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# Fostering Participatory Climate Action in Indian Cities using Technology

9-10 May 2023

## Workshop Proceedings



# National Workshop on Fostering Participatory Climate Action in Indian Cities using Technology

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**National Workshop on Fostering Participatory Climate Action in Indian Cities using Technology (9-10 May 2023)**  
Report

**Developed By:**

Climate Centre for Cities, NIUA, in association with the United Nations University Institute for Environment and Human Security (UNU-EHS) and The Energy and Resources Institute (TERI)

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## Director's Message



Climate change is an imminent threat, and urban areas are on the frontline of this battle. In this context, it is crucial to underscore the role of public participatory methods, collective decision-making, adaptive infrastructure, local governance, inclusion, and digitalisation in building climate resilience in Indian cities.

Climate action cannot be successful without active involvement from the people. Engaging citizens in planning and decision-making empowers communities, enhances local ownership, and ensures climate initiatives align with the needs and aspirations of the people. Moreover, resilience-focused infrastructure is a cornerstone of climate adaptation. Smart cities are equipped to invest in sustainable infrastructure that can withstand climate-related challenges. Simultaneously, effective local governance is essential for implementing climate action at the grassroots level. Advocacy for inclusive approaches that prioritise the most vulnerable communities, ensuring that no one is left behind in climate resilience efforts, are to be thrust at all levels. The advent of digital technologies has revolutionised the way cities operate. Smart cities can leverage digitalisation to enhance climate resilience by improving data collection, monitoring, and response mechanisms. To bring all the aspects together, collaborating with government agencies, civil societies, innovators, subject experts and industrial partners to design and implement innovative solutions addressing complex challenges is essential.

The path to climate resilience in Indian cities lies in the confluence of public participation, collective decision-making, resilient infrastructure, and local governance using effective digitalisation avenues. Indian cities are at the forefront of climate action, driven by national policies, data practices, and the active engagement of various stakeholders. As an organisation dedicated to urban affairs, NIUA plays a pivotal role in catalysing the development of frameworks for sustainable cities and efficient management systems. Together, we can build a future where cities thrive in harmony with nature, even in the face of climate uncertainty.

**Sh. Hitesh Vaidya**  
**Director, National Institute of Urban Affairs (NIUA)**

# Message



India stands at a pivotal moment in its urbanisation journey, where the dynamics of economic growth and the mass migration of rural populations to urban centres are reshaping the nation's landscape. These transformative forces, coupled with varying levels of preparedness at the city level and rapid global technological advancements, create a complex and uncertain outlook for the future appearance of Indian cities.

Our cities assume a central role in achieving India's promised destiny, acting as incubators for innovative policy solutions to address the intricate challenges posed by urbanisation. Looking ahead, our cities confront two formidable tasks. Firstly, they must bridge the gap in essential urban

infrastructure and services while concurrently reversing trends of local environmental degradation. Secondly, they need to harness the untapped potential of technological interventions in urban governance to facilitate more participatory and efficient decision-making processes.

It is crucial to emphasise that the exact nature of these interventions remains fluid, necessitating our agility in approach and alignment with global trends and, wherever possible, taking a leadership role in shaping them.

In light of recent developments within G20 nations and the unveiling of the Delhi Declaration on the future of cities, we witness a significant and timely development that holds great promise for India and the world. This declaration acknowledges the pivotal role of cities in the global landscape and underscores the urgent need for comprehensive, sustainable, and resilient urban solutions. Furthermore, it highlights the paramount importance of climate action in cities to enhance their resilience in the face of disasters, aligning perfectly with TERI's vision for India's urban future, which places sustainability and resilience as core principles in our journey ahead.

It is this continued, collaborative, innovative, and committed approach to driving positive change in our cities that will position India at the forefront of this rapidly changing world.

**Sh. Sanjay Seth**  
**Senior Director, The Energy and Resources Institute (TERI)**

## Message



Sustainable development is pursued against a backdrop of climate change and uncertain future conditions. Development decisions in a changing climate need to include choices and actions that reduce greenhouse gas emissions and adapt to the impacts of climate change to sustain development efforts over time. Given the complexity and the uncertain nature of social-environmental challenges, actor participation is a critical success factor in climate action. India, the most populous nation in the world, is uniquely positioned to bring together the global trends of urbanisation and digitalisation for long-term sustainable development. Great potential lies in augmenting the capacity of citizens and

communities to collaborate on forward-looking, transformative climate actions facilitated by data-driven - decision-making platforms. With our project titled 'Transformative Climate Action using Participatory data-driven decision-making platforms (T-CAP)', we are excited to leverage the untapped potential of digital means to facilitate participatory decision-making on climate actions in Indian cities. The project aims to assist city authorities in working effectively with stakeholders to gather, analyse and share information needed for participatory decision-making on climate actions. It was great pleasure to learn from and share experiences with cities and stakeholders across India in the "National Workshop on Fostering Participatory Climate Action in Indian Cities using Technology". I hope this workshop report enriches readers, and inspires cities to pursue collective climate actions together with vulnerable groups and pave the way for a forward-looking, resilient, informed, and integrated urban transformation in India.

**Dr. Saskia Werners**

**Head of Section & Academic Officer, United Nations University (UNU)**

## Message



As our cities expand and evolve, they are confronted with a unique set of climate challenges. However, Indian cities are rising to the occasion, devising innovative strategies to combat climate change through national policies, data practices, and the active engagement of various stakeholders. India has recognised the urgency of addressing climate change and has committed to national policies, such as the National Action Plan on Climate Change (NAPCC). These policies set the framework for climate action at both the national and local levels, encouraging cities and states to develop their climate action plans.

Indian cities understand that tackling climate change is a collaborative effort. Public participation is a pillar of these efforts, with cities like Chennai involving residents in tree planting initiatives and Mumbai engaging citizens in coastal clean-up drives. In Kolkata, digital solutions are helping reclaim public spaces, making them more sustainable and accessible. Smart city technologies are creating an enabling environment for citizen engagement, improving waste management, and optimising energy consumption—all of which contribute to low-cost, scalable solutions.

Indian cities and states are increasingly adopting data-driven approaches to understand their vulnerabilities and create targeted strategies. For example, cities like Bengaluru and Pune have established comprehensive data platforms to monitor environmental indicators and engage in evidence-based policymaking. To achieve sustainable development goals, Indian cities are recognising the importance of industrial and entrepreneurial collaborations. For example, Hyderabad is partnering with tech companies to implement smart water management solutions, and Ahmedabad is collaborating with non-governmental organisations and businesses to promote sustainable transportation alternatives. Building climate resilience also means embracing water-sensitive design, ecological practices, and indigenous knowledge. Cities like Jaipur are adopting rainwater harvesting techniques, while Thiruvananthapuram is preserving its wetlands to enhance flood resilience. Engaging with public groups and drawing upon local collaborations is key to implementing these initiatives effectively.

By integrating water-sensitive design, ecological practices, indigenous knowledge, and robust public participation, our cities are not just combating climate change—they are building resilience, ensuring a sustainable future for all. Through the T-CAP project, we intend to empower Indian cities for climate resilience leveraging policies for participatory climate action and technology.

**Dr. Victor R. Shinde**  
Head, Climate Centre for Cities, NIUA

# Executive Summary

A national workshop with the agenda to bring about valuable exchange and encourage convergence of various stakeholders to contribute to the groundwork of participatory city climate action using technology was arranged on 9<sup>th</sup> and 10<sup>th</sup> May 2023 in New Delhi. The 'National Workshop on Fostering Participatory Climate Action using Technology' provided a zone for participants to share , knowledge and ideas across sectors. The nine workshop sessions were designed to present, prepare and process climatic challenges and data-driven decision-making procedures. Six presentation and interaction-based sessions engaged participants with varied approaches to systems thinking with advancing technology. Representatives from administration, academia, research, technology, innovation, non-profits, and start-ups presented their strengths, challenges and possibilities to develop city-level climate resilience within communities by cultivating an enabling environment using technology. Apart from the explanation and collective exploration of project themes, the interactions tapped into the synergies of participants with three interactive sessions, one panel discussion, presentations by experts and ten smart city/ municipal corporation officials. The officers from Surat, Thane, Kochi, Visakhapatnam, Ahmedabad, Varanasi, Chennai, Srinagar, Kalyan Dombivili and Pune discussed their state-of-the-art undertakings with ICCC for city management, outreach and emergency response systems. More than 70 participants attended the 9 sessions with 20 city and innovation experts, including officials from 10 Indian cities.

In the current world system, understanding, monitoring and reporting climate change is crucial for developing effective policies and programmes that catalyse adaptation, mitigation and response to climate-related disasters. A more intentional, organised data ecosystem would have great benefits and improve the existing de facto structure and frameworks that govern the risk-informed decision-making landscape of Urban India. Data-driven approaches are establishing new avenues for anticipatory and robust systems to deal with shocks and stresses, as well as in improving resource efficiency. The significance of institutionalising evidence-based decision-making is crucial for building resilience at the local level.

While digital means are increasingly used to assist in managing cities, an untapped potential lies in using these means to facilitate participatory local-level policymaking and implementation to catalyse transformative climate actions. In this ever-dynamic world, data-driven decision-making platforms can assist in augmenting the capacity of local actors and communities to collaborate on forward-looking, transformative actions.

The key- objectives of the two-day workshop aimed to explore how technology can facilitate participatory climate action in Indian Cities in two related parts:

- The workshop was designed to stimulate a healthy dialogue across academia, urban authorities and citizens. The objective was to discuss the opportunities and best practices for meaningful frameworks for Indian cities.
- The sessions tried to deliberate on What is being done?; What is required ?; and What are the opportunities in Indian Cities?

Under the action research project titled **Transformative Climate Action using Participatory data-driven decision-making platforms (T-CAP)**, the National Institute of Urban Affairs (NIUA), in collaboration with the United Nations University Institute of Environment and Human Security (UNU-EHS) and The Energy and Resources Institute (TERI) organised the two-day closed room workshop to embed a dialogue on participatory climate actions at the heart of urban discourse to pave the way for better-informed and resilient cities. This workshop was organised under NIUA's efforts as the U20 technical secretariat to facilitate knowledge and deliberation around priority areas of 'Encouraging Environmentally Responsible Behaviours' and 'Catalysing Digital Urban Futures'.

During the workshop, the power of synergy was witnessed as cities, representatives from advocacy groups, partner institutions, start-ups, and ICCC solution providers came together to advance the vision of an inclusive, participatory climate action approach to Indian Cities. The participants delved into integrating data analytics, artificial intelligence and risk management strategies in the context of smart city development. Various topics



were explored, including infrastructure resilience, citizen engagement, sustainable mobility, and environmental sustainability. Recognising the interconnectivity of these aspects, the participants emphasised their significance in creating inclusive and resilient cities.

The interactive sessions proved to be engaging platforms for stimulating conversations, productive debates and the exchange of diverse perspectives. Together, the participants cultivated an environment that fosters innovation, nurtures partnerships, and advocates for a holistic approach to smart city development. The workshop served as a catalyst for learning, growth and collaboration, empowering the participants to think beyond conventional boundaries and challenge existing norms. By harnessing the insights gained from the workshop, the participants are poised to contribute to the ongoing transformation of cities into sustainable, resilient and inclusive spaces. The following outcomes were mapped during the workshop.

### Outcomes

- **Knowledge Exchange:** The workshop facilitated the exchange of knowledge, experiences and best practices among participants, enabling them to gain insights into successful smart city projects and innovative approaches.
- **Engaging Conversations and Diverse Perspectives:** The interactive sessions provided a platform for engaging conversations, fruitful debates, and the exchange of diverse perspectives. Participants shared their challenges, aspirations and potential solutions, fostering a deeper understanding of the complexities involved in smart city development.
- **Networking and Collaboration:** Participants expanded their professional networks, fostering potential collaborations and partnerships for future smart city endeavours.
- **Actionable Strategies:** The workshop provided participants with actionable strategies and practical insights to overcome challenges in integrating data, engaging stakeholders and achieving sustainability and resilience in smart city development.
- **Learning, Growth and Collaboration:** The workshop provided a platform for learning, growth and collaboration among participants. It facilitated the exchange of ideas, experiences, and best practices, enabling participants to broaden their knowledge and strengthen their professional networks.
- **Empowered Participants:** The workshop empowered participants with the knowledge, tools, and connections to drive positive change in their respective cities, enabling them to contribute towards building smarter, sustainable, and resilient urban environments.

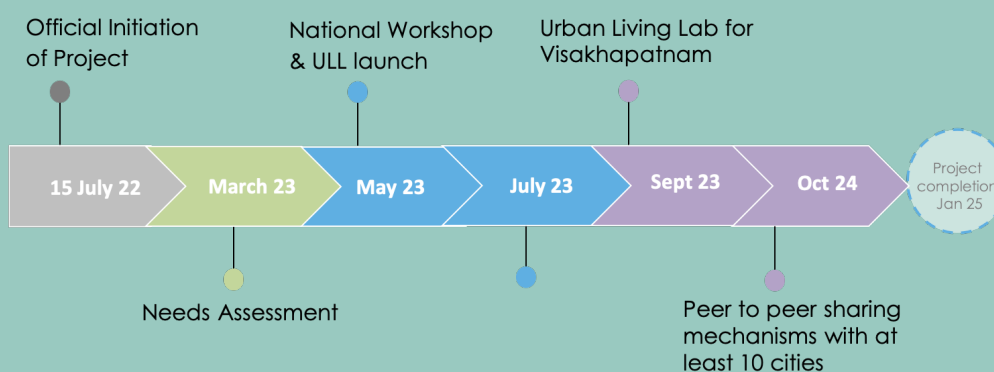
The workshop highlighted the challenges faced in the significance of climate-sensitive thinking, provided valuable takeaways for participants and generated key outcomes such as knowledge exchange, networking, actionable strategies, policy recommendations, and empowered participants. These outcomes serve as a foundation for further advancements in fostering transformative Climate Action using Participatory data-driven decision-making in Indian Cities.

# About T-CAP



## Transformative Climate Action using participatory data driven decision making Platforms (T-CAP)

While digital means are increasingly used to assist in managing cities, an untapped potential lies in using these means to facilitate participatory local level policy making and implementation to catalyse transformative climate actions. This holds special significance in the small and medium cities from the Global South that face resource and capacity constraints. In this ever dynamic world, data driven decision making platforms can assist in augmenting the capacity of local actors and communities to collaborate on forward looking, transformative climate actions. The project assists urban local bodies in working effectively with all stakeholders (particularly the civil society) to gather and analyse data needed for comprehensive policy making and jointly implement transformative climate actions. It aims to showcase a science based participatory planning framework for data driven decision making that can inspire cities across the globe.



Find more at [www.international-climate-initiative.com](http://www.international-climate-initiative.com)

## SDGs aimed by T-CAP Project



# Introduction

Sustainable and inclusive urban growth are essential to realise the full benefits of urbanisation. A third of India's population currently lives in cities, contributing to 63% of the national GDP. Based on the current trend, it is projected that within this decade (by 2030), India's urban population will increase by 590 million, and its GDP contribution will increase to 75%. In addition to addressing the urbanisation challenges, cities are increasingly tackling extreme events like flooding, heat waves and cyclones. According to the National Disaster Management Authority (NDMA), 77 cities in the country's coastal regions, including some of the largest and densest urban agglomerations, are prone to frequent cyclones. The frequency of urban floods has already increased drastically in the last decade. According to the IPCC 1.5°C Special Report, India is projected to experience more high-intensity cyclones and a higher risk due to extreme rainfall and heat waves.

On the other hand, data-driven approaches establish new avenues to respond to and manage the lives, livelihoods and properties. The significance of institutionalising evidence-based decision-making is crucial for building resilience at the local level. The robust data collection and harnessing of frontier technologies will enable an ecosystem for better informed and self-resilient cities. Employing integrated climate data ecosystem platforms will make it easier for stakeholders in and outside governments to access necessary data and information to tell relevant stories, educate the public, identify opportunities and take action to adapt to climate change and mitigate its effects.

While digital means are increasingly used to assist in managing cities, available avenues of using technological means to facilitate participatory local-level policymaking and implementation, catalysing transformative climate actions, remain unexplored. On a parallel front, considerable efforts are being made by Smart Cities Mission to address the ease of the decision-making process in Urban India. However, the challenges related to building community resilience, resource and capacity constraints and enabling legal and policy frameworks for participatory climate actions in Indian Cities need to be discussed. The National Institute for Urban Affairs (NIUA), in collaboration with the United Nations University Institute of Environment and Human Security (UNU-EHS), Bonn, Germany and The Energy and Resources Institute (TERI), New Delhi, has undertaken an action research project titled "Transformative Climate Action using Participatory data-driven decision-making platforms (T-CAP)". Under the project, NIUA intends to embed a dialogue on participatory climate actions at the heart of urban discourse to pave the way for better-informed and self-resilient cities.

The national workshop on fostering participatory climate actions is a key milestone to introduce the approach among Indian cities and engage stakeholders, opening discourse to organise important aspects for an enabling environment using inclusive technology that contributes to collective decision-making for city-level climate actions.

According to the IPCC special report 'Global Warming of 1.5°C', a global challenge like climate change requires global solutions. It will require movement-building and on-the-ground action, as well as new national policies and economic transformations.

India is amongst the countries that are likely to be most affected by the changing climate (Eckstein et al., 2021). Growing cities, widening infrastructure, higher individual movements, concretisation, and exploitation of natural resources push people to climate risks while exacerbating systemic and spatial inequalities (Garschagen et al., 2016). The traditional top-down urban planning and management approach is lagging behind the ever-urbanising landscape and has provided limited avenues for participatory policy-making and implementation. However, as of now, there are three primary points to understand-

1. First is the aspect of communities that have been at the receiving end of climate hazards and have been negotiating their day-to-day activities in co-creating and designing formal and informal systems around themselves. While there exists local knowledge and community-level climate action, there is a need to integrate various city stakeholders for effective climate mitigation and adaptation strategies.
2. Secondly, with city development initiatives, India is also witnessing rapid adoption of digital technologies. The digitalisation wave has exponentially enhanced access to information and collaboration avenues, thereby bringing all actors (be it the public, private or civil society) closer. This democratisation of access through information technology has opened new possibilities to engage with

people from across spectrums of society and can be particularly beneficial in enhancing transformative climate actions in small and medium cities of the global south (Balogun et al., 2020).

3. The third integral point about Indian Cities is that they are already spearheading technological adaptation, enabling the potential of improving safety, accountability and inclusivity at the city level under India's Smart Cities Mission - data-driven governance through the deployment of Information and communications technology (ICT) interventions, particularly by setting up of Indian urban observatories in cities called Integrated Command and Control Centre (ICCC).

