CSTEP is developing. Through technical discussions, interactive mapping activities, and implementation dialogues, participants helped identify where the emerging approach was useful, where additional context was needed, and what considerations to incorporate as the project moves from evidence generation to tool development.

This synthesis note captures the key discussions, insights, and methodological learnings that emerged from the workshop. The findings will inform the continued development and refinement of the DEFT framework.

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Contents

1. Background	8
2. Workshop Framework	9
2.1. Objectives.....	9
2.2. Overview.....	9
2.3. Participant profile	10
3. Workshop Proceedings	11
3.1. Reading the city	11
3.2. From climate risk to adaptation pathways	12
3.3. Interactive mapping exercise: Solve your grid	13
3.4. Assessing land suitability for EbA: Stakeholder insights.....	15
3.5. From suitability to implementation	15
3.6. Focus group discussions: Implementation dialogues.....	17
4. Way Forward	20
5. List of Participants	21

Figures

Figure 1: Project overview.....	8
Figure 2: Sequence of workshop proceedings.....	9
Figure 3: Nine beneficiary groups of DEFT identified across three questions.	10
Figure 4: Blue-green mapping for the 3-km area of influence in Hebbal using Cartosat-2E imagery (top), with green (left) and blue (right) cover represented at the same grid-level resolution.	11
Figure 5: Multidimensional vulnerability indicators selected for the assessment.....	12
Figure 6: Example of grid-level interpretation of the primary risk driver and underlying vulnerability (V) factors (red represents grids with high risk; yellow moderate risk; and green low risk).	12
Figure 7: Participants interpreting spatial evidence, mapping relationships, and identifying adaptation opportunities during the ‘Solve Your Grid’ exercise.	13
Figure 8: Proposed considerations for translating land suitability into EbA opportunities. ...	15
Figure 9: Participants discussing the ground-level feasibility, governance, and maintenance of NbS.....	19

Tables

Table 1: Key takeaways from the interactive mapping exercise.....	14
Table 2: Key takeaways from the land suitability presentation.....	15
Table 3: Key takeaways from deliberations on implementation.	17
Table 4: Core learnings from the focus group discussions.....	18



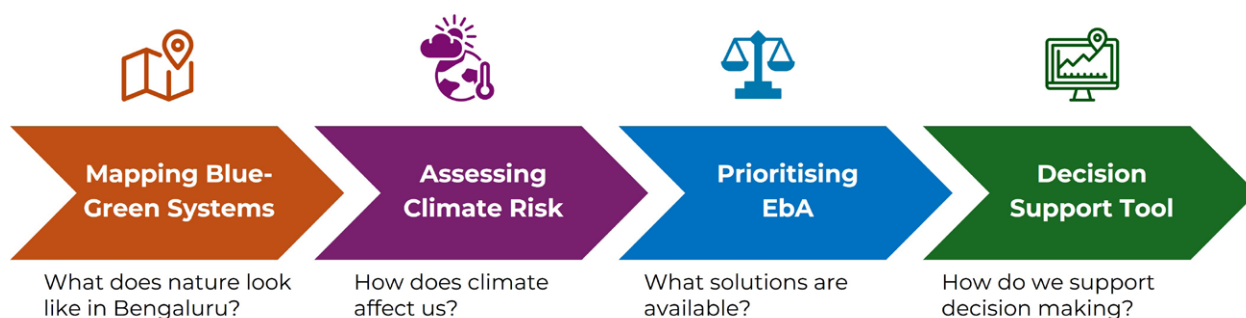
1. Background

Ecosystem-based Adaptation (EbA) is a specific application of Nature-based Solutions (NbS), which the International Union for Conservation of Nature (IUCN) defines as addressing ‘societal challenges through actions to protect, sustainably manage, and restore natural and modified ecosystems, benefiting people and nature at the same time’ (IUCN, n.d.-b). EbA focuses on using ‘biodiversity and ecosystem services to help people adapt to the adverse impacts of climate change, particularly slow-onset changes like shifting rainfall patterns and sea level rise’, as well as increasing heat stress (IUCN, n.d.-a).

In practice, EbA requires understanding the climate risks and vulnerabilities to be addressed; the condition and functions of the ecosystems and biodiversity present; the ecosystem services provided and how they can reduce climate risk and strengthen adaptive capacity; and the people and places for whom ecosystem-based responses may be appropriate, feasible, and beneficial.