To mitigate and adapt to climate challenges, solutions must come from communities, from local to national governments and businesses. Tapping on to the right implementation structures and effective mediums of collaboration can bring all city stakeholders together to deliberate and act upon building regional climate resilience. Proper policies, together with innovative approaches to use technological tools involving people-expertise with evidence-based methodologies, have the potential to move forward with robust social and economic systems.

The two-day workshop nudged to explore how technology can facilitate participatory climate action in Indian Cities. It was designed to stimulate healthy dialogues across academia, urban authorities, innovators and citizens to discuss the opportunities and best practices for meaningful frameworks for Indian cities. The multiple sessions, as elaborated in this report, cultivated an environment to engage, enable and enrich participants with ideas and solutions to undertake climate actions in their cities.

The primary outcome of the workshop is that it proved to be a platform for speakers and participants to learn, discuss, visualise and share what is happening in Indian cities with regard to the adoption of digital technologies and climate action, where are the gaps & how can these be addressed through digital means giving way to climate action processes being made more participatory. Nonetheless, there are also a few challenges that affect the applicability and aspect of digitalisation -

- Integrated Climate data systems: Climate data encompasses a wide range of information, spanning various scales and jurisdictions, including transnational, national, and sub-national levels. This diversity hinders the effective and comprehensive management of data.
- Engagements for climate actions: Engaging and involving various stakeholders, including government bodies, communities and private sectors, in the planning, decision- making and implementation of participatory climate action.
- Coordination and Data Stewardship: New reporting requirements and the demand for data to drive action on climate change necessitate enhanced coordination and communication among stakeholders. Currently, coordination between various agencies and departments is inconsistent, resulting in fragmented information and data. Insufficient coordination and unclear roles in data stewardship hinder access to existing data, diminish its value, and increase the likelihood of redundant efforts. Relevant stakeholders within and outside of the government must identify one another and collaborate on shared data needs.

The following sections revisit the workshop proceeding in the order of their conduct, highlighting session intent, activities format, brainstormed dialogues concluding with major takeaways. Please refer to the agenda in the annexure for an overview of the designed sessions.

# DAY 1

# Part 1

## Inaugural & Context Setting

### Context-Setting



The workshop commenced with a welcome note and context setting by Dr Victor R. Shinde, Head, Climate Centre for Cities, National Institute of Urban Affairs(NIUA), followed by an introduction to the project by Dr Himanshu Shekhar, Associate Academic Officer, United Nations University(UNU). Shri. Rahul Kapoor, Joint Secretary, Ministry of Housing & Urban Affairs, addressed the participants, sharing a vision of inclusive governance and related mechanisms that can solve the problems of the most destitute in our society. Antje Berger, Counsellor, Climate & Environment German Embassy, joined the workshop highlighting the role and impact of 'Die Internationale Klimaschutz Initiative'(IKI) or 'International Climate Initiative' support for climate initiatives. Sh. Sanjay Seth, Senior Director, The Energy and Resources Institute(TERI), motivated the participants to collaborate on a participatory approach to planning and managing our cities.

The speakers in the inaugural session set out the context for the national workshop by emphasising important aspects of how utilising technology can promote participatory climate action and support the management of city-level services with efficient response mechanisms during environmental hazards. The structures of 'just' and reliable data collection, monitoring, analysis, dissemination and actions thereafter are crucial in helping cities to contextualise solutions, aiding the development of frameworks for settlements in varying Indian geography. The experts discussed the challenges of leveraging digitalisation to foster transformative climate action. The challenges include providing access to affordable, decentralised, unbiased, and participatory solutions, prioritising local needs and regional priorities, and standardising data collection, monitoring and governance protocols. It was also mentioned that data privacy and protection laws with the Universal Declaration of Human Rights, addressing the pitfalls of digital technologies, must work in tandem with 'frontier technologies' and 'frugal' and mundane innovations.

The experts highlighted the importance of engaging citizens in developing more robust technologies for on-ground climate actions. They also emphasised the need for inclusivity, ensuring that everyone can afford to mitigate challenges or risks. India's vulnerability to climate change and rapid urbanisation were discussed. The Smart City Mission and the Climate Smart Cities Assessment Framework were cited as successful models for sustainable, inclusive and technology-driven urban planning.



Consequently, the experts stressed the importance of taking action now to mitigate the impacts of climate change and reduce greenhouse gas emissions to ensure that the Earth remains liveable for future generations. The need for action at all levels, including at the country, city, and village levels, was also pointed out. This section briefly summarises the thoughts presented by the speakers of the session in the following pages.

“ Scientific knowledge is necessary to strengthen the equation between cities and communities. Community driven approach is important to solve climate challenges. ”

**Dr. Victor Shinde**  
Head, Climate Centre for Cities



**Dr Victor Shinde** delved into the concept of technology, aligning it with the definition of 'a science addressing real-world problems.' Emphasizing that cities are increasingly inclined towards adopting technology for fostering a conducive environment in governance and decision-making, he raised the crucial question of how cities discern the most suitable technological tools from the myriad of innovations available. Dr. Shinde underscored the necessity of developing scientific knowledge that can influence institutional mechanisms, fortifying the relationship between cities and communities. Contrary to the perception of technology as a top-down approach, Dr.

Shinde advocated for citizen involvement,

highlighting the significance of exploring methods such as crowdsourcing data and information. He stressed the importance of leveraging available human resources by establishing robust frameworks for crowdsourcing and engagement across diverse domains. In essence, the talk underscored the imperative for a strategic and collaborative approach in integrating technology within urban settings.

During his presentation, **Dr. Himanshu Shekhar** underscored the urgency for India to swiftly embrace climate action initiatives, given its pivotal role in global climate dialogues. He elaborated on the multifaceted nature of city-level transformations, emphasizing the interplay of scale, timing, and innovation. Dr. Shekhar pointed to the Smart City Mission's pivotal role in developing systems that facilitate cities in adapting to the dynamic challenges posed by climate change, particularly in the context of India's vulnerability and rapid urbanization.

In examining the transformative potential of technology, he positioned it as a key catalyst for making Indian cities smarter, with a focus on societal well-being. Despite the challenges cities face in sustaining justice and environmental responsibility, he stressed the importance of empowering cities to effectively utilize their resources. The central question posed was the role of digitalization in shaping just and sustainable urban landscapes, with Dr. Shekhar asserting that digitalization should be viewed as an enabler rather than a definitive solution. His ongoing project referenced delves into climate action and data-driven decision-making within the realm of digital transformation, providing a tangible framework for these theoretical considerations. He further explored the capacity of digital services to be safe, trustworthy, and inclusive, while also catalyzing stakeholder participation by prioritizing local needs and ensuring unbiased access with last-mile connectivity.

“ Rapid urbanization can enhance vulnerability to climate change. ”

Digital technology, just and inclusive transition, and participatory data driven approach are necessary for transformative climate action.

**Dr. Himanshu Shekhar**  
Associate Academic Officer, United Nations University



Beyond practical considerations, Dr. Shekhar raised broader ethical concerns regarding the compatibility of existing data laws with the Universal Declaration of Human Rights. He urged a cautious approach to data, acknowledging its dual role as both an enabler and a potential source of challenges associated with decision technology, rebounds, trade-offs, and societal divisions. In essence, Dr. Shekhar's talk delved into the intricate dynamics of technology, climate action, and data governance, positioning them as crucial elements in shaping the trajectory of India's urban future.

## Perspectives

Guests of honour joined the inaugural session sharing their insights on relevant themes and expectations from the workshop. While Shri. Rahul Kapoor emphasised on inclusion and collaboration in innovation for climate change solution, Dr. Antje C. Berger elaborated on developing sustainable approaches for city, mobility, building systems and green technologies. She also explained about the approach and initiatives of the International Climate Initiative (IKI) in India. Shri. Sanjay Seth brought attention to the G20 efforts and government initiatives drawing importance on urban living laboratory approach for participatory decision making in local governance structures of Indian cities.

## Dignitaries -

1. **Shri. Rahul Kapoor**, Joint Secretary Ministry of Housing & Urban Affairs
2. **Dr. Antje Berger**, Counsellor, Climate & Environment German Embassy
3. **Shri. Sanjay Seth**, Senior Director, The Energy and Resources Institute

To mitigate Climate Change, we need to create an ecosystem fostering COLLABORATION.

Inclusive framework for Climate Action, knowledge resources, and partnerships needs to be included in the policies.

### Shri. Rahul Kapoor

Joint Secretary, Ministry of Housing & Urban Affairs



**Shri. Rahul Kapoor**, Joint Secretary at the Ministry of Housing and Urban Affairs (MoHUA), underscored the pervasive impact of climate change, elucidating on phenomena such as a warming climate, the heat island effect, altered rainfall patterns, and the ensuing challenges like droughts and urban floods. These environmental shifts not only impact crop yields but also exacerbate stress on limited resources, especially with a burgeoning global population.

Mr. Kapoor emphasized the need for inclusive climate action, acknowledging that while certain individuals may have the means to relocate in response to environmental

challenges, not everyone enjoys such flexibility. He highlighted ongoing initiatives, including projects under the Smart City Mission and T-CAP, as examples of participatory decision-making geared towards addressing climate-related challenges.

The overarching goal of the workshop, as articulated by Shri. Kapoor, is to create a comprehensive knowledge resource informing policy that extends beyond a select few cities. While local action is imperative, the focus is on ensuring widespread implementation simultaneously across all cities. Recognizing the substantial transitioning costs involved in achieving the set goals and targets, Mr. Kapoor conveyed the urgency of concerted efforts to tackle the multifaceted impacts of climate change on a global scale.

**Dr. Antje Berger**, in her discourse, spotlighted the Climate Smart Cities Mission, a flagship initiative by the Government of India designed to cultivate smart cities characterized by resilience, sustainability, and a low carbon footprint. Drawing attention to historical oversights in industrial city development, resulting in environmental degradation and health hazards, she urged Indian cities undergoing rapid industrialization to adopt a more sustainable trajectory. This entails promoting green technologies, energy-efficient buildings, and sustainable transportation systems.



Emphasizing the urgency of action to mitigate climate change impacts and reduce greenhouse gas emissions, Dr. Berger advocated for learning from past mistakes and integrating indigenous knowledge into present and future decision-making. She stressed the importance of comprehensive action at all levels—national, municipal, rural, and familial—to foster a culture of sustainability and encourage sustainable behaviours, crucial for shaping a sustainable future. Highlighting India's exemplary adaptation to climate change, Dr. Berger affirmed the priority of investing in India, citing the country's effective utilization of resources for constructive and fruitful outcomes. Her talk underscored the importance of proactive measures to ensure a liveable Earth for future generations through sustainable city development and a culture of environmental responsibility.

India and Germany have signed several climate agreements and are working together since decades in the fields of climate and environment. What is required now is data for more climate friendly transformation, particularly in urban settings.

Cities will decide whether and how we can win the battle against climate change.

**Dr. Antje C. Berger**

*Counsellor, Head of Environment & Climate, German Embassy New Delhi*



**Shri. Sanjay Seth** underscored the transformative potential of technological interventions in urban governance, advocating for increased efficiency and participatory decision-making. Stressing the importance of India adopting agility to align with and surpass global trends in these areas, he highlighted the Urban 20 Engagement Group's emphasis on environmentally responsible behaviours and the catalysis of digital urban futures as a unique opportunity for India. The Smart City Mission, a landmark initiative by the government of India, was lauded for reshaping the perception of urban cities, and successfully establishing a sustainable, inclusive, and technology-driven organizational model.

Transformative Climate Action (T-CAP) Project works on three-pronged approach:

1. Climate Action
2. Citizen Participation
3. Technology Driven

It aligns well with U20 principles of encouraging environmentally responsible behaviour and creating digital urban future.

**Shri. Sanjay Seth**

*Senior Director, The Energy and Resources Institute*



Discussing the 'Climate Smart Cities Assessment Framework (CSCAF)' by the Climate Centre for Cities, NIUA, Shri. Seth pointed to its role in institutionalizing urban planning efforts and mainstreaming resilience. Additionally, he highlighted the T-CAP project's focus on climate action, participation, and digitalization. Introducing the concept of Urban Living Lab (ULL) in Panjim, Goa, by TERI, he emphasized its innovative and participatory approach to addressing urban challenges. TERI aims to replicate this successful approach, including learnings and methodologies, within the T-CAP project.

## Participants & Perspectives

The workshop had government officials representing 10 different cities, as well as academics, businesses, start-ups, and Non-Governmental Organizations (NGOs), primarily working in the domain of sustainable cities and related systems, consultancies, and research organisations.

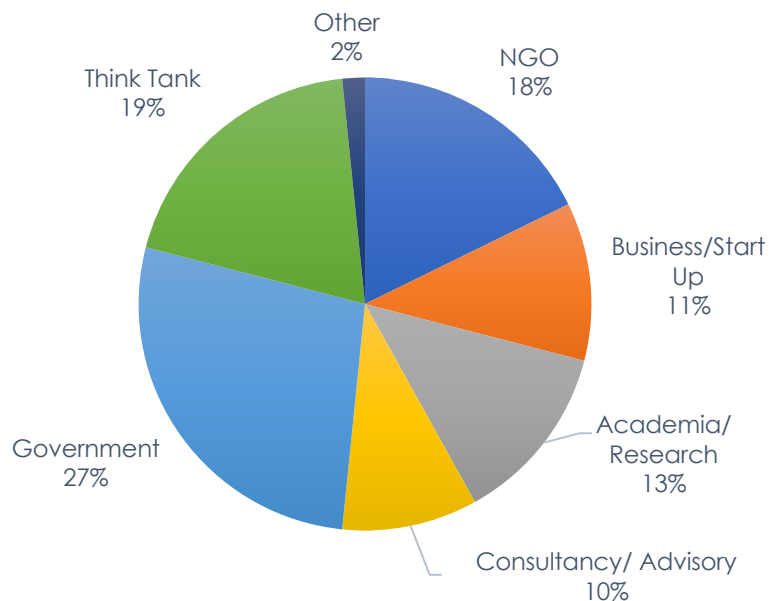


Figure 1: Sector-based Proportions of Participants

The participants have been working or were interested in tapping into digitalisation avenues for city management or improving the systems of waste management, mobility and air quality, water management, energy and green building besides urban planning, green cover and biodiversity. (Refer to annexure for participation overview).

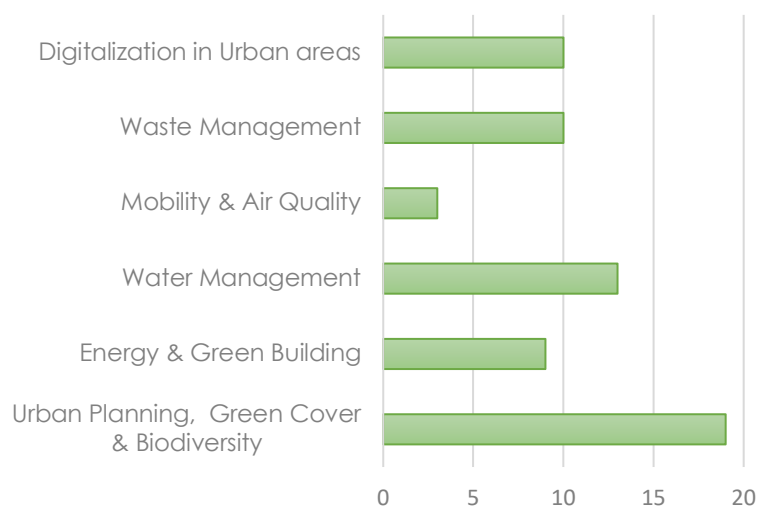


Figure 2 : Thematic Area of Participants



## What is “good governance”?

Participatory	Inclusive	Transparency
Transparency with digital solution	Easy, Accessible & Transparent	Ease of doing business
Capacity Building	Effective & efficient coordination among stakeholders. Citizens should be at the centre of planning	Managing livelihood in an eco-friendly and self sustaining way
Easy, accessible and transparent	Inclusive & Responsive	Transparent & responsive delivery of government services
Minimal governance, maximum participation	<b>Accountability</b>	Participatory, Transparent, Accountable
Transparency & digital solution	Effective implementation via informed decision ensuring sustainable life for citizens	Partnership-based & Inclusive
Providing a healthy & disaster resilient city to the citizens	Decentralised with devolution of power!	Participatory, Inclusive, Effective
Efficient & Accountable	<b>Transparency</b>	Hassle free transparent service delivery
Providing safe and liveable conditions for people	Higher Ease of living index, good mobility & healthcare facilities, better redressal management	The facilities which fulfil requirements of citizens easily
Effective planning & implementation	Leave no one behind	Minimum government maximum governance
Sustainable approaches	Interdepartmental coordination & transparency	Good coordination amongst all involved
Effective distribution of functions	Make change happen fast	Just make processes system-driven
Stringent regulatory mechanism, robust framework, bottom-up approach	Responsive governance, data driven, informed decision-making, transparent, efficient, accountable, sustainable & resilient	Best planned against Climate Change
Encouraging public participation, green growth	Visualisation of Data	Digitalisation is simplicity

Figure 5 : Mentimeter short answers by participants for good governance





### What is your idea of “digitalisation”?

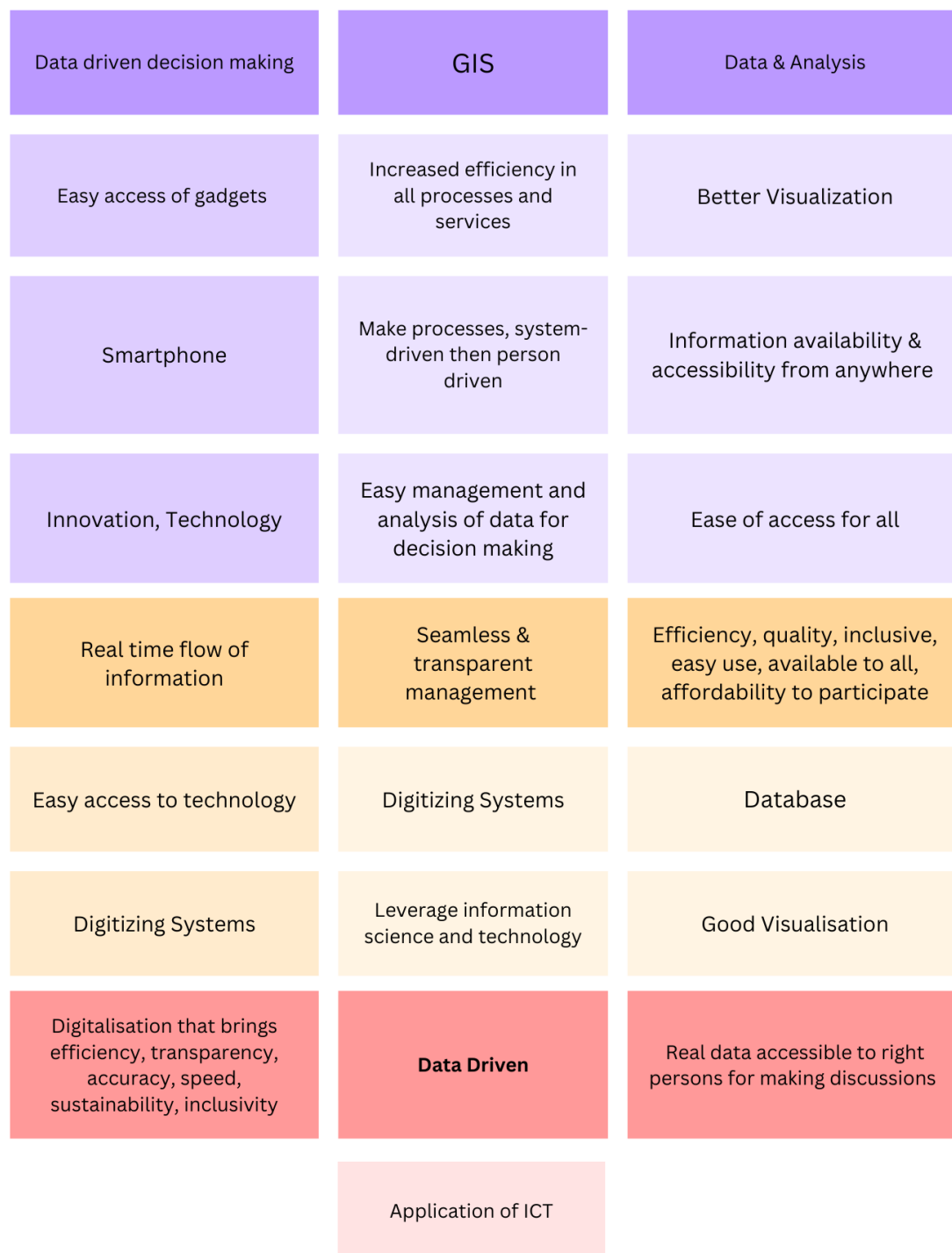


Figure 6 : Mentimeter short answers on digitalisation by participants

A multitude of ideas regarding governance structures, digitalisation, participation, and the necessity for urban centres to enhance climate resilience were discussed among participants and organisers. Strong emphasis was placed on the view that sound governance involves transparency and accountability. Various facets of digitalisation, encompassing data digitisation and its application through digital means in decision-making, were put forth. An informal exchange provided a platform for further discourse among the participants.



## What is participation in decision-making, in your opinion?



Figure 7 : Mentimeter Word Cloud on participatory decision-making by participants

One of the participants expressed that his organisation works on 'waste to fuel', where they are converting dimethyl ether to eco-fuel having lesser content of PM 2.5. As per him, this product can be a replacement for diesel.

One of the participants raised concern about the question, 'What is participation in decision making'. It was highlighted by them that the participation of people should go beyond crowdsourcing data because the collection of data points, processing method and quality of data collected are some major concerns, and the outcomes that are consequential post-assessment, should be given primary attention.

## Takeaway

*The inaugural session focused on the urgent need to leverage digitalization to promote participatory climate action. The experts emphasized the importance of data and digital technologies in transforming urban living, governance, and service delivery. The session called on the G20-U20 to take action in three priority areas for catalysing the digital urban future. Firstly, to facilitate data-enabled decision making by formulating protocols, data standardization frameworks, and toolkits for ethical, fair, and inclusive data generation, management, security, and sharing. Secondly, to ensure that benefits of the digital economy are shared universally, and thirdly, to encourage digital innovations as multi-level strategies with human-centred approach transforming databases to ground reality. The experts stressed on the need for inclusivity in climate action, and the importance of engaging citizens to develop robust technologies fostering a culture of sustainability and liveability for the present and future generations.*

## IKI Approach

The objective of this session was to illustrate how IKI-funded projects can influence change in the climate action domain. Additionally, these discussions aimed to highlight how these projects have leveraged public participation through digital means to create change.

### Speakers -

1. **Dr. Antje C. Berger**, Counsellor, Head of Environment & Climate, German Embassy New Delhi
2. **Sebastian Markart**, Senior Advisor, Sustainable Urban and Industrial Development, GIZ GmbH
3. **Vaishali Singh**, Deputy Manager, Transport Systems & Electric Mobility, ITDP
4. **K Venkatramana**, Associate Fellow – Centre for Climate Modelling, Earth Science and Climate Division, TERI

**Dr. Antje Berger** underscored India's active and longstanding engagement within the International Climate Initiative (IKI) family, with the country being among the initial beneficiaries of IKI funding for over 15 years. Currently, more than 40 projects in India are supported under this initiative. She highlighted the notable expansion of central government-driven initiatives, such as the Climate Smart Cities (CSC) program, reaching over 100 cities, indicating a substantial scale-up in climate-friendly solutions at the national level.



At the regional level, initiatives like the Urban Act have facilitated invaluable cross-learning among South East Asian nations, fostering the development of an institutional environment for climate-sensitive planning and evidence-based decision-making. Dr. Berger emphasized a sectoral, transport, and participatory planning approach, encouraging sustainable practices like walking, cycling, and public transport use across Indian cities. She also advocated for the development of digital solutions through collaboration with start-ups.

The talk emphasized the significance of international collaboration in climate science and forecasting. Dr. Berger provided the example of monsoon forecasts being shared with stakeholders, including farmers, through workshops and regional-language mobile applications. The creation of dashboards with data under different scenarios for multiple countries, accessible to decision-makers and researchers, was highlighted as a beneficial measure for informed decision-making. Overall, the initiatives discussed aimed to promote sustainable and climate-resilient practices in India, showcasing the positive impact of long-term collaboration under the IKI.

**Mr. Sebastian Markart's** presentation centred on ongoing initiatives, specifically, the Climate Smart Cities and the Urban Act Project, undertaken collaboratively with the Ministry of Housing and Urban Affairs (MoHUA), the Government of India, and the National Institute of Urban Affairs (NIUA). The Climate Smart Cities Assessment Framework (CSCAF) was highlighted and developed in response to MoHUA's request to mainstream climate action across 100 cities. The framework, comprising 30+ indicators, facilitates performance assessment and cross-learning, supporting evidence-based decision-making. The establishment of the 'Climate Centre for Cities' was emphasized, playing a pivotal role in institutionalizing climate action in Indian cities through capacity building, training, and knowledge management. The 'MuSavior' App, designed for Bhubaneswar, monitors flood and waterlogging. The 'Urban Act' Project, fostering regional exchange in the South East Asian context, involves cities like Bhubaneswar, Kochi, Coimbatore, Shimla, and Panaji. The objective is to build smart and climate-friendly solutions, contributing to evidence-based decision-making and sustainable urban development.







**Vaishali Singh** from the Institute for Transportation and Development Policy (ITDP) India presented a strategic approach of "Test -> Learn -> Scale," focusing on three national challenges to promote walking, cycling, and public transport usage in Indian cities. The success of these challenges was attributed to participatory planning, involving resident surveys, crowdsourcing, and collaboration with local champions. The challenges, such as 'Freedom to Walk' and 'Freedom to Walk Cycle,' engaged city leaders to comprehend residents' issues, fostering a competitive environment for performance comparison and ranking among cities. Digital solutions, developed in collaboration with start-ups and the government, were incentivized with cash prizes for the best solutions. ITDP offered comprehensive support to the government through toolkits, guidelines, templates, and digital platforms. The initiative facilitated peer learning through 'WhatsApp' and email groups, encouraging a collaborative and knowledge-sharing approach among cities for effective urban planning.

### ***Ways forward on participatory climate action using technology***

- *Collaboration and co-creation are key for knowledge exchange and transformative climate actions*
- *Assessing performance of local government across parameters can be supported by emerging technology platforms such as ICCC*
- *Learning and experience sharing mechanisms from the South and South-East Asia region can be mutually beneficial*
- *Involving citizens in design and crowdsourcing data from citizens through digital means can help with data gaps that often exist at the local level*
- *Emerging digital means of participation and collaboration such as 'WhatsApp' and other social media channels can facilitate information dissemination*
- *Regional contextualization of complex global climate models and relatable visual representation can benefit different actors and aid informed decision making*

**Mr. K. Venkatramana** introduced the 'Climate Capacity' project by TERI, comprising Climate, Hydrology, Agriculture, and Migration components, with a specific focus on climate mitigation in Uttarakhand. The project offers a comprehensive 100-year climate change dataset, encompassing 30 years of historical data and future scenarios, culminating in a bilingual report for Uttarakhand in English and Hindi. The Climate component includes a long-term monsoon forecast, aiding farmers in their cropping cycles through regional-language workshops. The Potsdam Institute for Climate Impact Research (PIK) has developed a mobile app for convenient information dissemination.

A visualisation component presents data for various countries and scenarios on a freely accessible dashboard, featuring multiple layers of information and parameters, downloadable for researchers or decision-makers. Additionally, the project includes a capacity building and outreach component, featuring five workshops and various publications to share the insights and knowledge gained from the initiative. This holistic approach showcases TERI's commitment to climate mitigation and sustainable practices, with a particular focus on the unique challenges faced by Uttarakhand.



## Takeaway

The T-CAP project aspires to leverage the potential of technology as well as global climate knowledge in contextualizing technology based participatory mechanisms for the Indian cities that can foster transformative climate actions. In this regard, learning from this session provides valuable lessons across scales and domains including the following:

- Contextualization of global climate science and policies
- Mechanisms to involve citizens
- Cooperation and collaboration across actors





## Part 2

# ULL Approach, Methods and Digital Tools

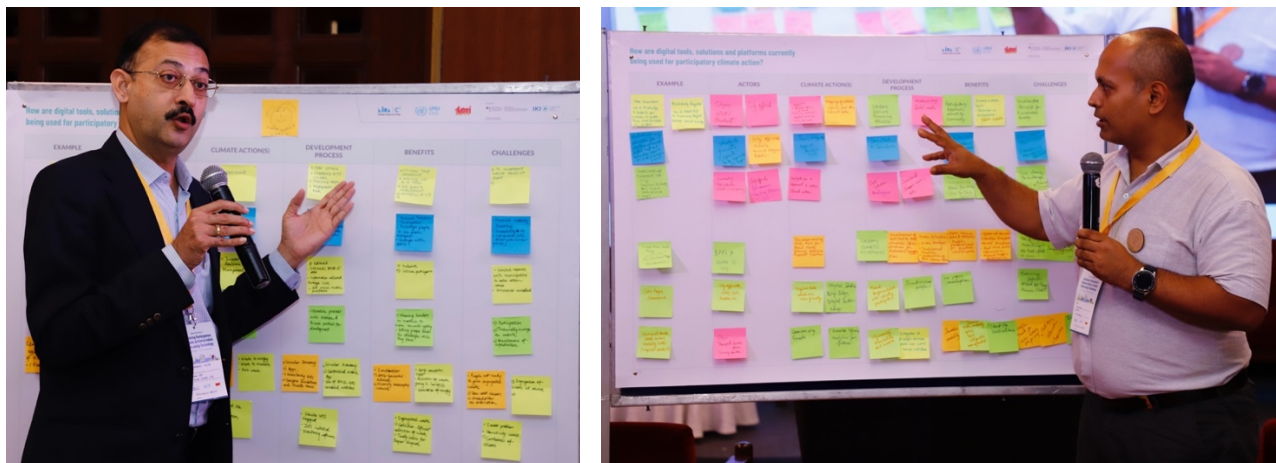
## Interactive Exercise Insights: Co-innovating Solutions

The examples, challenges and benefits shared inform our current work on digital tools and platforms which will be developed and tested in the Vizag Urban Living Lab (ULL). Taking into consideration existing initiatives and their pros and cons allowed us to not only enhance our understanding of what is already being undertaken but also discuss what is most relevant in the Indian context.



It was stressed that while considering digital solutions, it is critical to ensure that everyone is on board to make the process inclusive and just. It is equally important to prioritise data privacy and security, such as by anonymising data and establishing ethical guidelines for data usage and digital tools. Utilising digital means also enables the identification of governance gaps, providing an opportunity to address and enhance the identified shortcomings. It is crucial to integrate traditional and indigenous knowledge into the use of digital tools and solutions. Moreover, when employing these technologies, organisations must carefully consider the organisational, institutional, and ethical dimensions involved.

It is important to acknowledge and build on the active participation of citizens in activities such as improving air quality, plantation drives, adopting saplings etc. In this context, it is critical to consider fatigue with existing tools such as dashboards and apps. While data-driven decision-making is important and efforts are geared towards facilitating the same, there is a need for sensitisation in addition to capacity building. Further, there should be a way to evaluate if the data collected is being effectively utilised. While developing tech solutions, it is important to account for the calibration and maintenance of hardware such as sensors etc.



The use of Integrated Command and Control Centers (ICCC) in Smart Cities Mission has enabled addressing urban challenges and improving municipal service delivery. They are envisaged to be the hub of innovation as they facilitate effective management of city operations, exceptional scenarios and disaster mitigation using information and communication technology.

## Ways forward on participatory climate action using technology

- *Multi-stakeholder collaboration through digital means should be sensitive to limitations such as digital literacy, access to digital means, limitations in participation, human rights data privacy etc.*
- *Strengthening capacities of different stakeholders to ensure that means at disposal can be effectively used, additional training and access should be provided wherever necessary*
- *Providing last mile connection that is affordable, reliable and relatable*
- *Leveraging the potential offered by the Smart City Mission of India that provides unprecedented access to real time data collection and dissemination*



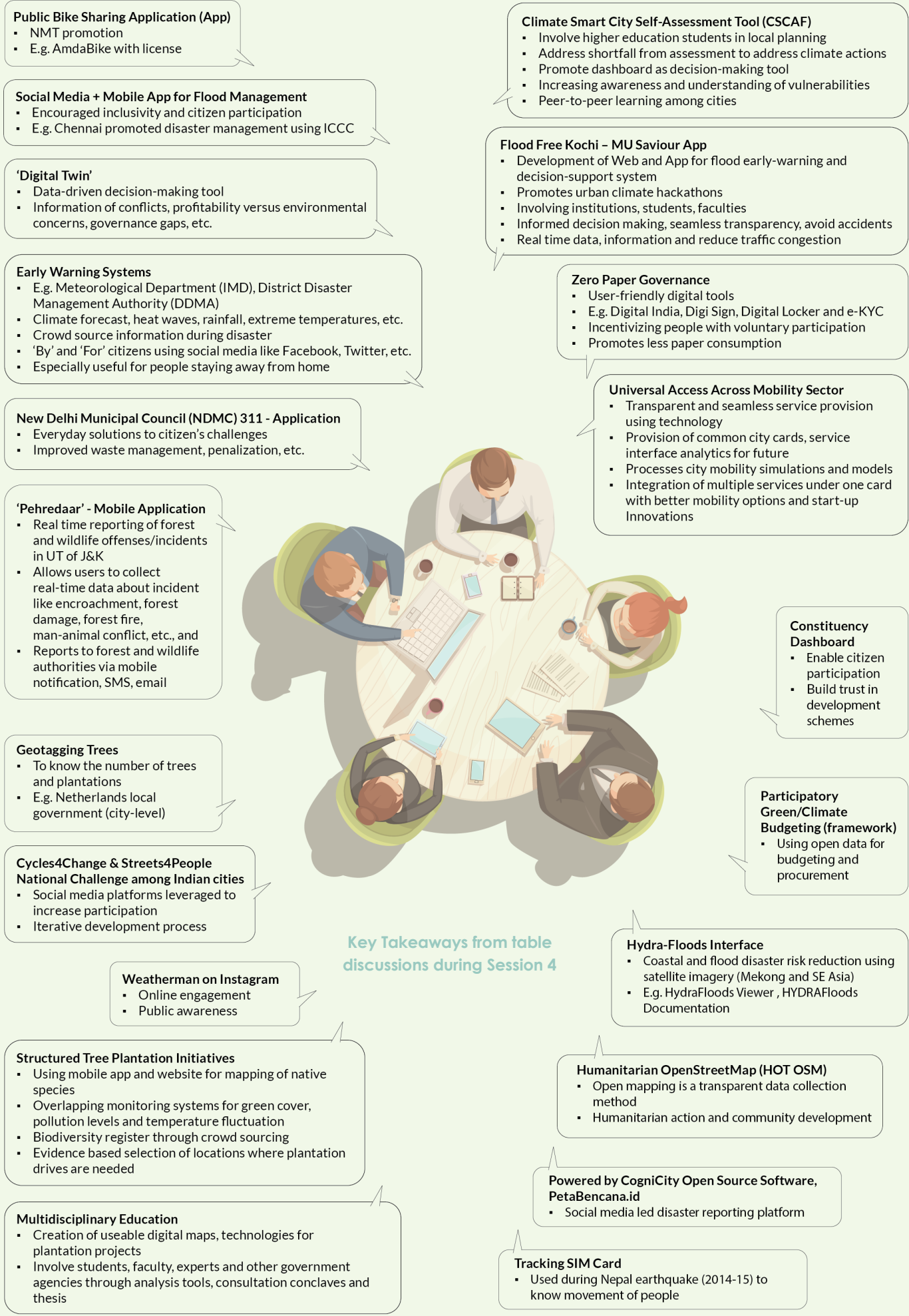




## Takeaway

*The findings from this session support the design thinking of the T-CAP project and indicate the potential of India's Smart City Mission in facilitating participatory climate action. Various use cases shared by the participants provide a rich set of possible climate action interventions for the T-CAP project. Several of the use cases shared are relatable to real life scenarios in Visakhapatnam and by learning from the practical experiences of local government and other actors regarding these show the pathway for T-CAP project to get inspired from. The recommendations provided by different groups will be duly considered while co-creating solutions in Visakhapatnam.*





Key Takeaways from table discussions during Session 4

Figure 8 : Key Takeaway from Session 4 Interaction



## Urban Living Lab Case Studies

The focus of the session was primarily to engage with sector experts in understanding the challenges and opportunities of urban living labs and to deliberate on how Indian cities can take the concept forward. The moderator of the session was Mr. Sanjay Seth, Senior Director of the Sustainable Habitat Programme, TERI. The session started with a welcome address by Mr. Sanjay Seth, who highlighted how the concept of Urban Living Lab (ULL), being a testbed for urban innovative solutions, can help a project be sustainable as well as successful. Following the address, a presentation to set the context for the concept of ULL was showcased by Ms. Rhea Shrivastava, Research Associate, TERI, after which a discussion steered towards the objective of the session. People from different organisations were called upon to share their experiences regarding the ULL.