The Center for Study of Science, Technology and Policy’s (CSTEP) Developing an EbA Feasibility Tool (DEFT) project aims to enhance urban resilience through evidence-based planning and the integration of EbA into city development processes in Bengaluru. The project seeks to develop a decision-support tool to help urban planners, policymakers, and local institutions assess the feasibility of EbA interventions by bringing together information on ecosystems, infrastructure, and communities. The project objectives are presented in Figure 1.

Figure 1: Project overview.



Under DEFT, multiple datasets have been developed on climate risk, biodiversity, ecosystem condition, urban vulnerability, and land suitability to support adaptation planning in Bengaluru.

2. Workshop Framework

2.1. Objectives

The stakeholder workshop was designed as a working session to examine how evidence could be translated into decisions, validate emerging approaches, and incorporate practitioners' knowledge into the EbA decision-support framework. The workshop focused on Bengaluru's risks from floods and heatwaves and aimed to

- demonstrate the evolving decision-support framework;
- showcase how climate risk, biodiversity, ecosystem condition, and land suitability can be interpreted together to support adaptation planning; and
- gather practitioner feedback on implementation challenges, potential for adoption, and willingness to support EbA interventions.

2.2. Overview

The full-day participatory workshop combined technical presentations, interactive mapping exercises, land suitability assessments, and focus group discussions (Figure 2).

Figure 2: Sequence of workshop proceedings.



The proceedings moved progressively from interpreting urban evidence to identifying adaptation opportunities and examining their suitability, feasibility, and implementation requirements.

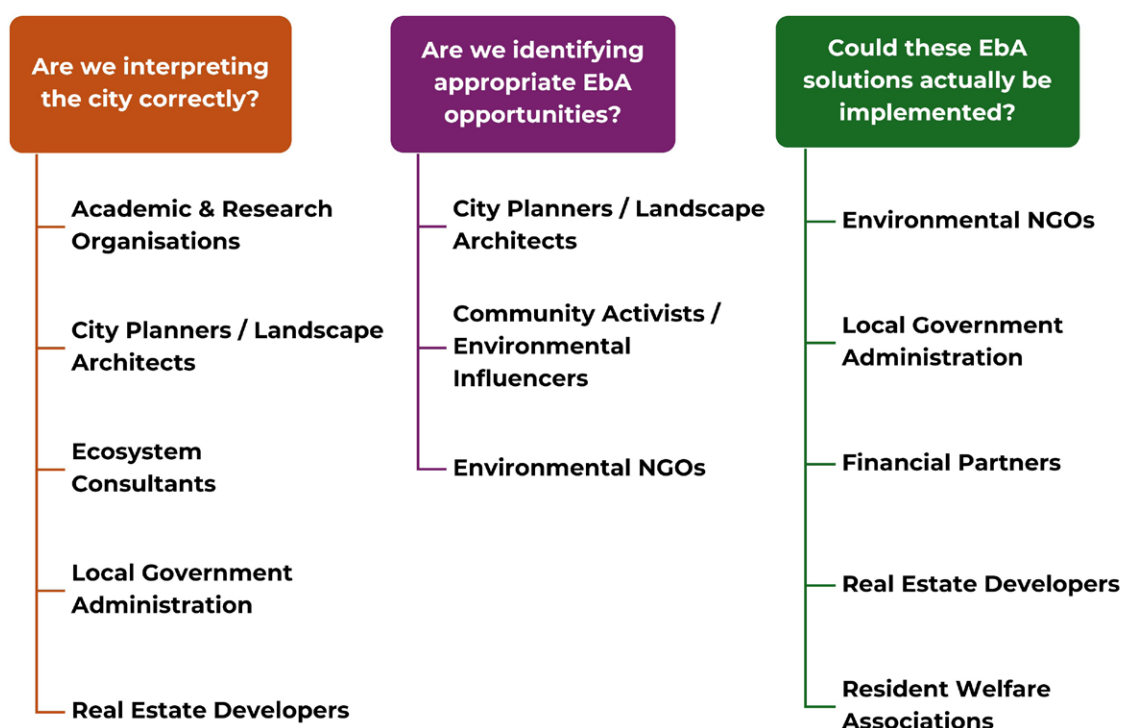
2.3. Participant profile

The workshop brought together 29 participants from 24 organisations working on blue-green systems, urban planning, climate action, and implementation in Bengaluru and similar urban contexts.

Participants were carefully selected to bring complementary perspectives to the three questions that structured the workshop discussions (Figure 3). These questions correspond to key stages of the DEFT process, with stakeholder groups organised around the expertise required at each stage. This included interpreting spatial, ecological, and urban evidence; identifying contextually appropriate EbA opportunities; and considering institutional, financial, and on-ground implementation requirements.

The discussions drew on diverse expert perspectives to examine the proposed EbA pathways across the process, from identification to implementation.

Figure 3: Nine beneficiary groups of DEFT identified across three questions.



3. Workshop Proceedings

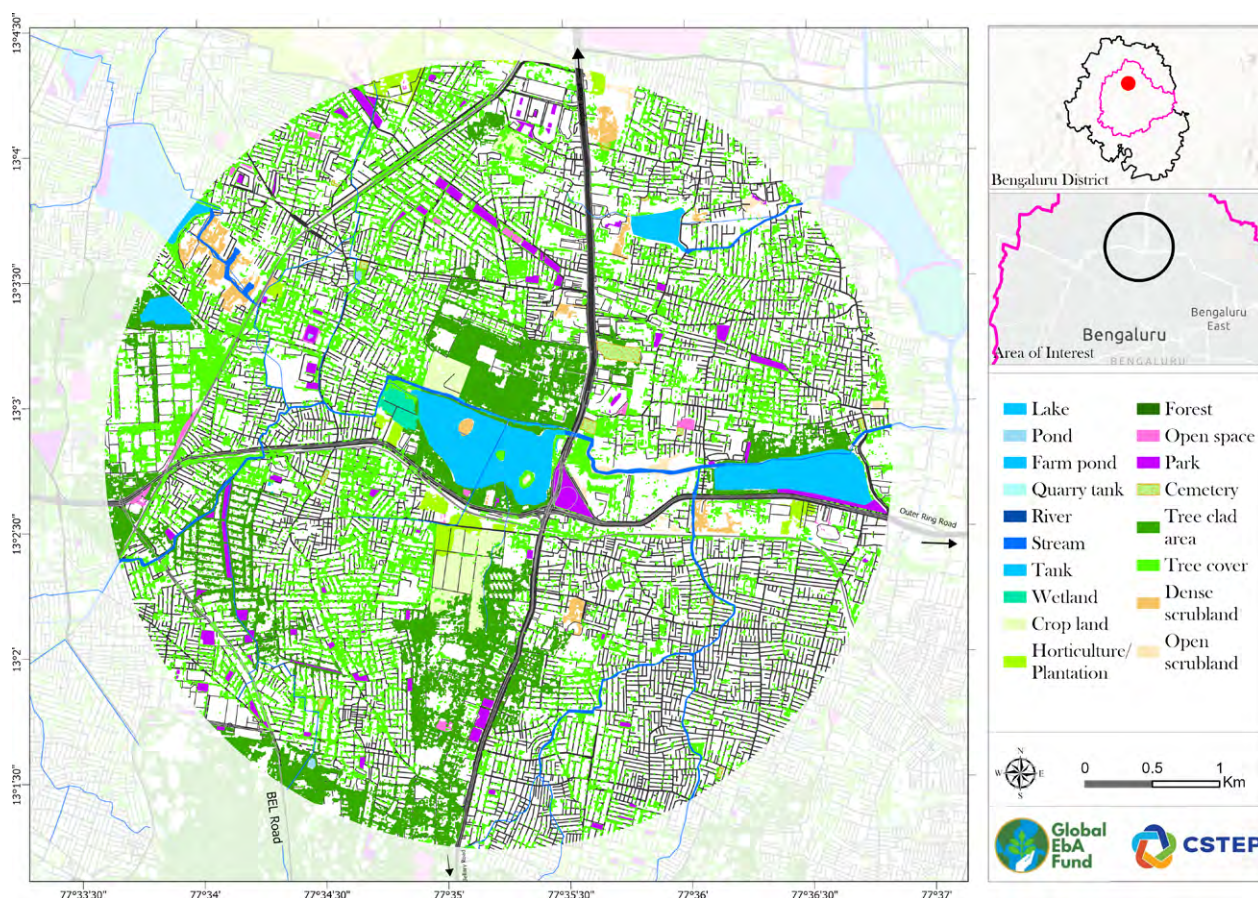
3.1. Reading the city

The first session introduced participants to the different forms of evidence generated for the 3-km area of influence around Hebbal Lake (see earlier [Synthesis Note](#); CSTEP, 2025) and explored how these datasets could be read together to understand the ecological and climate-risk context.