### Speakers:

1. **Ms. Anuradha Vattem**, Lead Architect, International Institute of Information Technology, Hyderabad
2. **Dr. Vikrom Mathur**, Director, Transitions Research
3. **Dr. Anita K. Sharma**, Urban Sector Counsellor, Royal Danish Embassy



The discussion on various topics unfolded, which included co-innovating solutions for urban climate change, experimental governance by users and decision-makers, institutional flexibility and many more. The panel members proposed their ideas with the importance of good quality data which shaped the data-driven decision-making within the framework of Smart Cities. The Urban Living Lab provides a platform for co-innovating solutions for climate action. Moving away from a copy-paste solution enables the provisioning of a testbed for solutions that are location and region-specific. The ability to iterate multiple solutions by bringing all the relevant stakeholders on board is crucial to participatory decision-making.

The upcoming Varanasi Urban Living Lab with a focus on the green river was also discussed in the session. This lab is expected to act as a testbed for future actions in preserving and rejuvenating river basins. Therefore, acting as a lighthouse example for Indian river systems across the country. A key concern that was pointed out by all the speakers was sustaining such experiments. This would require adopting a business model and addressing the lifecycle cost of the project on the same lines as the infrastructure project. The quadruple helix model of ULL ensures the collaboration of industry, government, research institutes, and the public; which play a crucial role in ensuring its sustenance.

## Ways forward on participatory climate action using technology

*The discussion around Urban Living Lab mapped to the priority areas of U20 with living labs providing frameworks for reinventing urban governance and planning through a data-driven participatory approach. The focus on digitalization by engaging with ICCC infrastructure can transform how one looks at city governance with real-time monitoring and grievance redressal. With active civic engagement, through ULL, the larger principles of sustainable, equitable and resilient urban development can reach every citizen who can then be an active participant rather than a passive receiver. It ensures a just transition where no one is left behind in the vision of a sustainable city.*

**Ms. Anuradha Vattem**, Lead Architect, IIIT-Hyderabad shared her experience of setting up a living lab. She talked about the participatory aspects of the living lab and how people from various domains can contribute to providing innovative ideas to cater to a problem. Her presentation captured insights into the nodes built in the living lab campus for various services and how the nodes were being monitored on a daily basis. She also showcased how the ESG (Economic Social Governance) sector can be utilised for ULLs. Talking about corporate interventions in terms of monetary help, Ms Vattem deliberated on how effective co-innovative solutions can generate funds for the longevity of the living lab.

**Dr. Vikrom Mathur**, Director, of Transitions Research was the next to share his experience. He was involved with the project of Panaji ULL, the first of its kind ULL in India. The project catered to themes like Urban Flooding and Water Resilience, Nature-based solutions, Mobility and data-driven governance and planning. He talked about the importance of government will in setting up the living lab. He went on to deliberate on the social and behavioural aspects of the stakeholders involved in the project and how they propelled women's safety issues with the help of NGOs like the Safety Pin.

**Dr. Anita K. Sharma**, Urban Sector Counsellor, Royal Danish Embassy, shared her experiences and talked about the adaptation and adoption of projects under ULL. She emphasised the fact that 'one size fits all' cannot be the regular approach to the living lab, instead contextualising the approach according to its geographical embeddedness will help in the success of pilot testing the use cases. Therefore, it is important for the government to put in regulatory support. She also mentioned the upcoming Varanasi ULL project on clean rivers.

## Takeaway

*The recommendations enable the strengthening of the ULL framework by providing crucial insights into what could be the possible interventions while implementing the framework. Moreover, the implementation of data-driven decision-making would require local-level capacity building among the different stakeholders. The learnings from International Institute of Information Technology, Hyderabad (IIIT-H) and Panaji ULL will act as use cases that can positively influence the implementation of the TCAP project at the national level. These use cases will provide scope for synergies and scaling up capacities at local and national levels. The cross-sectoral learning will go a long way in peer-to-peer learning and knowledge exchange.*





**DAY 2**

# Reflection



Mr. Sarath Babu M G (Lead - Data, Technology and Innovation, Climate Centre for Cities, NIUA), deliberated on the first day of workshop embarked on a journey towards fostering collaboration, innovation, and synergy among cities, representatives from advocacy groups, partner institutions, start-ups, and ICCC solution providers. The workshop aimed to unlock the bonus of collective expertise by bringing together diverse stakeholders to work towards a common goal.

Throughout the day, participants engaged in thought-provoking discussions, interactive sessions and knowledge-sharing activities. The activities allowed to delve into the challenges and opportunities in respective fields, paving the way for collaborative solutions and meaningful partnerships. The deliberative format of the workshop enabled to dive deep into critical topics, examining the current state of the art facilities that effort to build smarter and more sustainable cities.

Esteemed speakers shared their expertise, insights and experiences, shedding light on the integration of technology, data analytics, and risk-informed decision-making in smart city projects. We learned about successful case studies, innovative approaches, and best practices that are driving positive change in the landscape of Indian smart cities. The discussions were both enlightening and inspiring, urging to think creatively and strategically as we tackle the complexities of urban development.

The interactive sessions provided an invaluable platform for participants to share their perspectives, challenges and aspirations. The enthusiasm and commitment of all attendees towards building resilient and future-ready cities is the spirit of such dialogues. The networking opportunities throughout the day allowed for valuable connections to be forged, laying the foundation for potential collaborations and partnerships.

There is unexploited opportunity to translate discussions into action, devising concrete plans that will shape the future of smart city development in India. It is necessary to continue to engage actively, challenge the status quo, and push the boundaries of innovation working towards a collective common vision.

He also expressed his appreciation and enthusiasm to all the participants, speakers and organizers for being the driving force of the themes in discussion and finding time to contribute to the sessions and related interaction.

## Part 3

# Smart Cities & Climate Action

## State of the Art: Risk Informed Decision Making in Nine Indian Cities

City authorities have been building city systems by managing everyday challenges, adapting to evolving technological advancements, and simultaneously, responding to collective public behaviour and aspiration. With the densification of cities and changing environmental patterns, devising and managing data-based, efficient city systems has become a necessity. Technological acclimatisation in the governance system endows the potential to build city-level climate resilience plans. This also brings opportunities to put in place innovative climate adaptation and mitigation strategies.

Moreover, Integrated Command and Control Centres (ICCC) are state-of-the-art hubs that equip every Indian city under the Smart Cities Mission with the ability to drive city-level response and ease the decision-making process. These centres also provide a niche to rapidly build climate resilience strategies. During the COVID-19 pandemic, many of India's cities effectively used their ICCC, which acted as the "brain and nervous system" for city management, as "Emergency War Rooms" for computing city-specific data, coordinating supply of food and medicine, and connecting with citizens. The ICCC's strengthened ground-level actions and data governance capabilities to manage the pandemic. This resulted in the development of the required agility and improved resilience for future crisis management. To institutionalise this transformation, Indian smart cities are now developing institutional coordination mechanisms and data-driven service delivery.

Indian cities have been affected by various climate disasters, affecting the livelihoods and everyday life of citizens. Inhabiting communities have been both at the receiving end, as well as building capacities to negotiate the day-to-day climate-related challenges, between the nexus of multiple social and economic structures. These structures contain strong ties to preparedness and collective recovery from climate disaster(s).

It becomes imperative to understand the existing relationships with city stakeholders and tap into traditional knowledge to negotiate activities and communication systems. Integrating data-driven knowledge for informed actions will help build stronger and more resilient communities. The learnings from the same can be scaled up for achieving healthier cities across India. Including vulnerable communities like fishing communities, slum-dwellers and women, children, elderly and persons with disabilities, in the conversation of building city-level resilience layers is crucial to build inclusive data and decision-making platforms.

This session brought together city representatives to share their experience building capacities of ICCC while gathering data, methods of analysis, constructing channels of stakeholder consultations and creating a more realistic, robust, and conducive environment for local-level resilience.

### Speakers –

1. **Mr. Aditya**, Technical Advisor, Smart Cities Mission
2. **Mr. Sukhbeer Singh**, Consultant, Innovation & Policy, Smart Cities Mission
3. **Mr. Jigar Patel**, Director (IT), Surat Smart City
4. **Mr. Sandeep Malvi**, CEO, Thane Smart City
5. **Mr. Clipson Mathew**, DGM, Cochin Smart Cities Limited
6. **Ms. Sameera**, Operations Manager and **Ms. Swapna Kota**, Programme Officer (SRU), GVMC, Visakhapatnam
7. **Mr. Sarang Modi**, DGM, Ahmedabad Smart City



**8. Mr. Santosh Kr. Tripathi**, CDO, Varanasi

**9. Ms. Christy Leema Rose**, Public Engagement and Partnership's Officer, Chennai Smart City

**10. Mr. Anuj Kumar Malhotra**, General Manager, Srinagar Smart City

**11. Mr. Prashant Bhagat**, GM, Kalyan Dombivili Smart City

The session explored the intersection of smart cities and risk-informed decision-making, particularly in the context of India. City officials and managers from nine cities shared their experiences and challenges in designing ICCC for building city-level resilience. The workshop provided a platform for participants to share their perspectives, challenges, and aspirations enabling translation of knowledge into action.

Each city has implemented various projects using ICCC such as smart LED streetlighting, solar rooftop dashboards, disaster management, smart street lighting, promoting Non-Motorised Transport (NMT), air quality monitoring, flood early warning and decision support system, public bike sharing, electric buses, and tree plantation. Each project provided benefits such as energy and electricity bill savings, CO<sub>2</sub> savings, centralised monitoring and control, and data-driven decision-making, among others. Different cities have established their ICCCs to integrate different functional departments' inputs and provide a single platform for the analysis of city-level information and decision-making. Following is a brief overview –

### 1. Mr. Aditya

Technical Advisor, Smart Cities Mission



He highlighted the significance of the Integrated Command and Control Centres (ICCC), often referred to as the nerve centre of smart cities. These centres are operational in 100 smart cities across more than 10 sectors, focusing on enhancing the quality of life and enabling data-driven decision-making through technology. Mr. Aditya emphasized the substantial investment, approximately 15,000 crores, dedicated to achieving the goals of better governance, data-driven decision-making, efficiency optimization, and integration of various departmental efforts.

The benefits of ICCC implementation are multifaceted, including collaborative governance, optimised operations, enhanced urban service delivery, Standard Operating Procedures (SOP), increased resilience, minimal manual intervention, cross-functional intelligence, and reduced response time. The digital infrastructure integrated with ICCC prioritizes public safety, exemplified by systems such as the Intelligent Traffic Management System (ITMS), Emergency Call Boxes, LED

streetlights, and surveillance cameras.

The ICCC played a pivotal role during the COVID-19 pandemic, acting as a 'COVID War Room' across all 100 smart cities. Its four key functions encompass communication, information, management, and preparedness. Mr. Aditya outlined the characteristics of a sustainable ICCC, including a model Request for Proposal (RFP) for wider participation, a focus on service delivery through Infrastructure Management and Framework (IMAF), Standard Operating Procedures supporting sustainability, and a business plan for financial sustenance and technology scalability. These elements collectively contribute to the effective governance, safety, security, and continual improvement of smart cities in India.

### 2. Mr. Sukhbeer Singh

Consultant, Innovation & Policy, Smart Cities Mission

In his presentation, the City Innovation Exchange (CIX) was elucidated as a crucial initiative addressing the innovation needs of cities, particularly in the realm of deep tech, fostering an incubation ecosystem between innovation suppliers and consumers. The Smart City's procurement strategies were highlighted, focusing on

structured processes such as pilotable solutions, pilot grants, convergent funding, and the scaling of solutions, particularly in the context of Integrated Command and Control Centres (ICCCs) for climate actions.

Ongoing initiatives involve smart procurement practices and ICCC implementation, leveraging internal innovation committees for quicker pilot executions and access to emerging technologies through the CIX platform. Valuable learnings include the importance of openness, expanding innovation capabilities through internal committees, de-risking innovation leadership and financial proof of concepts, thoughtful decision-making regarding making versus buying, and the expansion of peer engagement to catalyse meaningful partnerships. These insights inform future actions for a more effective and collaborative approach to advancing smart city innovations.



**3. Mr. Jigar Patel,**  
Director (IT), Surat Smart City



He elaborated that Surat Urban Observatory focused on its emergency response system for disaster management, aiming to enhance citizens' quality of life and improve various services.

Particularly crucial is the Flood Control Centre at the Integrated Command and Control Centre (ICCC), which provides continuous monitoring of Surat's flood scenario and the upstream Ukai dam. The devastating 2006 flood prompted the city to establish these measures to prevent future losses. The ICCC manages multiple functions, including analyzing water sources, rainfall amounts, reservoir water levels, discharge calculations, IMD forecasting, and relief efforts based on water discharge. During the COVID-19 pandemic, the ICCCs actively managed quarantine through an app, successfully tracking cases. Key benefits of the ICCC include timely information delivery, aiding authorities in making informed decisions, and providing analyzed data

for effective disaster relief planning.

**4. Mr. Sandeep Malvi,**  
CEO, Thane Smart City



The Integrated Command and Control Centre (ICCC) in Thane epitomizes a cutting-edge facility harnessing technology for the comprehensive monitoring and management of city services, spanning transportation, water supply, solid waste management, and public safety. Its primary objective is to enhance the efficiency and effectiveness of these services, ultimately improving the quality of life for Thane's residents. Beyond its core functions, the ICCC in Thane strategically incorporates features and initiatives aimed at mitigating the impacts of climate change, addressing challenges posed by urbanization, urban flooding, air pollution, and biodiversity loss.

Mr. Malvi presented a compelling use case for flood monitoring, detailing key stages such as initiation, where water level sensors in six flood-prone

coastal areas send real-time alerts to disaster management authorities through the ICCC. The subsequent stages involve data collection, analysis, and collaboration with relevant departments. The ICCC plays a pivotal role in flood monitoring and management through real-time data collection, flood hazard mapping, decision support systems, and public awareness initiatives.

To combat air quality issues, the Thane Municipal Corporation has implemented measures including mist spray fountains and an enhanced air monitoring mechanism. Notably, these efforts have yielded positive results, with sensors providing early forecasts of flooding and waterlogging, enabling timely warnings to disaster managers when forecasted values exceed threshold limits. All data is communicated through an IoT platform and meticulously analysed at the ICCC.

The city's Air Quality Index (AQI) has shown substantial improvement, declining from 126 in 2017 to 111 in 2023. This positive trend not only reflects the success of implemented measures but also identifies potential climate actions and future opportunities for further enhancements.

Collaboration has been a cornerstone of Thane's approach, involving climate scientists, experts, private sector partners, and extensive research initiatives. The city has fostered collaboration with community groups, international organizations, and local entities such as citizen forums, educational institutions, and NGOs. This collaborative effort aims to promote best practices in energy conservation, encourage the use of public transport for daily commuting, advocate for water conservation, and implement effective waste management strategies. The multifaceted approach showcases Thane's commitment to holistic urban development, resilience against climate challenges, and sustainable practices for the benefit of its citizens.

**5. Mr. Clipson Mathew,**  
DGM, Cochin Smart Cities Limited

The talk centred around the pivotal role of the Integrated Command and Control Centre (ICCC) as the central hub for a smart city, integrating diverse smart solutions onto a unified platform for centralized monitoring and control. The Indian Cybercrime Coordination Centre (I4C) comprises four components, namely the Control Room, Command and Control Center Application, Geographical Information System (GIS) Application, and Centralized Grievance Redressal Application, supported by a Citizen Web Portal and Mobile Application. The ICCC's capabilities include increasing situational awareness, standardizing response protocols, fostering collaboration across departments, enabling data-driven decision-making, and engaging field support staff to address civic issues and citizen grievances.



Mr. Mathew elaborated on three projects:

**Smart LED Streetlighting Dashboards:** This project aimed at converting sodium vapour lamps to LED, resulting in an expected energy saving of 41% and electricity bill savings of 53%. Streetlight availability surpassed 98%, and the initiative contributed to approximately 166 tons of CO2 savings annually.

**IC4 Solar Rooftop Dashboard:** The solar rooftop project achieved significant energy bill savings, amounting to 1.73 million units for public buildings, and a CO2 savings of about 1300 tons to date.

**COVID War Room and Monsoon Relief Camp Monitoring:** The application developed for monsoon relief camps served as a centralized repository of data on affected citizens, enhancing disaster management by aiding in the assessment of relief camp requirements, transportation planning, and the distribution of essential commodities based on historical data.

Additionally, the talk highlighted various climate initiatives, including the promotion of Non-Motorized Transport (NMT) in the Smart City's Area-Based Development (ABD) region, adherence to Indian Green Building Council (IGBC) standards in the Ernakulam market project, the creation of 4 km of cycle tracks along smart roads, and the distribution of colour-coded waste bins to encourage waste segregation among citizens. The multifaceted projects underscored the ICCC's commitment to sustainability, energy efficiency, and leveraging technology for efficient disaster management and citizen services in the smart city.

**6. Ms. Sameera, Operations Manager, and**  
**Ms. Swapna Kota, Programme Officer, Sustainability & Resilience Unit (SRU)**

The presentation emphasized the Disaster Management Integrated Command and Control Centre (ICCC) in Visakhapatnam, outlining its mission to establish a resilient city planning strategy in the face of various potential disasters, including cyclones, heatwaves, earthquakes, urban floods, and tsunamis. Notably, Visakhapatnam's ICCC stands as a pioneer, achieving ISO 27001 certification for Information Security Management Systems (ISMS), marking a significant milestone in ensuring data security. The ICCC infrastructure encompasses an emergency response centre, Internet of Things (IoT)-based waste bins, 350 GPS units, sensors, 360-degree pan cameras, waste-collecting vehicles facilitating



segregated waste collection, and transfers to waste-to-energy stations. Integrated across multiple sectors, these technologies contribute to surveillance, disaster management, solid waste management, smart street lighting, public announcement systems, emergency call boxes, bus transport systems, and revenue collection, among other functions.