A high-resolution 60-cm land use/land cover map derived from Cartosat-2E imagery was presented to visualise the distribution of blue-green infrastructure. This was complemented by information on patterns of species distribution and biodiversity hotspots around the lake system. By considering these datasets together, participants were encouraged to look beyond individual lakes, wetlands, forests, and parks and see how these elements function as part of an interconnected ecological network.

For spatial analysis, the area was divided into 1×1-km grids, providing a common analytical scale for examining ecological conditions and climate-risk results (Figure 4).

Figure 4: Blue-green mapping for the 3-km area of influence in Hebbal using Cartosat-2E imagery (top), with green (left) and blue (right) cover represented at the same grid-level resolution.

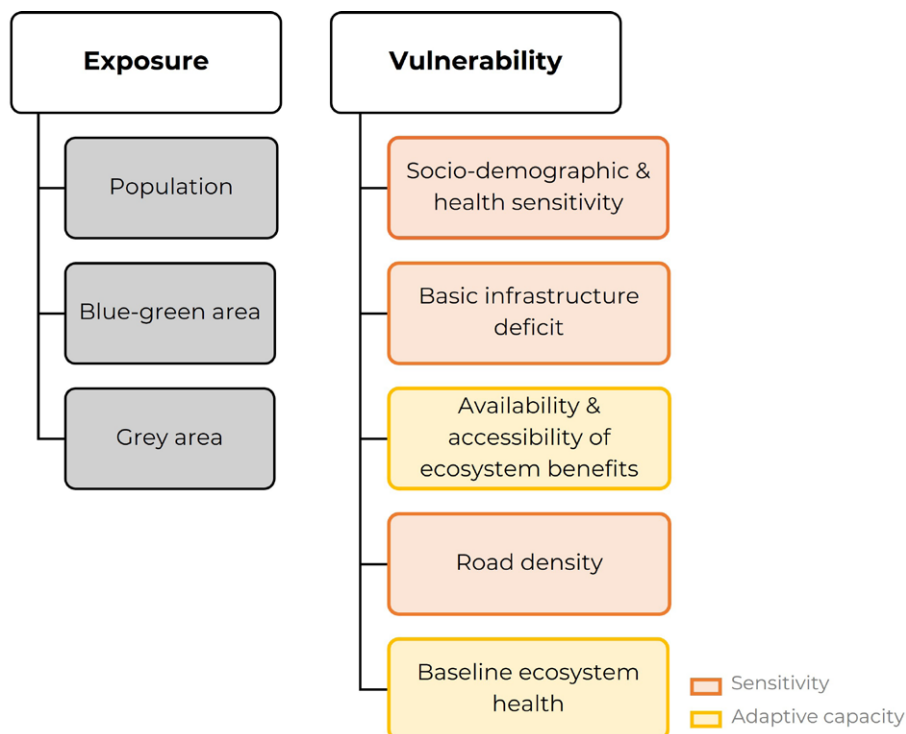


The ecological evidence was complemented by a climate-risk assessment, which helped participants examine how hazard, exposure, and vulnerability interact to determine grid-level risk from floods and heatwaves.

The team also presented an updated set of vulnerability indicators, informed by stakeholder

insights from an earlier consultation. These indicators informed a primary household survey covering approximately 6,500 households across Bengaluru Urban District, generating a multidimensional dataset (Figure 5).

Figure 5: *Multidimensional vulnerability indicators selected for the assessment.*



Flood and heatwave risk maps for the Hebbal region were then presented at a 1×1-km grid resolution and classified as high, moderate, or low risk. The maps demonstrated how hazard, exposure, and vulnerability data could be combined using the Intergovernmental Panel on Climate Change risk assessment framework (Field et al., 2014).

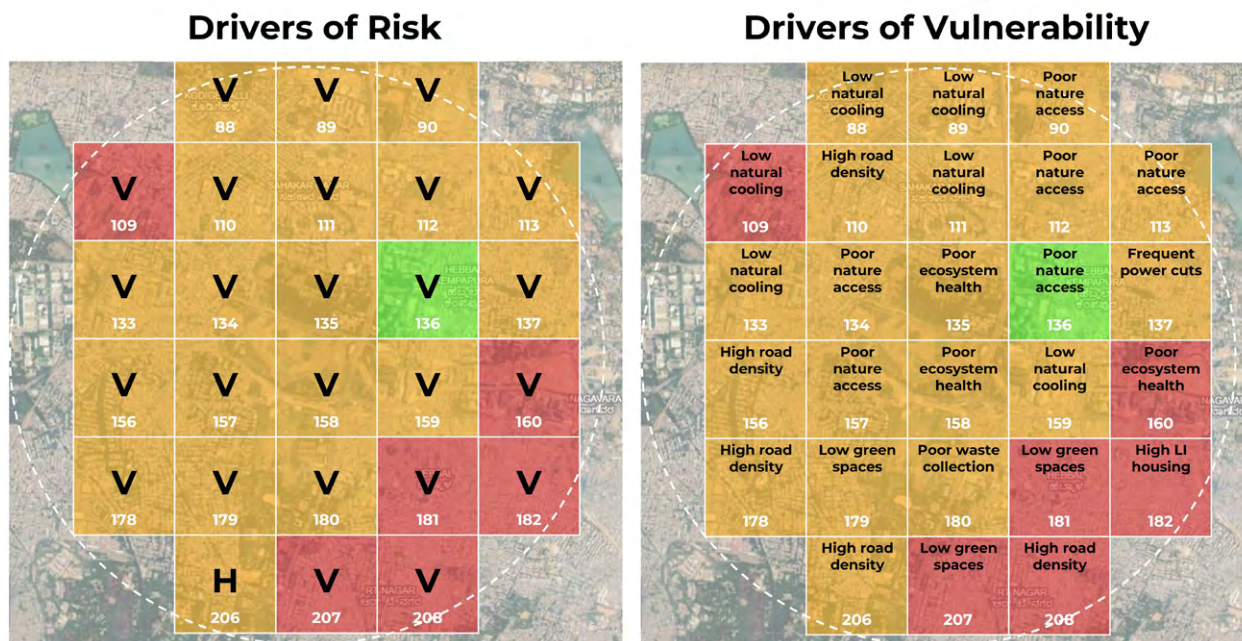
3.2. From climate risk to adaptation pathways

The ecological, biodiversity, socioeconomic, and climate-risk datasets provided different lenses for reading the same urban landscape. However, evidence alone does not determine the required adaptation response. The next stage of the workshop therefore focused on how climate-risk information could be interpreted to frame the adaptation problem and identify appropriate adaptation pathways.

Using selected grids in the Hebbal area, participants were introduced to the proposed decision logic for interpreting the level of flood or heatwave risk and its primary driver: hazard, exposure, or vulnerability. The assessment then unpacked the underlying factors contributing to risk within individual grids (Figure 6).

For example, Grid 109 was identified as a grid with high heatwave risk, primarily driven by the system's inherent vulnerability. Within the grid, limited natural cooling emerged as the most prominent vulnerability factor. In other grids, factors such as poor ecosystem health, low green cover, and high road density helped explain differences in vulnerability.

Figure 6: Example of grid-level interpretation of the primary risk driver and underlying vulnerability (V) factors (red represents grids with high risk; yellow, grids with moderate risk; and green, grids with low risk).



This diagnosis step helped frame the adaptation problem (what needs to change) before identifying potential solutions. Building on this problem framing, the proposed adaptation and resilience pathways linked different levels and drivers of risk to broad response strategies.

The exercise also demonstrated that similar levels of risk can arise from very different underlying conditions. Consequently, a common risk classification does not necessarily call for the same intervention across varying contexts.

The pathway framework was presented as an emerging decision logic rather than a singular deterministic methodology. Participants were invited to assess its relevance and consider how it could be applied across different urban contexts.

3.3. Interactive mapping exercise: Solve your grid

After the climate-risk assessment and adaptation pathways were presented, participants took part in an interactive mapping exercise intended as a sandbox for engaging with evidence generated through DEFT.

Participants were organised across five tables, deliberately bringing together stakeholders from diverse backgrounds (Figure 7). Each group included at least one participant with spatial planning expertise alongside stakeholders with sectoral, ecological, and community perspectives. Each table received a selected 1x1-km grid and a printed set of spatial evidence, including a risk profile, vulnerability scorecard, satellite imagery, hazard hotspots, and blue-green-grey asset maps.

Groups first conducted a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to understand their grid from an adaptation perspective. This encouraged participants to move beyond individual datasets and consider how climate risk, ecological assets, and urbanisation interacted spatially.

They then framed the adaptation problem, explored relevant pathways, and mapped potential responses.

Figure 7: Participants interpreting spatial evidence, mapping relationships, and identifying adaptation opportunities during the 'Solve Your Grid' exercise.



Table 1: Key takeaways from the interactive mapping exercise.