During the COVID-19 pandemic, the ICCC played a crucial role as a response centre, managing an end-to-end flow of information and assisting medical teams. The centre's activities are evolving to encompass cyclone-level hazards, expanding its capabilities in communication and response during such events.

The preparedness phase involves proactive measures such as removing hoardings at major junctions, clearing drain choke points, tree pruning, providing essential amenities at relief camps, draining water from low-lying areas, and prioritizing the removal of fallen trees.

Additionally, the ICCC explores avenues of innovation, collaborating with expert agencies to implement Variable Messaging Display (VMD) Boards for citizen sensitization, utilizing ANPR (Automatic Number Plate Recognition) and RLVD (Red Light Violation Detection) cameras for traffic management, implementing volumetric-based semi-underground bins, and exploring other possibilities.

The Visakhapatnam ICCC's multifaceted approach not only ensures efficient disaster management but also actively contributes to smart city

functions, embracing technology and innovation to enhance public services and urban resilience. The achievement of ISO 27001 certification underscores the commitment to robust information security management, reinforcing the centre's role as a pioneering force in the field.



## 7. Mr. Sarang Modi, DGM, Ahmedabad Smart City

The ICCC in Ahmedabad has spearheaded numerous successful projects across various sectors, including education, health, urban mobility, and citizen safety. Key projects include the implementation of Intelligent Traffic Management System (ITMS) and Automatic Fare Collection System (AFCS), the introduction of Janmitra—a universal card payment system, the establishment of a water network governed by the Supervisory Control and Data Acquisition (SCADA) system, the initiation of Public Bike Sharing (PBS), and the implementation of a citizen complaint and grievance redressal system.

The ICCC has played a pivotal role in flood early warning and decision support systems by creating a temporal database related to waterlogging and flood information. This involves the identification and mapping of waterlogging spots based on past events and topographical datasets, contributing to the development of a scenario-based web application. The integration of the water, sewer, and stormwater drainage network has further enhanced the city's resilience.

The promotion of Non-Motorized Transport (NMT), Public Bike Sharing (PBS), and electric buses aligns with the city's commitment to environmental sustainability. The ICCC's coordination with smart street lights has resulted in significant energy savings—proactively maintaining and utilizing street lights based on technology-based alerts. The Retrofit Smart Lighting Solution, built on the Low Power Wide Area Networking (LoRaWAN) protocol, has been a pioneering effort, achieving a remarkable reduction in operational and maintenance costs.

Additionally, the 'Mission Million Tree Plantation' initiative reflects Ahmedabad's commitment to green urban spaces. Environmental sensors and ICCC analysis identify hotspots for tree plantation, contributing to the city's goal of planting over a million trees annually. The forthcoming geotagging of trees will establish a comprehensive tree census, allowing the city to monitor and maintain the health of newly planted trees efficiently.

Ahmedabad's ICCC has been instrumental in driving transformative projects, leveraging technology to enhance urban services, address environmental challenges, and contribute to the city's sustainable development goals.



**8. Mr. Santosh Kr. Tripathi,**  
CDO, Varanasi

The development of the Kashi Integrated Command and Control Centre (KICCC) is rooted in the collaborative integration of various functional departments in Varanasi, such as Varanasi Nagar Nigam, Traffic Police, E-Governance, IT, City Surveillance, and the Electrical Department.

The primary goal is to assimilate and analyse inputs from these departments on a unified platform, providing comprehensive city-level information for effective decision-making. Key challenges addressed by the centre include flooding, poor air quality, and the reduction of carbon footprints

To combat flooding, the KICCC focuses on addressing breaching at various levels, submergence of *ghats* and buildings, and other flood-related damages. For air quality monitoring, the centre processes Climate Action Ambient Air Quality Monitoring plans for integrated ground action. An action plan for controlling air pollution in Varanasi has been devised, enabling accurate measurement of ambient conditions, including particulate matter, temperature, air and noise pollution, and humidity. The centre emphasizes the provision of real-time information to both citizens and administration, facilitating prompt actions during daily activities and climatic events to enhance resilience.

Varanasi Smart City has pioneered crowd-sourcing digital applications for pollution mapping, solid waste management (SWM), and traffic management. These applications are hosted on the Kashi-Geo Hub portal, enabling effective citizen engagement and participation. Additionally, the city earned carbon credits for its innovative initiative of converting cow dung into biogas.

In summary, the KICCC in Varanasi serves as a pivotal hub for data assimilation, analysis, and decision-making across various city departments, contributing to the city's resilience in the face of challenges related to flooding, air quality, and carbon emissions. The integration of innovative digital solutions further enhances citizen involvement and sustainable practices.



**9. Ms. Christy Leema Rose,**  
Public Engagement and Partnership's Officer, Chennai Smart City



Chennai's Central Operating Centre has been a cornerstone in the successful execution of a diverse array of urban development initiatives. These include the implementation of smart bikes, pedestrian plazas, cycle tracks, vertical gardens, walking paths, and the restoration of 210 water bodies, some ingeniously transformed into amusement parks. The ICC stands out as a technological hub, boasting 50 smart poles, 55 flood sensor cameras, and cutting-edge flood monitoring capabilities.

During the challenging times of the COVID-19 pandemic, the ICC seamlessly transformed into a war room, developing a specialized monitoring application tailored for COVID-19 patients. The mobile ICC played a pivotal role in monitoring urban flooding, executing comprehensive risk analyses, disseminating crucial information, collecting valuable citizen feedback, and timely announcements via social media platforms.

In the domain of disaster management, the ICC exhibited proactive monitoring by keeping a real-time check on bin overflow, street littering, and the operational status of solid waste processing centres. This capability enabled the prompt execution of preventive actions to tackle potential challenges.

The multifaceted capabilities of the ICC underscore its pivotal role in advancing urban resilience. By ensuring efficient response mechanisms across various aspects of urban governance, the ICC significantly contributes to the city's adaptability and preparedness. The successful amalgamation of technology-driven solutions and proactive monitoring positions the ICC as a vital asset in the continuous improvement and sustainable development of Chennai's urban landscape.

**10. Mr. Anuj Kumar Malhotra,**  
General Manager, Srinagar Smart City

Its operation involves processing data gathered from diverse field devices and sources, and facilitating coordinated responses with relevant stakeholders. In Srinagar, a comprehensive digital system has been introduced, consolidating multiple city services into a single app for streamlined citizen access.



Srinagar faces persistent challenges, notably the recurrent flooding caused by the overflowing Jhelum River, prompting the need for effective flood management. Additional concerns include noise pollution and water pollution. To tackle these challenges, the city has embraced climate actions, employing technologies like the Automatic Water Level Recorder (AWLR), Automatic Rainwater Recorders, and initiatives such as the relocation of the Economically Weaker Section (EWS). Furthermore, the implementation of the Water Quality Monitoring System and Noise Quality Monitoring System has played a pivotal role in addressing pollution and noise-related issues.

The outcomes of these climate actions are noteworthy:  
**Effective Flood Management:** Timely alerts about potential flood and avalanche events have been instrumental in saving human lives and safeguarding livestock. Recent instances in Anantnag saw proactive evacuation efforts based on flood warnings.

**Water Quality Monitoring System:** The system has empowered the Public Health and Engineering (PHE) department to control pollution, ensuring the delivery of safe and potable water to the public through regular monitoring of critical parameters.

**Noise Control:** The Noise Quality Monitoring System has facilitated agencies responsible for noise pollution control, directly benefiting the general public by addressing and mitigating noise-related concerns.

These results underscore the pivotal role played by the ICCC in Srinagar, leveraging technology and climate-oriented measures to enhance city resilience, ensure public safety, and promote the sustainable management of natural resources.

**11. Mr. Prashant Bhagat,**  
GM, Kalyan Dombivili Smart City

The Integrated Command and Control Centre (ICCC) serves as a linchpin in the operational management of municipal governments and various city-level services. By processing data from diverse field devices, the ICCC not only facilitates an integrated response through coordinated stakeholder engagement but also generates valuable insights for city administration. The city faces multifaceted challenges, including flooding, climate change, traffic congestion, and waste management, prompting a comprehensive climate action approach.

Climate action initiatives encompass flood monitoring, environmental monitoring, mapping, traffic management, and garbage monitoring. Environmental sensors play a crucial role in providing data on environmental conditions, aiding authorities in identifying areas where environmental factors impact human health and ecosystems. This data forms the basis for strategies aimed at reducing emissions and pollution levels, contributing significantly to climate change mitigation.

While CCTV surveillance systems may not directly mitigate climate change, they indirectly contribute by synchronising actions for reduced energy consumption, monitoring pollution, managing traffic, detecting environmental crimes, and more. The ICCC emerges as a pivotal tool for climate change mitigation, offering centralised monitoring and control over energy consumption, environmental factors, disaster response, and transportation management. Through these coordinated efforts, the ICCC plays a vital role in fostering sustainability, resilience, and effective governance in the face of urban challenges.



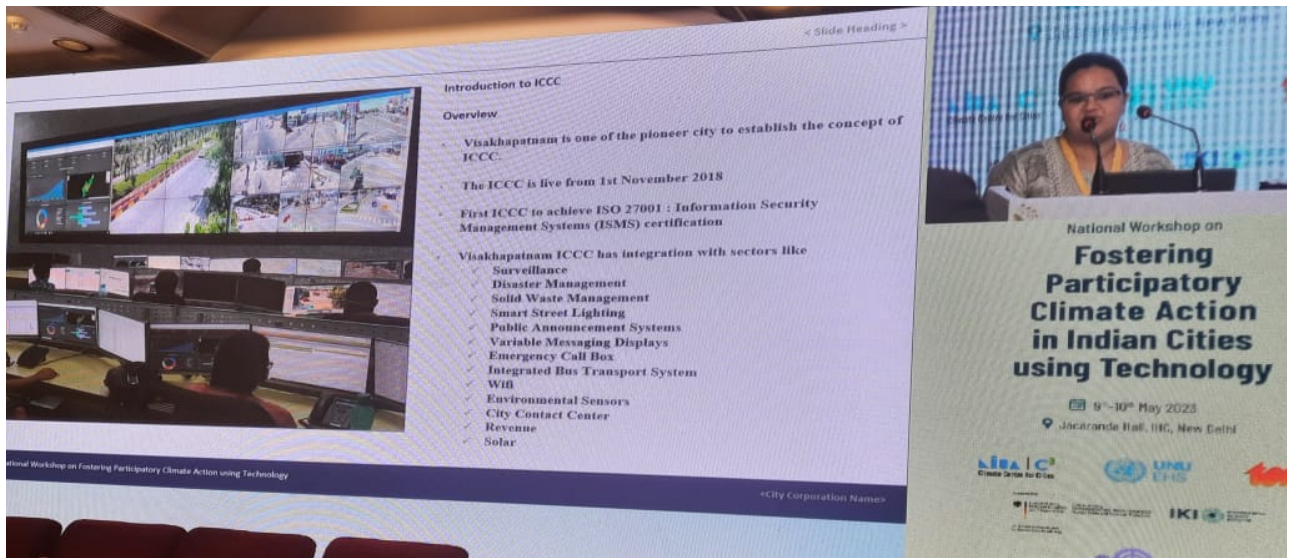
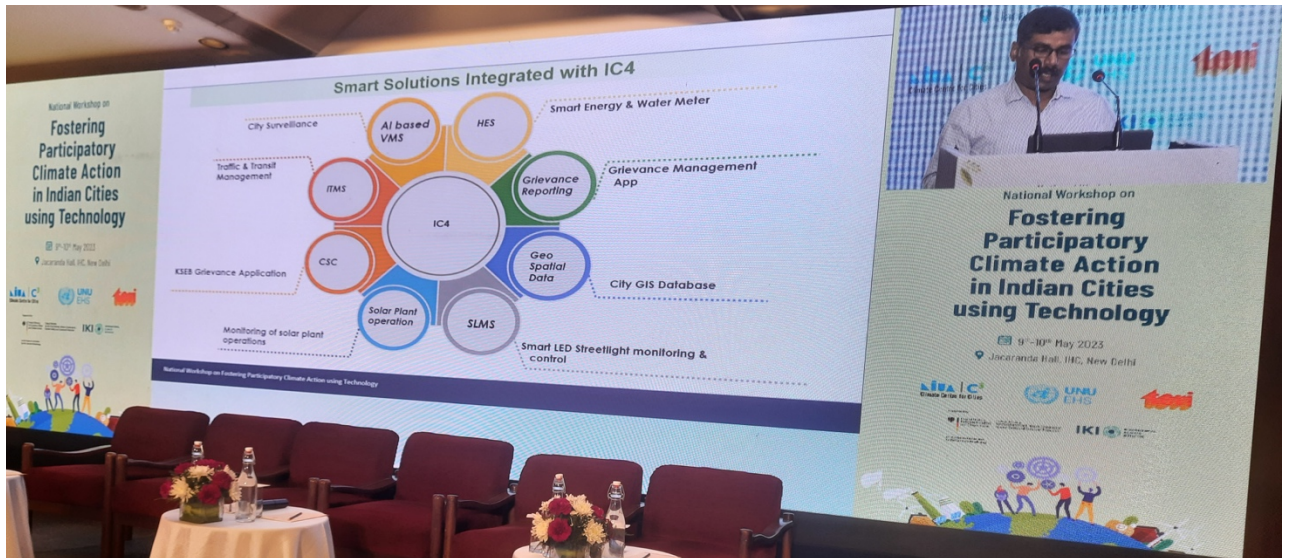
## Takeaway

These recommendations on technology based climate actions have provided a broad perspective on interventions possible to support the implementation of the ULL and promote active, efficient and effective support through the ICCC. The city officials discussed and presented various initiatives and solutions that have adopted a participatory approach for assisting climate actions. They focused on the Emergency Control Centres and the use cases of the ICCC to showcase the involvement of the citizens and the authorities towards preparedness and developing mitigative measures. It also showcases the live and ongoing experiences of local governments and other stakeholders in implementation of climate action in different sectors. These solutions shared by different cities will be duly considered while co-creating solutions in Visakhapatnam.

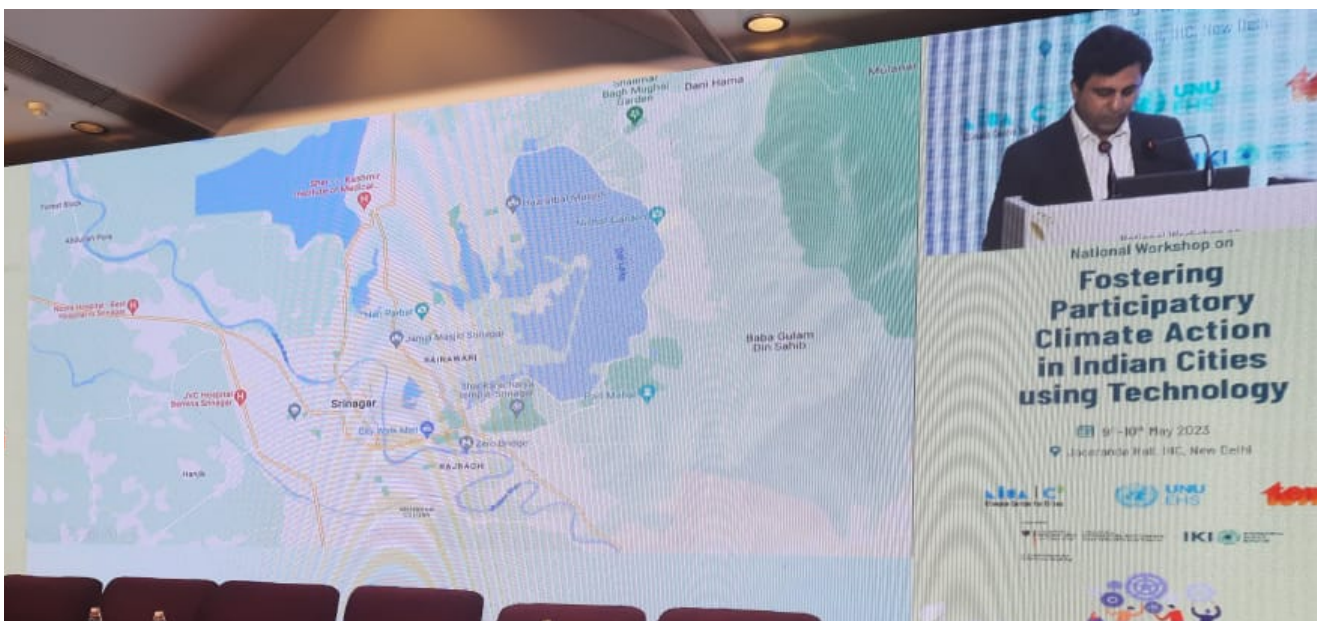
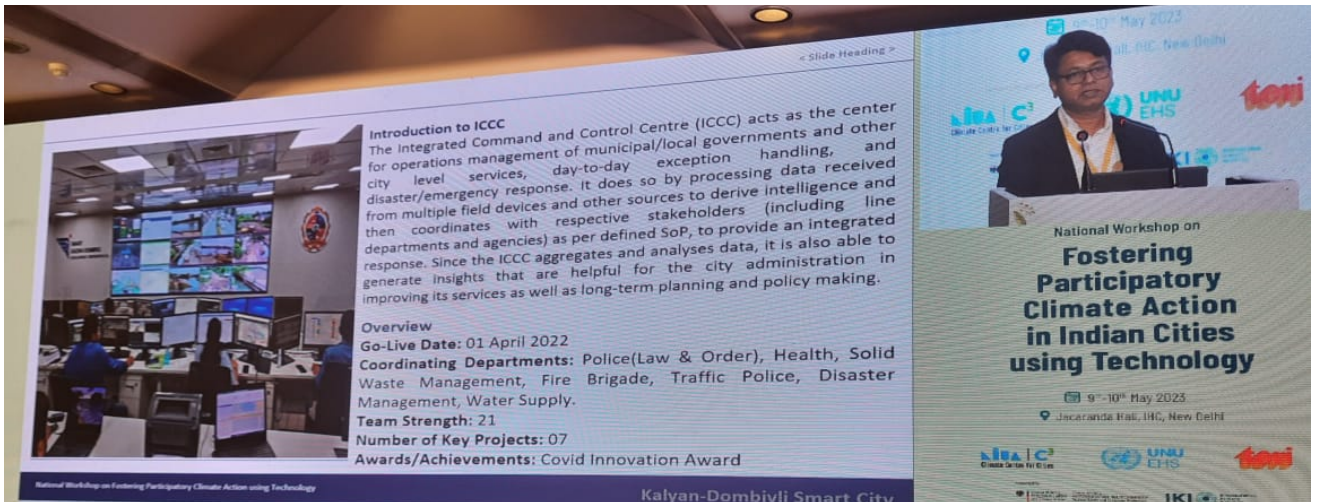
The series of presentations showcased speakers introducing key features of their respective Integrated Command and Control Centres (ICCC), outlining specific objectives for advanced systems managing sanitation, traffic, emergency response, and city service database development. The session also delved into the potential introduction of additional monitoring and management systems. The discussions involved city representatives collaborating with experts, researchers, and innovators to brainstorm solutions for various urban challenges, reflecting a comprehensive exploration of cutting-edge technologies and strategies to enhance city-level services and management.









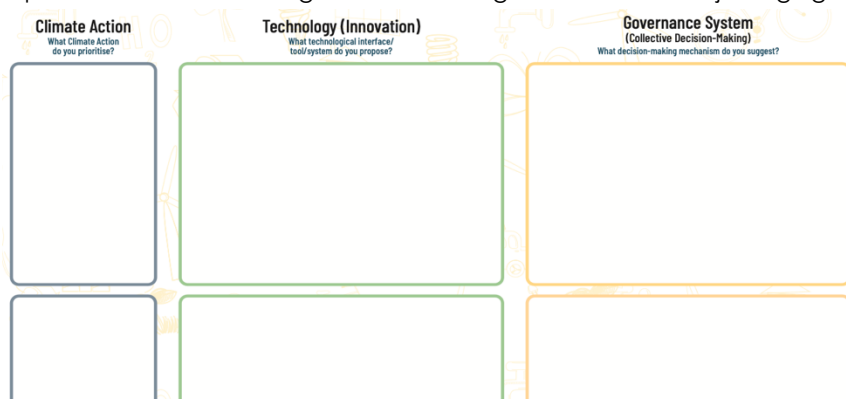


## Interactive Exercise Insights: Climate Action & Leveraging Digital Solutions

Climate actions are essential to mitigate the impacts of climate change and promote sustainable development. Adopting a climate-resilient approach at community and administrative levels helps reduce greenhouse gas emissions, promote renewable energy, improve energy efficiency, reduce deforestation, protect vulnerable communities and ecosystems, promote sustainable development, improve public health, preserve biodiversity, and ensure a sustainable future.

Technology and evidence-based decision-making play a critical role in monitoring, assessing, and evaluating the benefits of climate action in India. The information or data gathered through various sources of remote sensing, satellite imagery, and data analytics aids the identification of potential risks and opportunities associated with climate-action enforcement, tracking the impact, and prioritising areas that require immediate attention. It also helps policymakers make informed decisions, refine interventions, and implement actions that can facilitate early warning and mitigation measures for communities, prepare them for such events, minimise the impact, and support sustainable development.

The interactive exercises were carried out in five teams. Each team had experts from academia, technological start-ups, research organisations and city municipalities or municipal corporations (such as chief execution officer, city data officer or department head). The teams also had climate practitioners, policymakers and representatives from non-governmental organisations. The adjoining figure shows the template in which session



participants prioritised climate actions under five Climate Smart Cities Assessment Framework (CSCAF) themes exploring existing and possible technological solutions as central or subsidiary systems. In the process, the participants were innovating collective decision-making frameworks. The takeaways from the exercise are elaborated in the following pages.

The experiential learning exercise encouraged participants to interact, collectively brainstorm climate strategies, co-create technological solutions, and develop an understanding of a monitoring process in risk-informed decision-making leading to effective governance. The outcome was that the technologies and systemic interventions proposed under policy and physical infrastructure, helped create a robust and efficient climate action framework, providing transparency, accountability, and confidence for implementing climate actions.

### Takeaway

*The recommendations support participatory approach towards achieving climate actions. The table discussions led every stakeholder to think aloud and suggest as many ideas/ technologies/interventions as possible based on their cross-sectoral knowledge. The possible solutions which came up during the discussions can assist in the development of a module or toolkit on 'data-driven participatory climate action planning' for National Urban Learning Platform (NULP). The solutions also provide a database for scaling-up capacities at local and national levels. The climate actions discussed also suit the context of Visakhapatnam, and the solutions aid the development of the ULL. The solutions from the various stakeholders also emphasized that the emergency and Central Operation Centre (COC) must avail data from decentralized sources through a participatory approach, encouraging data transparency and data-sharing at all stages to promote better monitoring through the ICC.*







Fostering Participatory Climate Action using Technology





## PRIMARY THEMES OF DISCUSSION ON 5 TABLES


**A. Urban Planning, Green Cover and Biodiversity (UPGCB)**
**Policy Level Intervention-**

1. **HVRA Hazard, Vulnerability and Risk Assessment (HVRA) for Disaster Management:** GIS-based thematic mapping, community mapping and socio-economic mapping as a tool should be used, including data validation, analysis and then compiling Standard Operating Procedures (SOP).
2. **Heat Action Plan:** Drones, remote sensing, thermal mapping and real-time weather data collection can inform development of master plans, local area plans analysing real time simulation and creating avenues for citizen participation.
3. **City Climate Action Plan:** Set targets for reduction in emissions, focusing on climate indices and reliable data collection models through sensors. Incentives based on action plan and resource management can be explored.
4. **Local Area Biodiversity Action Plan:** Neighborhood-level mapping through GIS self-assessment tools for identification and monitoring, and further incorporating the same in city and state level masterplans.
5. **Revision in Bye-Laws:** Development and incorporation of green building codes, heat-sensitive guidelines using 3D model simulation should be undertaken. GIS based interface can facilitate monitoring and integration of Online Building Permission System (OBPS) to ICCCC.

**Physical Infrastructure Intervention-**

1. **Set-Up City level Dashboards:** Capacity building through online and offline training modules by making learning platforms, and automation of processes for effective use of resources and financing. Sensitization and awareness for government officials, integrating Management Information System (MIS) and setting up of city dashboard for carbon emissions.
2. **Early Warning System Infrastructure:** IoT-mobile and community telecom services, facilities for machine learning and derivative learning can be made available, simultaneously, using ICCCC for data collection, monitoring and dissemination of information. (IoT is Internet of Things where all parts make up a larger system function).
3. **Construct Green belts and Greenways:** Geotagging trees, plantation of local species, Normalized Difference Vegetation Index (NDVI) analysis, incentivizing model of monitoring besides forming community monitoring groups must be undertaken.
4. **Conserving Mangroves and Wetlands:** Use radar and remote sensing for mapping coral reefs, wetlands and mangroves. Implement coastal regulations, and monitoring mechanisms through a community task force, regularly.
5. **Conserving water bodies:** Low-cost water quality-quantity assessment sessions should be conducted, and use of automatic robots for cleaning water bodies be encouraged. Conservation plans should include monitoring and implementation using urban design interventions for securing waterbody edges.


**B. Energy & Green Buildings (EGB)**
**Policy Level Intervention-**

1. **Net Metering Policies:** Use of renewable energy should be encouraged by making available opportunities of putting electricity generated by solar panels back into grid (including that at citizen level). Incentives for the same should be provided besides imbibing indigenous energy innovation system at local level.
2. **Clean Energy Action Plans:** City level action plans exist in some parts of U.P., Karnataka, Diu, etc. can be referenced by all other cities and larger region as per context.
3. **Collaboration: Partnerships** with industries is needed for better city research facilities and data collection of solar radiation.
4. **Formulation of Green Building Cells:** Fast-track compliance procedures at municipality level, official's training and capacity-building for green building codes and application should be emphasised.
5. **Incentivizing Trade-off Policies:** Understanding carbon credits and carbon-trading needs to be developed and emission caps needs to be established. For developing sense of accountability for high consumption users, a non-linear energy pricing should be imposed.

**Physical Infrastructure Intervention-**

1. **Retrofitting of Buildings:** Least efficient buildings must be treated and retrofitted after energy audit. Propagation of mechanisms for thermal insulation of buildings by collaborating with industry experts should be undertaken.
2. **Energy Efficient Streetlighting:** It saves energy with need based illumination. It can monitor and control lux levels, not just at city-center but across the city. This needs integrated efforts by government departments.
3. **Promote Compliance:** Strong mechanism to build adherence to bye-laws must be prepared. Assistance at household level through partnership with service-providers should be encouraged and making government offices energy compliant can set good examples.
4. **NMT Infrastructure Development:** Low carbon mobility, safe and comfortable pedestrian paths and cycling networks, electric buses, Electric Vehicle (EV) charging stations can reduce use of fossil fuel in transport.
5. **Renewable Energy Plants:** Installation and management of waste to energy plants should be undertaken. The grid should be connected with Recycle Tracking System (RTS), floating solar parks and wind power plants.

Figure 9 Key points presented by participants on policy and action-based systems-thinking exercise for UPGCB &amp; EGB (Session 7)





### C. Mobility and Air Quality (MAQ)

#### Policy Level Intervention-

1. **Implementing Clean Air Action Plan:** Utilizing sensors to measure air quality for informed decision-making.
2. **EV Readiness Plan:** To assess charging infrastructure, facilitating effective EV routes and related systems.
3. **Certification for Vehicle Manufacturers:** There should be informed formulation and understanding of life-cycle of vehicles, and stringent rules for manufacturers for building sustainable models of manufacturing.
4. **Air Quality Monitoring and Improvement:** Quality data gathering at frequent locations in and around the city informing local policy, and action based on location.
5. **Emission Inventory for Public and Private Vehicles:** Using Automatic Number Plate Recognition (ANPR) systems to develop geographical caps on use of vehicles, and informed networks for commercial and non-commercial movements.

#### Physical Infrastructure Intervention-

1. **ANPR Cameras and Vehicular Density Sensors:** These aid implementation of congestion pricing which would reduce vehicular traffic and emissions. Technology partners should be onboarded for managing the system. This may also assist with transportation re-routing and traffic calming.
2. **Public Transport & Last Mile Connectivity:** Using electric vehicles for mass transportation and non-motorized means for last mile connectivity. Upgradation of public streets, and creation of new infrastructure for walking and cycling will reduce reliance on motor vehicles.
3. **E-buses and Charging Infrastructure:** Making high income groups use e-buses by integrating the mode with route rationalization, and developing EV charging infrastructure at strategic locations.
4. **Smart poles and ICCC Systems:** Monitor air quality and publish data on public platforms to facilitate transparent decision-making. Utilize transport management systems that incorporate Global Positioning System (GPS), traffic cameras, and other monitoring technologies for real time



### D. Water Management

#### Policy Level Intervention-

1. **Demand Management Plan:** Identifying high consumption landuses, integrating with water budgeting can help in building efficient models for future consumption.
2. **Flood Management Plan:** Develop a historical timeline of vulnerable areas, map layers of water-logging zones throughout the season or year and integrating the same with alarm and response system.
3. **Water Resources Management Plan:** Preserve green-blue assets, undertake thorough assessment of age and access of service lines, and regular data monitoring of water quantity as well as quality with regular energy audits of water supply systems.
4. **Groundwater Recharge Plans & Mechanisms:** Understanding traditional Rain Water Harvesting (RWH) which can impact hyperlocal aquifer systems by collating data in hydrological models.
5. **Set-Up Non-Revenue Water (NRW) Cell:** Efficient monitoring systems using sensors, and intelligent modelling techniques to monitor age, coverage, leakages and regular maintenance.
6. **Setting up of Supervisory Control and Data Acquisition (SCADA) System:** Devise greywater monitoring, and proper waste management system by reusing treated wastewater so that stress on freshwater demands are reduced.

#### Physical Infrastructure Intervention-

1. **Set up Central Dashboard:** Integrate monitoring systems with GIS layers mapping crucial infrastructure from real time data generation and geotagging. This can be integrated with monitoring, and communication through (proposed) "Citizen Science" applications. (These apps can be used for gathering data and information by citizens, collectively).
2. **Maintain Water Parks and Squares:** Digital maps of key vulnerable areas assist identification of location of potential sponge areas, contributing to groundwater recharge, and then introducing methods that ease burden on municipal supply.
3. **Smart Water Metering Systems:** Smart monitoring systems identifying land-uses and high water consumption zones can influence further decision-making as per supply and demand.
4. **Introduce Pilots for Reusing Treated Wastewater:** Building efficient infrastructure for treatment and reuse, using indigenous and natural treatment methods, and building capacities of governing bodies, residents and service providers through pilot projects.
5. **Emergency Response System:** Installing Automatic Water Level Recorders (AWLR), water pressure sensors, water flow sensors assist in monitoring as well as identification of hotspots. Emergency Smart Water Monitoring system feeding to addressal mechanisms should be installed.
6. **Citizen Portals & Applications:** Two-way transparent communication channel, (proposed) "Citizen Science" digital application recording water logged and water-scarce areas as mapped by citizens, feeds into hydrological models at central dashboard, thereby effecting overall awareness and decision-making.

Figure 10 : Key points presented by participants on policy and action based systems-thinking exercise for MAQ & Water Management





## E. Waste Management

### Policy Level Intervention-

1. **Banning Single-Use Plastic:** Ban single-use plastic within city. Related policy should aim to reduce plastic waste and encourage adoption of eco-friendly alternatives.
2. **Waste Management Policy and Roadmap:** A city-level waste management policy should be developed, along with a detailed roadmap for the next two decades. This policy would provide a framework for waste management activities, and guide future initiatives.
3. **Complete Waste Management Dashboard:** The dashboard should be backed by e-waste management cell for proper management, monitoring city's efforts, and providing real-time data on waste management activities.
4. **IEC and BCC Programs:** Formulating and implementing Information, Education and Communication (IEC) programs to raise awareness as well as undertaking Behaviour Change Communication (BCC) initiatives to promote waste management practices at schools, colleges and workplaces.
5. **Swatch Mithra Volunteer Network and Champion Awards:** Volunteer network (similar to Anganwadi Asha workers) to engage citizens in waste management activities, champion awards to recognize outstanding contributions from schools, colleges, workplaces, and individuals can be introduced.
6. **Zero Landfill Approach and Alternative Landfill Research:** Adoption of zero-landfill approach, identifying and addressing illegal landfill sites, establishing recycle hubs, and dedicated research and development (R&D) besides involving interdisciplinary committees to adhere to targets.
7. **Coastal City E-Waste Management Cell:** At coastal location, special attention should be given to e-waste management, and introduce trading applications to facilitate e-waste disposal by forming industry consortium to ensure effective coordination in practice.

### Physical Infrastructure Intervention-

1. **Waste Segregation at Source:** Improve waste segregation, by developing validation app for volunteers and city authorities. The application verifies proper segregation by capturing evidence through photographs.
2. **Monitoring Tools & Recovered Material Analysis:** **Artificial Intelligence (AI)**, Machine Language (ML), and camera-based monitoring tools should be utilized to track and analyse recovered materials, assess effectiveness of waste management practices, and identify areas for improvement.
3. **Strict Enforcement and Data Transparency:** Strict enforcement measures should be implemented to discourage collection of unsegregated waste. Data related to waste management activities (including penalties) should be made available on digital platforms for transparency, and collective planning.
4. **Innovative Business Models and Funding Mechanisms:** Explore innovative business models ensuring sustainable funding initiatives. Levying environment improvement charges/fees, encouraging Public Private Partnerships (PPPs) to leverage resources, and expertise in handling specific waste categories should be introduced.
5. **Efficient Transportation and Automated Penalty Systems:** Transportation models incorporating Radio Frequency Identification (RFID), and GPS technology to minimize manual intervention should be mandated to ensure smooth waste collection, and disposal with automated penalty systems to efficiently enforce waste management regulations.
6. **Construction and Demolition (CND) Waste Management:** A digital mobile application and website module should be developed to facilitate collection of CND waste, citizens can request CND waste collection services, and accountability mechanisms for authorized PPP industry players, making the process transparent and participatory.

Figure 11 : Key points presented by participants on policy and action based systems-thinking exercise for Waste Management

The interactive and participatory exercise enabled participants to undergo experiential learning with the ability to:

**Interact** with all participants to understand and prioritize climate actions

**Co-create** to propose technological solutions or monitoring interventions to support climate actions

**Develop** an understanding of how monitoring can assist in risk-informed decision-making and climate governance.





## Interactive Exercise Insights: Partnership, Participation & Co-creation

This session was designed to focus on the participation aspect: how can citizens be involved, especially vulnerable groups? Where could they participate in decision making and how can digital solutions facilitate this? This would allow to build on the prior experiences and aspirations of the participants, towards potential digital solutions that would foster participatory climate action. Through discussions based on different scenarios, the groups deliberated on tools for different scenarios - in terms of what needed to be done, who would do it and what would it take to ensure the viability of the tools discussed. Imagining these desired solutions and processes helped identify existing gaps and points of intervention which will be explored further both in the Urban Living Lab and in the framework being developed.

### *Ways forward on participatory climate action using technology*

- *Multi-stakeholder collaboration through digital means ensuring access and inclusivity*
- *Providing last mile connection that is affordable, reliable and relatable*
- *Putting community at the centre of such actions*
- *Planning for long-term sustainability, acknowledging co-benefits of resource efficiency and holistic and integrated approaches and avoiding maladaptation*



The following figure presents the results of this session under the three scenarios discussed. For each of the discussed scenarios, the grey text represents the identified actors, the blue text lists the climate actions and potential solutions discussed, and the green text highlights the implementation pathways identified.



### Scenario 1 Addressing Urban Heat

#### Daily-Wage Earners, Construction Workers, Rickshaw Pullers-

- Provided with passive cooling mechanism (micro-level),
- Increased tree cover
- Heat responsive public spaces

*Achieved through identification of local practices through technology, applying traditional wisdom*

#### Slums, Residents, Low-Income Groups

- Support through green roofing
- Efficient housing typology, roof, building material
- Provision of basic infrastructure (water supply, sanitation)

*Forming ward level community action and advocacy groups*

**Urban local bodies municipal corporation** (which includes India Meteorological Department (IMD), District Disaster Management Authority (DDMA), Climate Cell, Integrated Command and Control Centre (ICCC))

- Ward level Heat Action Plans
- Conserve green-cover
- Plant local trees, install sprinklers

*Supported through identification of hotspots, collectively, to prioritize interventions at ward level*

#### Builder Associations/Real Estate Groups

- Construct energy efficient buildings,
- Use Paints that reflect less and delay heat indoors
- Use of Permeable and non-reflective surfaces

*Adhere to Building Bye-laws (FAR, built-up ratios, cool roofing etc.)*

#### Citizens

- Awareness regarding climate change
- Understanding carbon emissions
- Adoption of efficient engineering and design components

*Run demonstrative pilots for water recycling, waste recycling, water saving, rainwater harvesting system and urban design elements*

### Scenario 2 Reducing risks from Urban Flooding

Fishing community (men and women), Children in informal settlements, Street-vendors, Informal workers (e.g. domestic helps), Daily wage workers (e.g. rickshaw pullers), Persons with disabilities, Elderly community, First responders, Transport and other essential service providers

- Well designed and appropriately located shelter homes
- Water level markers in public places
- Standard Operating Procedures (SOP) for response during disaster
- Training of community members (apart from first responders) about key documents to safeguard, evacuation procedures
- Designating safe locations for grains and perishable goods, etc.
- Training programs for women Self-Help Groups (SHG) and mock drills
- Awareness among children through school programs
- Timely procurement and distribution of relief material
- Material innovation (permeable pavers etc.)
- Constructing elevated platforms for cattle and other livestock
- Regularly carrying out vulnerability mapping
- Geographic Information System (GIS) mapping of infrastructure with updates regarding damages

- Real-time data for transport management minimizing disruption of services during and post disaster
- Identifying local capacities for preparedness and response
- Employing digital means
  - Citizen digital applications to inform and demand action
  - Crowd-sourced data at community level
  - Humanitarian bots via social media
  - Location-based alerts (amber alerts)
  - Citizen reporting (applications, maps, geotagged images etc.)
  - Community data officers (e.g. Robinhood Army who provided support to elderly etc.)