What emerged from the exercise	Implications for DEFT
Ecological and infrastructural assets provided starting points for adaptation.	Spatial layers need to be interpreted together rather than independently.
Participants identified relationships extending beyond individual sites and grids. For instance, most groups interpreted road–drain–lake relationships and wider blue-green networks rather than individual locations.	The 1×1-km grid is useful for risk diagnosis and exploration but should not be treated as an ecological or hydrological boundary for decision-making.
Land management, maintenance, institutional coordination, resident welfare associations and community participation, and development pressures emerged through discussion rather than mapped evidence.	The tool cannot capture all determinants of adaptation through spatial analysis alone; ground-truthing and contextual knowledge remain necessary.
Groups proposed interventions ranging from household and neighbourhood measures to responses addressing wider drainage and blue-green network challenges.	A single analytical scale may not suit all interventions; the appropriate planning and implementation scale varies by response.
Groups often proposed combinations of retention, de-concretisation, green-space enhancement, and household or neighbourhood measures rather than single interventions.	The tool should offer context-specific combinations of responses rather than imply a one-grid–one-solution relationship.
Participants could identify where an adaptation response appeared relevant, but this did not establish whether a particular NbS could physically or practically be implemented there.	Grid-level analysis should be treated as screening and decision support, not site-level prescription. Land suitability and implementation feasibility require subsequent assessment.

3.4. Assessing land suitability for EbA: Stakeholder insights

Following the sandbox, participants were introduced to the land suitability assessment component of DEFT. This session outlined the spatial indicators used to assess the suitability of different NbS and demonstrated the assessment process using urban parks as an example.

The rationale for the selected indicators and the suitability logic was explained to show how different land characteristics influence the suitability of an intervention. Land-suitability maps developed for the different NbS options were then presented, allowing participants to compare the interventions identified during the ‘Solve Your Grid’ exercise with those generated through the land suitability assessment.

Table 2: Key takeaways from the land suitability presentation.

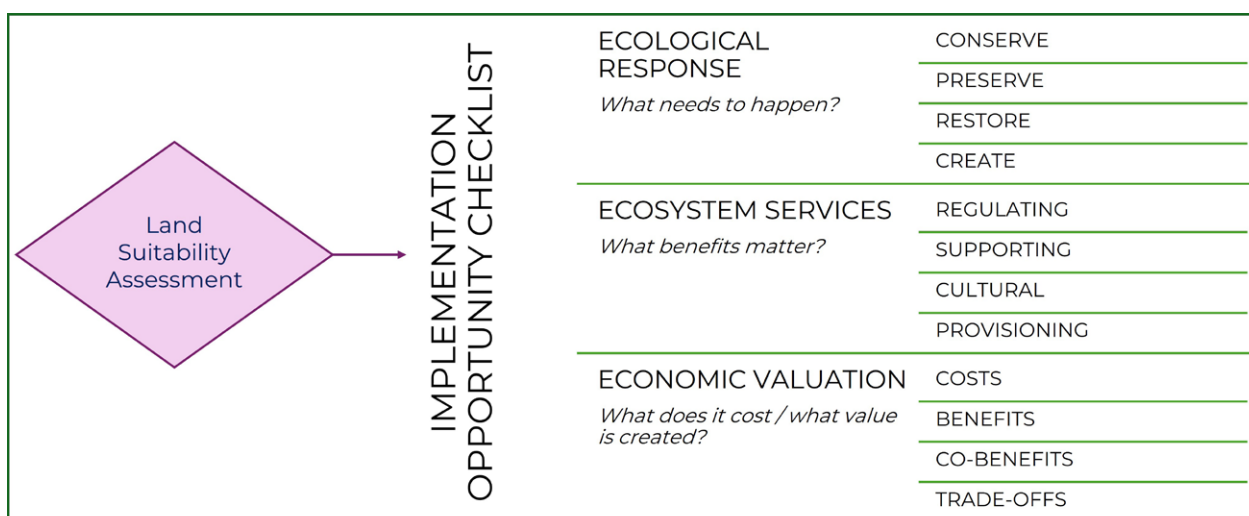
	Stakeholder insight	Action point for DEFT
1	Suitability indicators differ across NbS, highlighting the need for intervention-specific suitability logic.	Validate and refine intervention-specific indicators and weightages through follow-up expert consultations.
2	Land ownership and implementation feasibility are important governance considerations that influence NbS implementation beyond physical suitability.	Explicitly distinguish physical land suitability from implementation feasibility within the DEFT framework.
3	Three-dimensional site characteristics are important, particularly for stormwater-management interventions.	Refine hydrological and subsurface suitability indicators through consultations with hydrology and geology experts.
4	Participants sought clarification on the role of biodiversity within the suitability assessment.	Continue integrating baseline biodiversity and ecosystem-service assessments within the prioritisation stage rather than as part of the land-suitability assessment.
5	Ecological and hydrological connectivity, including upstream–downstream relationships and interactions across neighbouring grids, is important.	Interpret and implement NbS at appropriate system scales, including watershed and administrative boundaries, rather than relying solely on grid-based planning units.