*Employers to extend support and take responsibility of their workforce (Households to support domestic workers and their families, industries to support the employees), working committees of different actor groups under Corporate Social Responsibility (CSR) initiatives, support SHG, response groups, climate task-forces, etc.*

*'Digital' is just a means and volunteers or some kind of a support system would be required to support the communities to use any proposed digital tools at initial stages, long-term local capacities can be developed, there is a need to develop an 'interface' when thinking about leveraging digital tools and solutions for enhancing participation of vulnerable groups for climate action*

### Scenario 3 Emergency Warning System for All

#### City Authorities/Officials

- Lay and forward SOP with reduced implementation time
- Build emergency infrastructures
- Disseminate information through ICC, IMD, electronic digital media and social media

*Requires inter departmental coordination, advocacy with the concerned department and implementing via preparation of communication plan, capacity building and emergency budget allocation*

#### NGOs, Self-Help Groups (and Influencers)

- Support dissemination of SOP
- Awareness generation
- Social support
- Volunteering mechanism
- Facilitate government officials in implementing SOP

*They can help in social campaigns, and geo mapping of the affected beneficiaries maintaining community ties*

#### Academicians, Entrepreneurs and Capacity Building Organizations

- Assist in Research Study
- Preparing training manuals with higher academic institutions
- Exploring technological solutions

*Ensuring co-creation with public and building networks for research and pilot funding*

#### Health-Care Providers

- Ensure basic health care facilities
- Activate quick response team
- Provide health awareness and training programs
- Integration with data dashboard
- Ensure SOP are followed including coordination with medicines and service providers
- Nudge availability of data dash board, contributing to war rooms and monitoring system through ICC

*The implementation requires emergency fund allocation, data collection, analysis and resource mobilization*

#### Vulnerable Groups

- Access to health-care and basic facilities
- Follow SOP and due cooperation
- Identification of active groups to represent respective vulnerable communities
- Active participation for presenting concerns to government and other stakeholders

*Requires both social and digital media with implementation through Information, Education, Communication (IEC) campaigns, Focus Group Discussions (FGD), representative nomination and community leaders*

Figure 12 : Key points discussed during scenario based interaction (Session 8)



## Takeaway

*The findings from this session support the design thinking of the T-CAP project and indicate prerequisites for an effective participatory climate action. The scenario-based recommendations hold particular significance for T-CAP as all the scenarios discussed are significantly relatable to real life scenarios in Visakhapatnam. The recommendations provided by different groups will be duly considered while co-creating solutions. Heat stress, urban flood and emergency warning systems for all have also surfaced as the key priority areas in Visakhapatnam by different stakeholders. This session also received real life experiences and feedback from different stakeholders residing in varied parts of India that provided a comprehensive overview and practical lessons for the project.*



## Part 4

# Workshop Conclusion

### Reflections

The sessions (as outlined in Annexure – Agenda on pg. 63-64) of the workshop brought out imperative components of 'Climate Action', 'Participation' and 'Digitalization' encompassed by the T-CAP project. This chapter takes into account important aspects of the three primary themes, as experienced and envisioned by professionals from varied fields of expertise.

The sessions presented by officers from the Indian cities brought forward their insights, gaps, and ideas of possible interventions, experienced by them while managing city operations and innovating technical as well as systemic mechanisms. The varied groups of professionals from different walks of life collectively brought forward meaningful discourses, especially, in the interactive sessions. The important aspects of the three interactive sessions are presented in the following table.

	Session 4	Session 7	Session 8
<b>Interaction Frames</b>	Participatory planning opportunity using Digitalization for Climate Action	Interventions for climate resilience using digital and non-digital technology across UPGCB, EGB, MAQ, Water and Waste Management sectors	Identifying vulnerable communities, finding potential partnerships for building climate resilience
<b>Systems in Discussion</b>	Existing Systems in cities	Existing + Proposed Systems in cities	Proposed Systems in cities
<b>Results in terms of</b>	Climate action types and digital tools	Policy and physical infrastructure level sector-based interventions, enabling technologies and institutional structures	Actor groups, partnerships and implementation pathways
<b>Project themes covered</b>	Digitalization, Climate Action, Participation	Governance, Innovation, Climate Action, Participation, Digitalization	Climate Action, Participation, Local Governance, Digitalization
<b>Discussion levels</b>	Government, citizen groups & citizen level actions	Climate action at city and local levels	Community & citizen level climate actions
<b>Primary discussion avenues of participants</b>	<p>a. Modes for public communication are direct public engagement, print media, phone messaging &amp; social media</p> <p>b. Technologies (tech.) are in use for awareness, warning &amp; redressal mechanisms</p> <p>c. Tech. entrepreneurs, NGO, etc. are working with 'real time data' based knowledge management systems with citizen groups</p> <p>d. Multiple examples of mobile and web-based applications, social media, complaint and redressal interfaces are existing tools of communication</p> <p>e. City and/or constituency level integrated dashboard, digital twin creation can aid governance at Urban Local Bodies (ULB)</p> <p>f. Analytical softwares combined with real time and crowdsourced data should enable citizen participation for building climate action and resilience</p> <p>g. Tech-based approach for evidence-based decision-making should be user-friendly, transparent, reliable, accessible for all and builds trust in the longer run</p>	<p>a. Monitoring and management across sectors with centrally integrated dashboard</p> <p>b. Efficient city management systems based on risk-informed inventories with well-defined parameters</p> <p>c. Understand local and regional needs, vulnerability, exposure and threat for reinventing existing management and governance structures</p> <p>d. Amend old and/or add effective policies and bye-laws for participatory climate action using enabling technologies</p> <p>e. Revise industry compliances, certification, banning unsustainable practices as well as incentivising best practices</p> <p>f. Utilize citizen (science) capacity by building citizen portals for transparent two-way communication feeding to central dashboard</p> <p>g. Establish specialized cells for local, city or regional level disaster risk reduction</p> <p>h. Conserve natural and city-level physical infrastructure and strengthen sustainable city practices for service management</p> <p>i. Encourage innovative business models, funding mechanisms and technological collaborations in governance structures</p>	<p>a. Vulnerable communities identified - Low income groups (are directly exposed to natural hazards), daily wage earners, informal settlers, elderly persons, women, children, persons with disability, first responders and essential service providers (transport, fire-fighters, ground response personells, etc.)</p> <p>b. Vulnerability mapping, risk-reduction, rescue and rehabilitation strategies should be formulated for local action</p> <p>c. Macro and micro level physical, social and digital interventions should be identified and tested</p> <p>d. Awareness and community climate action with support from municipality, advocacy groups, academia, entrepreneurs and corporates should be encouraged</p> <p>e. Standard Operating Procedures (SOP) facilitating cooperation and implementation strategies can be created</p> <p>f. Real time data capturing, analysis and communication can be integrated with ICCC for effective resource mobilization</p>

While the sessions were designed with specific objectives, the invaluable discussions throughout the workshop added to the approach of interaction. Under the given premise of problem statements in the three interactive exercises, the discussants proposed new systems with climate actions at varied levels of individual, community, city and state. The themes of collective brainstorming moved beyond the primary lens and included intense conversation on challenges and opportunities that may help formulate effective practices.

All the designed sessions of the workshop experienced a few recurring avenues that were gathered from expert presentations, questions raised by attendees and takeaways from the group-based sessions. The following matrix presents the fundamental points that were inherent to the dialogues. The matrix illustrates basic but larger avenues of strategies with suggested approaches in coloured boxes. To begin with any intervention, the priority should be carefully placed, based on the type of intervention, for e.g. to initiate technology-based collaboration (yellow box in third column and third row), it is primary that people are kept at the centre for the outcome to be contextual and people-centric.

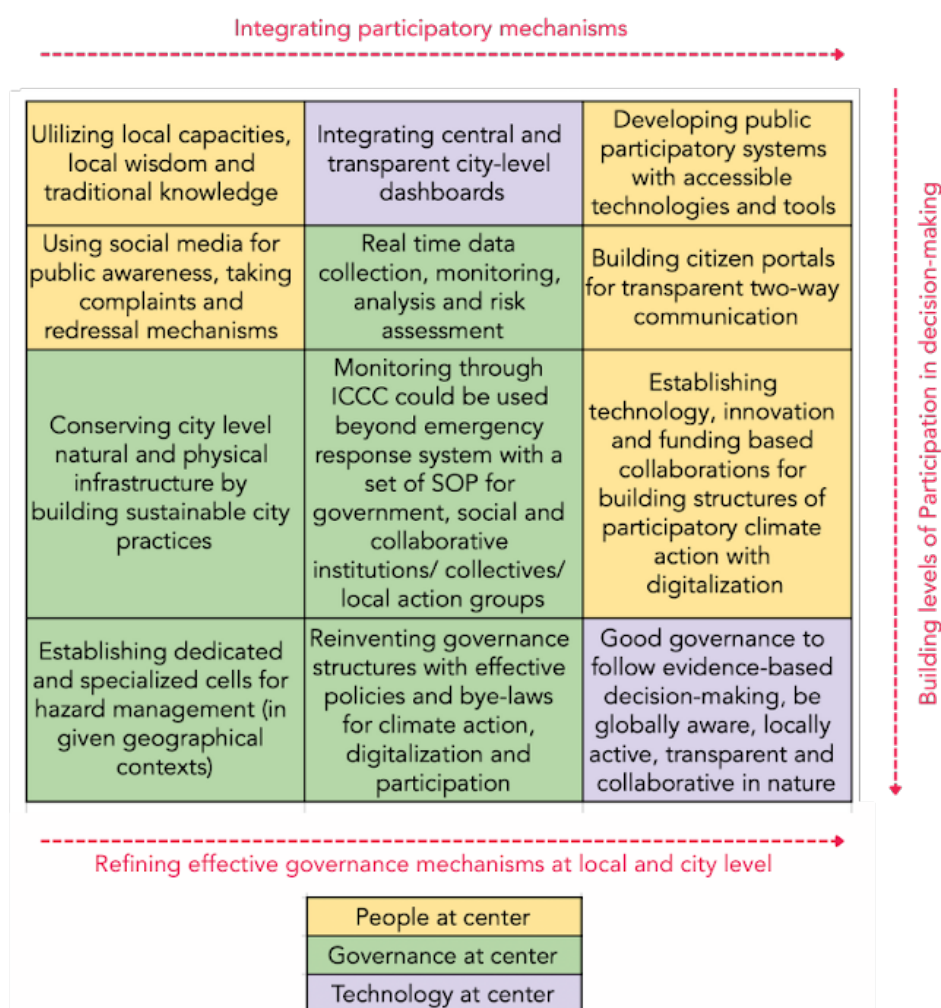


Figure 13 Recurring discussion themes across sessions

The broad learnings from the workshop are organised in the following diagram with key expressions in the existing and aspired domains of practice and discourse. The intervention pathways or approaches are organised in the infographic with the primary themes of climate action, participation and digitalisation. The overlap of any two themes points to a desired approach of intervention that can strengthen the culmination of the same. Naturally, from the perspective of Indian cities, ICCC (established as COC or Urban Observatory in some cities) falls at the cusp of the primary themes for them to be judiciously entailed and enforced. Nonetheless, any transformation in any of the themes will build a higher quality of participatory climate action in an enabled environment using digitalisation technology.



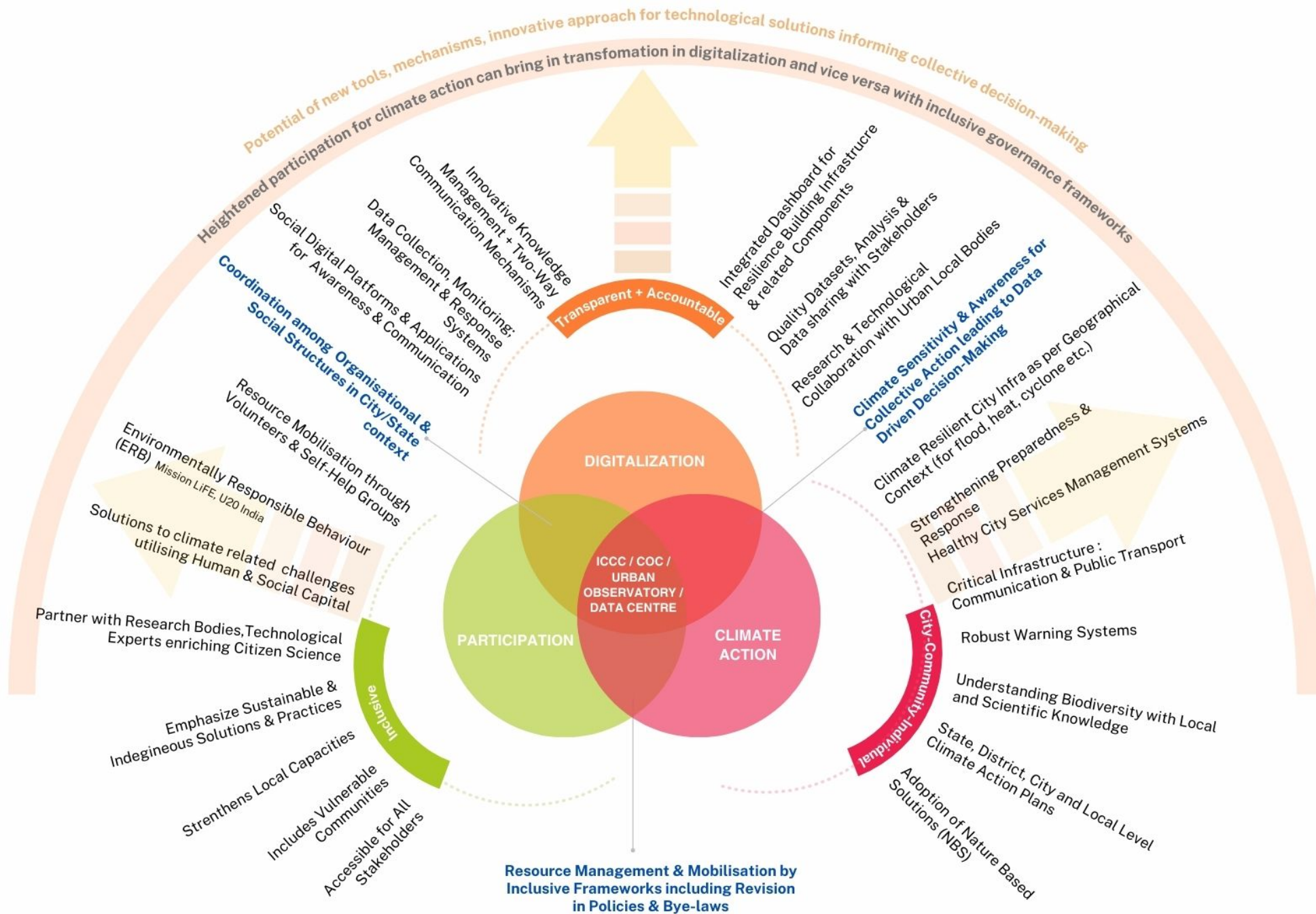


Figure 14 : 'Participatory Climate Action using Digitalization' Avenues for Cities

The essence of the three themes was recounted during the sessions -

**The participation structure has to be inclusive**, taking into account the most vulnerable members of society (elderly, children, persons with disability, low income households, pregnant women, daily wage earners and more). These structures must be just to strengthen the ecosystem of evidence-based decision-making, simultaneously, building platforms of collaboration. The opportunities must exploit technology-based pathways for transparency and accountability for fostering participatory climate policies.

**Climate action should be connected horizontally and vertically**. The structures must function for the city as well as individuals. Digitalisation opportunities bring avenues of enforcing participatory methods for building resilience. Pre, during and post-disaster, resilience-building or recovery actions must percolate at all levels – state, district, city, neighbourhood and residential units, for mitigation as well as adaptive strategies.

**Transparent and accountable digitalisation** systems and subsystems are to be embedded in the digitalised world, supporting individual and collective climate actions. The capacity of the structure could be fairly explored and built upon by re-inventing participatory governance frameworks and devising strategies to build larger but connected efforts for climate resilience.

The national workshop was successful in -

- Bringing stakeholders from different backgrounds together
- Providing a platform for city representative to showcase their state-of-the-art undertakings
- Being the space for participants to co-learn and co-create through interactive exercises
- Introducing the Urban Living Lab approach through case studies
- Initialising avenues for stakeholder collaboration

## Key Takeaways

- **Localisation of Urban Observatories for addressing on-ground climate challenges:** A strong urban observatory at the local level is to cascade down and share the same knowledge, the same investment, and the same technologies, along with the people who are at the local level for addressing the on-ground challenges. It is important that the observatories are decentralised and taken down to that level.
- **Integration of Frontier Technologies and Platforms for Risk-Informed Decision-Making:** Science-based policymaking relies heavily on the availability of standardised, near-real-time data that is AI-compatible, as it has the potential to fuel advancements in climate adaptation and the mitigation of disaster risks in the face of escalating extreme weather occurrences. The integration of data analytics, artificial intelligence and other emerging technologies enables cities to make informed decisions, enhance efficiency, and effectively manage risks.
- **Frameworks for Climate Data Management:** Establishing a Climate Data Governance framework involving stakeholders from various levels, defining roles and coordination mechanisms; implementing standardised protocols for data collection, storage, and sharing across scales and jurisdictions; promoting data accessibility through open policies and user-friendly platforms; developing mechanisms for integrating diverse climate data sources; and investing in capacity building are the significant steps in the foster informed decision-making.
- **Climate Data Governance:** The importance of governance is crucial for catalysing impactful work at the intersection of climate actions. Merely collecting data for the sake of collecting it is not deemed significant. The core lies in how it is governed, managed in terms of technology, and used democratically. This governance aspect plays a crucial role in influencing data sharing. Individuals or entities possessing the data would prefer assurance that a governing mechanism is in place. This mechanism ensures that if data is

shared, it will not be exploited against them but rather provide them with benefits. Achieving this requires the implementation of good governance practices.

- **Fostering Innovation and Challenging Norms:** This can be achieved by incentivising research and development, fostering collaboration among diverse stakeholders, and empowering local communities to actively participate in climate action initiatives. Additionally, challenging existing norms and traditional practices will be crucial for identifying and implementing innovative solutions tailored to the unique climate challenges faced by Indian cities. By embracing innovation and challenging norms, Indian cities can drive transformative change and build resilient, sustainable urban environments for the future.
- **Inspirations from Cities:** Some of the cities are empowered with good instruments, good guidance and good tools that they can work with. Some of them are not ready to embrace technology today but they are ready to embrace what they believe will work for them. Therefore, it is important to identify the instrument, which each city can adapt to. A variety of tools is available but how to use those tools for planning, design and investment is equally important.
- **City-Specific Approaches:** Cities are different at various levels of development and transitions. Each city necessitates a unique set of approaches concerning data and data systems. Key factors in this regard include the bottom-up and top-down aspects of data and innovation, particularly in terms of integration. Leveraging the insights gained from city-to-city connections can assist cities in advancing their urban observatories and achieving higher levels of development.
- **Integration of Local Knowledge, Practices and Capacities:** Local communities possess valuable expertise rooted in their environments and experiences. Local practices offer insights into resource management, adaptation strategies, and mitigation techniques. Empowering communities and building upon their capacities fosters ownership, engagement, and resilience. Integrating local knowledge creates inclusive and impactful climate actions, addressing unique challenges while promoting sustainable development.
- **Participatory Approaches:** Integrating local capacities by tapping into the potential of digital tools and an already connected world is vital for participatory climate actions. The administrative city systems need to be made more visible as well as inclusive. National to local level efforts of bringing local communities and vulnerable sections closer to the city management systems remain crucial in the policy domain that can provide and protect viable on-ground strategies.

# Annexure

## Workshop Snapshot

YouTube Videos for the 2-day workshop could revisited using the following links –

**Day 1** : <https://www.youtube.com/watch?v=bkZYyRkY99U>

Session 1: Inaugural Welcome & Context Setting

Session 2: Ice Breaking Session

Session 3: Impacts of IKI project in India

Session 4: Participatory planning frameworks for data-driven decision making

Session 5: Urban Living Lab



**Day 2** : <https://www.youtube.com/watch?v=ckhIMdFzhy0>

Session 6: State of the Art – Indian Smart Cities and Risk Informed Decision Making

Session 7: Interactive Exercise: Climate Actions and Leveraging Digital Solutions

Session 8: Partnership, Participation and Co-creation

Session 9: Valedictory Session





# Agenda



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## National Workshop on Fostering Participatory Climate Action in Indian Cities using Technology

9<sup>th</sup>-10<sup>th</sup> May 2023 📍 Jacaranda Hall, IHC, New Delhi

Day 1 (May 9, Tuesday)	
9:30 am onwards	<b>Registration</b>
10:15 am to 11:15 am (60 min)	<p><b>Session 1 Inaugural Session: Welcome and Context Setting</b></p> <ul style="list-style-type: none"> <li>Welcome and context setting by Dr Victor Shinde, Head, Climate Centre for Cities National Institute of Urban Affairs (10 mins)</li> <li>Opening address by Dr Himanshu Shekhar, Associate Academic Officer, United Nations University (10 mins)</li> <li>Special Address by Shri Sanjay Seth – Senior Director, The Energy and Resources Institute (10 mins)</li> <li>Video Message by Shri Kunal Kumar IAS, Joint Secretary &amp; Mission Director (SCM), Ministry of Housing &amp; Urban Affairs (10 mins)</li> <li>Special Address by Dr Philipp Ackermann, German Ambassador to India and Bhutan (TBC) (10 mins)</li> <li>Keynote Address by Shri Rahul Kapoor, Joint Secretary, Ministry of Housing &amp; Urban Affairs (10 mins)</li> </ul>
11:15 am to 11:30 am (15 min)	<b>Tea Break</b>
11:30 am to 12:00 pm (30 min)	<p><b>Session 2: Icebreaking Session</b></p> <p><b>Objective:</b> A short ice-breaking session to warm-up participants and encourage conversation amongst them, besides setting a larger context of the workshop</p>
12:00 pm to 1:15 pm (75 min)	<p><b>Session 3: Impacts of IKI project in India</b></p> <p><b>Objective:</b> The session will deliberate on the IKI projects taking leadership in the building on local resilience (Innovation in ensuring inclusive, evidence-based, need-based, data-led, vulnerability-informed climate action planning, decision making and implementation)</p> <p><i>Presentation by Partner Agencies</i></p>
1:15 pm to 2:15 pm (60 min)	<b>Lunch Break</b>
2:15 pm to 4:00 pm (105 min)	<p><b>Session 4: Participatory planning frameworks for data-driven decision making</b></p> <p><b>Objective:</b> The session will deliberate needs, challenges and opportunities for the Participatory planning framework in Indian Cities with focus on non-governmental stakeholders</p> <p><i>Breakout Session</i></p>
4:00 pm to 4:10 pm (10 min)	<b>Tea Break</b>
4:10 pm to 6:00 pm (110 min)	<p><b>Session 5: Urban Living Lab: Towards Co-innovating Solutions for Urban Climate Action</b></p> <p><b>Objective:</b> This session discusses the challenges and opportunities of the Urban Living Lab</p> <p><i>Panel Discussion</i></p>
7:30pm onwards	<b>Networking Dinner (at Habitat Terrace, India Habitat Centre)</b>

Day 2 (May 10, Wednesday)	
9:30 am to 11:30 am (120 min)	<p><b>Session 6: State of the Art – Indian Smart Cities and Risk Informed Decision Making</b>  <b>Objective:</b> The experts will share ‘what worked’, ‘what’s not’ and ‘what challenges’ for designing ICCC for building city-level resilience.</p> <p><i>Moderated presentation by CEO/ CDO of Indian Cities and stakeholder feedback</i></p>
11:30 am to 11:45 am (15 min)	<b>Tea Break</b>
11:45 am to 1:45 pm (120 minutes)	<p><b>Session 7: Interactive Exercise- Climate Actions and Leveraging Digital Solutions</b>  <b>Objective:</b> A participatory experiential learning exercise for participants to interact, collaborate and together develop an understanding of the roles and relevance of different climate actions using technology at cities</p> <p><i>Breakout Session</i></p>
1:45 pm to 2:30 pm (45 min)	<b>Lunch Break</b>
2:30 pm to 4:30 pm (120 min)	<p><b>Session 8: Partnership, Participation and Co-creation</b>  <b>Objective:</b> Moderated breakout session and feedback round on what are the potential partnerships that can help facilitate the outcome of Transformative Climate Action, with focus on Academia &amp; NGO and intake in ULBs</p> <p><i>Breakout Session</i></p>
4:30 pm to 4:45 pm (15 min)	<b>Tea Break</b>
4:45 pm to 5:30 pm (45 min)	<p><b>Session 9: Valedictory Session</b></p> <ul style="list-style-type: none"> <li>• Dr Himanshu Shekhar, Associate Academic Officer, United Nations University (15 mins)</li> <li>• Shri Sanjay Seth – Senior Director, The Energy and Resources Institute (15 mins)</li> <li>• Vote of Thanks – Dr Victor Shinde, Head, Climate Centre for Cities National Institute of Urban Affairs (15 mins)</li> </ul>



## Feedback & Evaluation

As had been introduced The sectoral expertise and thematic distribution covered participants with varied experience, expertise and interests. Following is a brief recap-

57 participants attended the sessions, in various capacities including staff members of partner agencies observing and interacting in the nine sessions of the National Workshop. The adjoining graph shows the gender-based proportions of registered participants who contributed to all the sessions of the workshop.

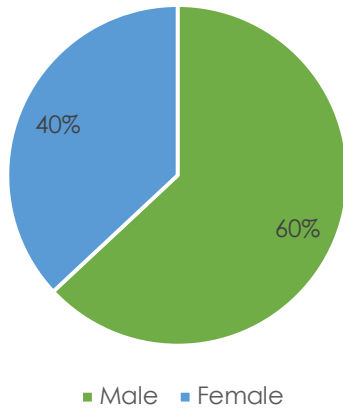
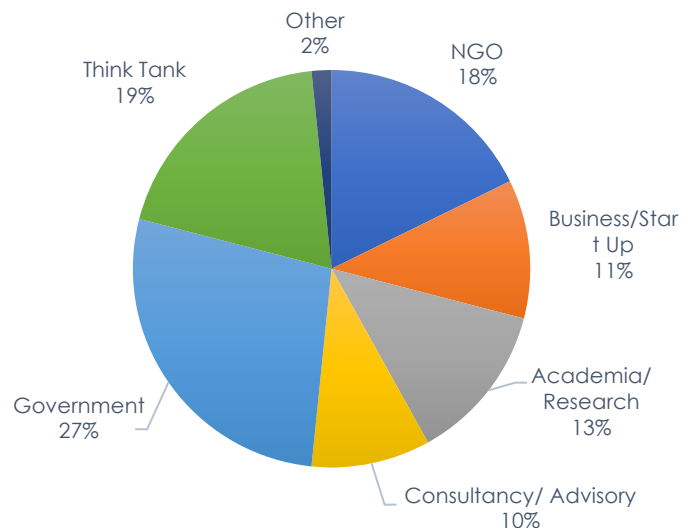


Figure 15 Gender participation proportion (based on registration and feedbacks)

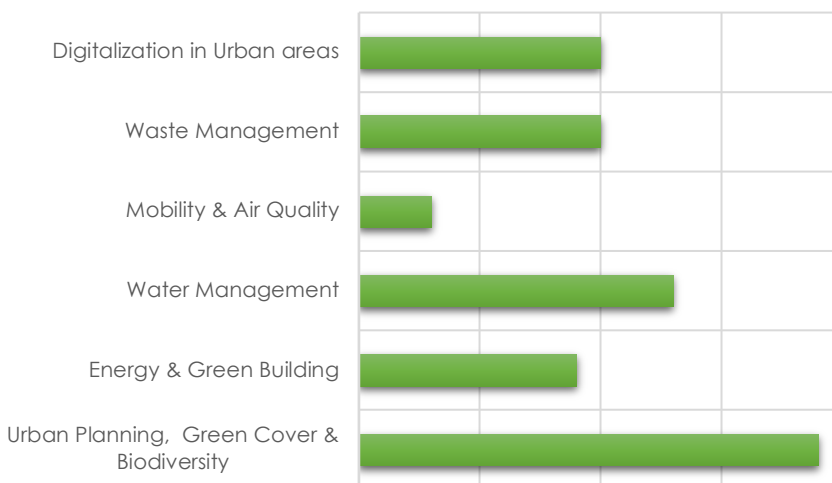
participants who expressed interest in this area.

The highest level of participation was from Government bodies, comprising 27% of the attendees, think tanks followed closely with 19% representation, while NGOs accounted for 18% of the participants. Academia and research institutions constituted 13% of the attendees, whereas businesses/start-ups were represented by 11% of the participating members. Consultancy/advisory service



were 10% of the participants, and the remaining 2% belonged to the 'Others' category. This noteworthy distribution indicates the significant involvement of government officials in the workshop, which in turn facilitated a wider reach and enhanced connectivity during the project's scaling-up phase. The diverse array of organisations brought their respective expertise and knowledge to the various breakout sessions, panel discussions, and presentations, thus enriching the overall workshop.

Based on feedback received via a feedback form shared with all participants analysing sessions and overall development of the workshop, the



following is an overview –

According to the participants' feedback, the interactive sessions were found to be of interest. Further, it was found significant that Session 7's Interactive Exercise on Climate Actions and Leveraging Digital Solutions was appreciated, followed by Session 4 on Participatory Planning Frameworks for Data-Driven Decision Making and Session 8 on Partnership, Participation, and Co-creation.

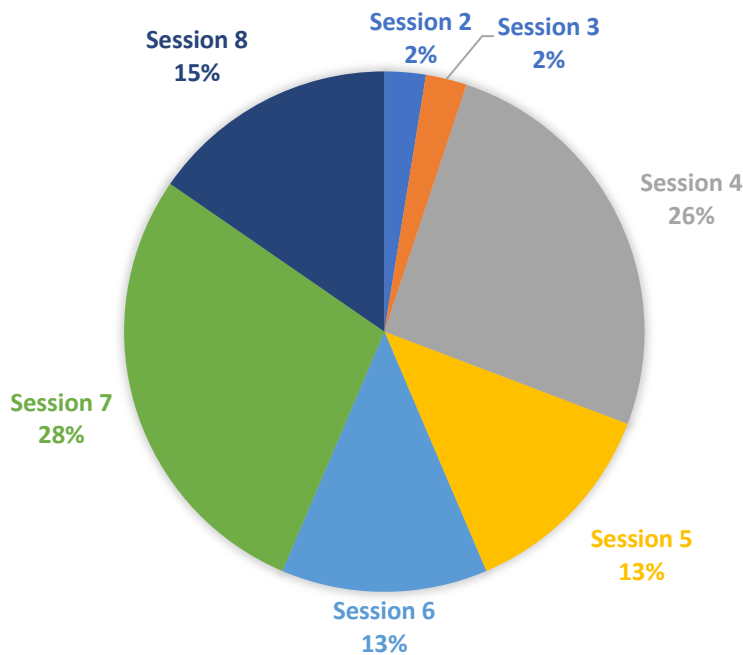


Figure 16 : Feedback Chart 1 – Helpful Sessions for Participants

This assessment further indicates that the interactive sessions were more effective in connecting and engaging the participants compared to the panel discussions or presentations. In Sessions 4, 7 and 8, all participants at each table interacted, collaborated, and generated priority climate actions and technological solutions. These sessions were designed as breakouts to encourage active participation and idea generation.

Detailed feedback was collected from the participants of the National Workshop, encompassing various aspects such as content and methodology, conduct, interest, and workshop arrangements. The

average rating for each category surpassed 4.50, indicating that the workshop was productive and successful. Notably, the highest rating of 4.85 was awarded to the event itself and the overall workshop arrangements. Following closely, the participants expressed a high level of interest in the workshop, with a rating of 4.77. The conduct of interactive sessions and the content and methods employed received a commendable rating of 4.69. Lastly, the participants appreciated the conduct of informative sessions, as well as the content and methodology of the workshop, both of which were rated at 4.62.

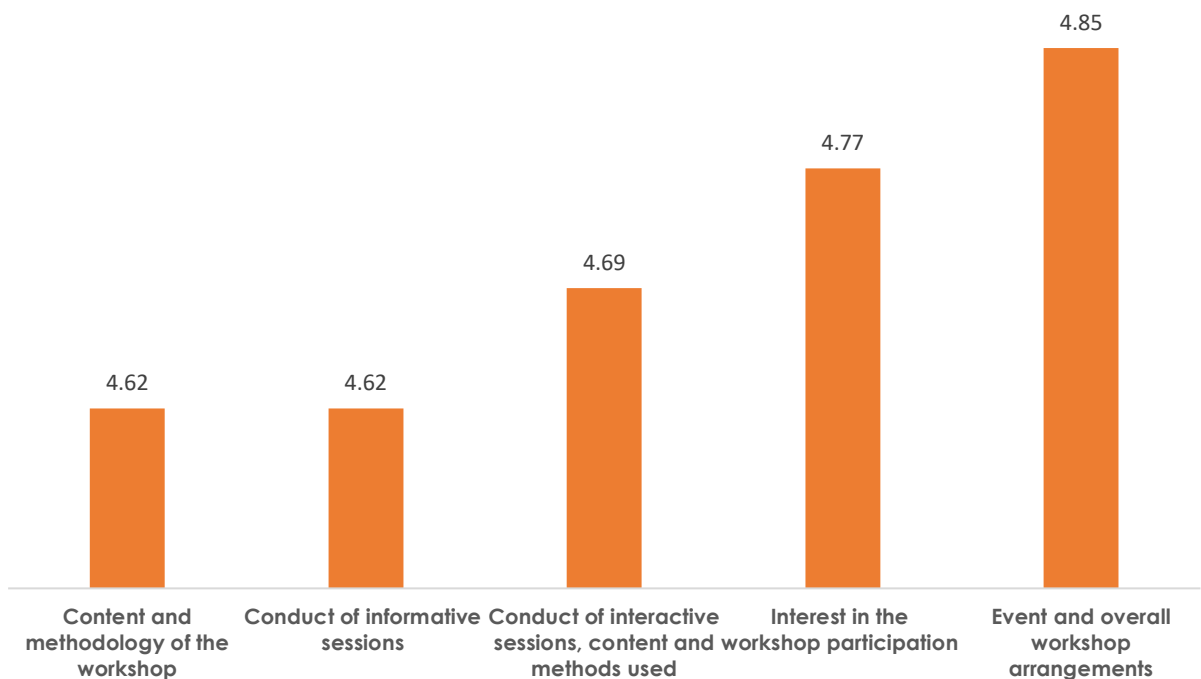


Figure 17 : Feedback Chart 2 – Workshop Conduct Insights



Following is list of organisations of participating representatives –

GIZ India	Grant Thornton Bharat
ICLEI South Asia	Civic Data Lab
IIT Delhi	AccionLAND Pvt. Ltd.
RTI International	Amol Carbons Private Limited
Save the Children	ITV News London
SPA Delhi	Quality Council of India
CEPT Research & Development Foundation (CRDF)	Ernst & Young
GISE hub IIT Bombay	BARIFLO LABS
REVY Environmental Solutions Pvt. Ltd.	Civic Data Lab
CEPT University	INRM Consultants Pvt. Ltd.
Surat Smart City	Thane Smart City
Cochin Smart Cities Limited	Greater Visakhapatnam Municipal Corporation
Ahmedabad Smart City	Varanasi Municipal Corporation
Chennai Smart City	Srinagar Smart City
Pune Smart City	Kalyan Dombivili Smart City

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