Overall, the discussion reinforced the need to distinguish where an NbS is physically suitable from whether it is contextually appropriate and implementable. This distinction became a central theme of the subsequent discussions on implementation.

3.5. From suitability to implementation

Following the land suitability assessment, participants were introduced to the next stage of the DEFT framework: translating spatially suitable NbS options into implementation opportunities. Three considerations were presented for further development: the ecological response required, the ecosystem services provided by different NbS, and their economic value (Figure 8).

Figure 8: Proposed considerations for translating land suitability into EbA opportunities.



The discussion highlighted that moving from physical suitability to implementation also requires consideration of governance, institutional capacity, planning scales, long-term maintenance, and community acceptance. These inputs will help refine the framework and determine which considerations can be incorporated into the decision-support tool and which require complementary site-level assessment or further stakeholder engagement.

Table 3: Key takeaways from deliberations on implementation.

Aspect	What emerged from the discussion	Implications for DEFT
Governance and land	Land identified as spatially suitable may face constraints related to ownership, informal settlements, encroachment, or regulatory mandates. Participants also highlighted the need for coordination across agencies such as Bruhat Bengaluru Mahanagara Palike, Bangalore Water Supply and Sewerage Board, and Karnataka State Natural Disaster Monitoring Centre.	Clearly distinguish physical suitability from implementation feasibility and identify relevant governance considerations.
Scale and connectivity	Ward boundaries matter for municipal administration and budgets, but flood, heat, and ecological processes extend across administrative and grid boundaries.	Allow opportunities to be interpreted across administrative, ecological, and hydrological scales rather than treating grids as isolated units.
Institutional capacity	Government officials and contractors may require greater familiarity with site-specific ecological conditions and NbS approaches to integrate them into conventional engineering and planning processes.	Position the tool as decision support complemented by technical expertise, ground-truthing, and capacity building.
Maintenance and stewardship	While capital funding may be available, long-term operation and maintenance arrangements can remain unclear. Participants highlighted potential roles for local governments, ward committees, resident welfare associations, and citizen groups.	Communicate long-term maintenance and stewardship requirements alongside intervention options.

Aspect	What emerged from the discussion	Implications for DEFT
Economic value and adoption	Participants highlighted avoided flood damages, reduced cooling expenditure, water benefits, opportunity costs, and wider ecosystem co-benefits. Willingness to contribute may also depend on visible benefits and institutional transparency.	Strengthen economic valuation to capture costs, benefits, co-benefits, and their distribution over time.
Trade-offs and disservices	Potential concerns included falling branches, mosquitoes and insects, clogged drains, and competition for limited road or open space. Participants also cautioned against short-term engineering responses with long-term ecological impacts.	Make trade-offs and potential ecosystem disservices visible when comparing intervention options.

3.6. Focus group discussions: Implementation dialogues

Following the session on moving from land suitability to implementation, participants were divided into four moderated focus groups to explore ground-level feasibility and acceptance of NbS (Figure 9).

Each group was given one hour to respond to a common set of 11 questions, organised around three themes: (i) lived experiences and perceptions, (ii) economics and maintenance of NbS interventions, and (iii) governance and NbS implementation. Responses were recorded collectively, while willingness-to-pay was collected anonymously to capture individual perspectives.

Table 4: Core learnings from the focus group discussions.

Theme	Group learnings
Lived experiences and perceptions	- Participants described water scarcity, flooding, and heat as interconnected urban challenges associated with declining groundwater recharge, loss of permeable surfaces, encroachment, waste management, and increasing concretisation. - Coping responses were largely individual; for example, staying hydrated, seeking shade, or using air conditioning. These varied with income and access to resources. - Discussions also highlighted differences in vulnerability associated with occupation, gender, informal settlements, and access to public spaces.
Economics and maintenance of NbS	- Awareness of NbS costs varied considerably across groups. - Willingness to contribute was closely linked to visible and tangible benefits, such as reduced cooling or water costs and protection from flooding. - Some participants considered existing taxes and municipal charges to constitute their contribution. - Long-term maintenance was considered critical, with different roles envisaged for government, communities, and other actors.

Theme	Group learnings
Governance and NbS implementation	- Participants generally favoured complementary grey and green responses, recognising the role of engineered measures for immediate risk reduction alongside NbS for long-term resilience. - Institutional fragmentation and administrative discontinuity were identified as barriers. - Participants raised potential trade-offs and disservices, including space constraints, insects, falling branches, and clogged drains. They proposed different combinations of government, community, and private-sector responsibility rather than a single governance model.

The focus groups added an important uptake and equity lens to the technical assessment. Three considerations emerged:

- **Perceived benefits influence uptake:** Willingness to pay was linked to whether benefits were tangible and relevant, highlighting the importance of communicating the expected benefits and co-benefits of different NbS.
- **Acceptance extends beyond cost:** Trust, convenience, perceived disservices, and willingness to modify private or shared spaces can influence adoption even where an intervention is technically suitable.
- **Benefits and adaptive capacity are unevenly distributed:** Differences related to income, occupation, gender, and access to public space highlight the importance of considering who benefits, who bears costs, and who may remain underserved.

Together, these findings suggest that the transition from identifying technically appropriate interventions to supporting context-specific adaptation choices requires considering perceived value, social acceptance, distributional impacts, and institutional conditions as DEFT progresses.

Figure 9: Participants discussing the ground-level feasibility, governance, and maintenance of NbS.



4. Way Forward

The workshop reinforced that moving from climate-risk evidence to implementable NbS is not a linear process of matching a risk hotspot to an intervention. Different forms of evidence become relevant at distinct stages of the decision process.

Climate-risk assessment helps diagnose where risk exists and what drives it. Ecological and spatial evidence helps identify existing assets and potential opportunities. Land suitability assessment helps establish where particular NbS may be physically appropriate. Economic, institutional, and social considerations then help determine which options are appropriate and implementable.

The workshop helped clarify the role and limits of the decision-support tool. The 1×1-km grid provides a useful analytical unit for screening and exploring spatial patterns, but it does not represent ecological, hydrological, or administrative boundaries. Similarly, spatial suitability can support screening and shortlisting but cannot substitute for site-level assessment, local knowledge, or implementation planning.

Insights from the workshop will inform the next phase of framework development, with due consideration to

- refining land suitability, including expert validation of intervention-specific indicators, thresholds, and weightages;
- developing a context-specific NbS shortlist by combining climate-risk and adaptation pathways with land suitability, existing ecological conditions and the appropriate ecological response—conserve, preserve, restore, or create;
- differentiating suitable options through ecosystem services, including the primary adaptation benefits and wider co-benefits associated with different NbS options; and
- developing the economic and implementation assessment, including costs, benefits, maintenance requirements, trade-offs, and distributional considerations.

5. List of Participants

	Stakeholder category	Affiliation	Participant name
Users/owners	Resident welfare associations	Resident Welfare Association, RT Nagar	Vidya Goggi
	Environmental nongovernmental organisations	Socratus Collective Wisdom Corporation	Bhargavi Nagendra
		WELL Labs	Shashank Palur
	Community activists / Influencers	Bangalore Sustainability Forum	Manasi Pingle
		Nature Classrooms	Shivangi Thakkar
			Tanaya Rele
Technical experts	Academic & research organisations	Srishti Manipal Institute of Art, Design and Technology	Dr Chandrima Home
		Chanakya University	Dr Kumaraswamy T R
		BMS Institute of Technology and Management	Shreya S
	City planners / Landscape architects	Mod Foundation	Aliza Sherwani
			Prateeksha Pabhakar
		Biome Environmental Trust	Ayushi Biswas
		Jana Urban Space Foundation	Pravalika Sarvadevabhatla
	Ecosystem consultants	Rail Wheel Factory, Bengaluru	Ajay Singh
		Independent	Jerusha Issac
		C40 Cities	Kaveri Bahure
		Ananas Permaculture	Nishanth Srinivas
		Transitions Research	Nupur Khanter
		WRI India	Praseeda Mukundan
			Rakshada Rode
		Elixir GeoTech	Sanjayam M S
		Independent	Srinidhi Santosh
		Median Research & Consulting Pvt Ltd	Subrata Dey
		PlanAdapt	Sudev Madhav
		Vasudha Foundation	Vaishnavi T G Shankar
	Financial partners	SELCO Foundation	Geethu Thomas
		Wipro Foundation	Nakul Heble
		Ashraya Hastha Trust	Susan Jaison
			Vikram Patel

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