GLOBAL HEAT & COOLING FORUM

Solutions for a Warming World

17-18 March 2025
New Delhi, India

Acknowledgments

This event was organized jointly by the Natural Resources Defense Council (NRDC), National Disaster Management Authority (NDMA), Department of Science and Technology (DST) and the World Bank.

We are grateful for the strategic guidance and leadership provided by Dr. Krishna Vatsa (Member, NDMA), Safi Rizvi (Advisor, NDMA), Dr. Anita Gupta (Head of Scientific Divisions, DST), Auguste Tano Kouame (Country Director, World Bank), and Abhas K. Jha (Practice Manager, South Asia Region, World Bank).

We would also like to thank all the panelists and participants who shared their insights and made this event a platform for meaningful dialogue and collaboration.

This event was made possible with financial support from the Resilient Asia Program (RAP) - a World Bank regional trust fund financed by the UK's Climate Action for a Resilient Asia (CARA) program.

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I. Current Context: Extreme Heat Is an Increasingly Urgent Issue.[1]

The world is warming at a pace never seen in human history. 2024 was the hottest year ever recorded globally, beating the previous record set in 2023 (WMO, 2025)[i]. The past decade (2015-2024) has been the warmest on record in India, and India has seen 10 of its hottest years occurring since 2010 (IMD, 2025)[ii]. In several parts of the country, the Wet Bulb Temperature (WBT) – which measures the effects of heat and humidity together – has already reached 32°C (90°F) (Raymond et al., 2020)[iii]. For outdoor workers, most physical labor becomes unsafe above 32°C. Experts warn that the WBT could start to exceed 34°C (93°F) by 2030, as extreme heat events fueled by climate change become more common (McKinsey Global Institute, 2020)[iv].

This is critical because 35°C (95°F) WBT is generally considered to be the physiological limit for humans to adapt to heat stress (Vecellio et al., 2023)[v]. Extreme heat has been responsible for an estimated 489,000 deaths globally each year from 2000 to 2019 (Zhao et al., 2021)[vi]; and 37% of global heat-related mortality has been attributed to climate change (Vicedo-Cabrera et al., 2021)[vii].

Figure 1: A toll booth worker seeking shade under an umbrella during a record-hot 52.3°C day in New Delhi, May 29, 2024 (Credit: Arun Sankar/AFP via Getty Images)

Access to air conditioning (AC) can mean the difference between life and death: globally, an estimated 195,400 heat-related deaths among people aged 65 and older were avoided in 2019, because of access to air conditioning (Romanello et al., 2021)[viii]. Currently, there are an estimated 2 billion AC units globally, which is projected to rise to 5.5 billion by 2050, with India projected to show the most rapid growth rate in AC use (Statista, 2025)[ix]. The number of households in India with room AC is forecasted to grow six-fold in less than twenty years (MoEFCC, 2019)[x]. The absolute increase in global electricity demand in 2024 was the largest ever recorded, and a major contributor was growing demand from electricity-intensive appliances like ACs. High temperatures in 2023 and 2024 also drove energy demand even higher: heat extremes contributed to about half of the global

[1] See NRDC's blog for additional description, available at: https://www.nrdc.org/bio/sameer-kwatra/global-heat-cooling-forum-solutions-warming-world

2023 vs. 2024 increase in greenhouse gas (GHG) emissions, two-thirds of which came from India and China (IEA, 2025)[xi].

Therein lies the Heat-Cooling Paradox: While cooling is critical for survival, skyrocketing growth in cooling-related energy demand, especially from air-conditioning, will exacerbate global warming further if not managed sustainably. Air-conditioning is designed to provide relief from rising temperatures, but when fossil fuels supply electricity, more GHG emissions worsen global warming. In cities, dark surfaces like pavement and building materials absorb incoming sunlight and tend to retain and later re-radiate it. This "Urban Heat Island" (UHI) effect can raise urban temperatures several degrees higher than the surrounding suburbs and increase city electricity consumption. Studies suggest that the UHI increased average annual electricity consumption by 11% across several districts in Delhi; in other global cities like Beijing, the UHI accounts for nearly one-third of the city's total air conditioning electricity consumption (Kumari et al., 2021)[xii]. Furthermore, excessive energy consumption can create surplus waste heat from appliances, increasing local temperatures further (Islam et al., 2024)[xiii].

There are stark inequities in who has access to cooling; rising heatwaves continue to highlight the "Heat Divide" between those who can stay cool and those who cannot. According to a recent analysis of heat-associated risks across 77 countries, an estimated 1.12 billion people among the urban and rural poor are at high risk due to lack of access to cooling. India comprises the largest share, with 309 million people at high risk (SE4ALL, 2023)[xiv]. Up to 75% of India's workers are exposed to extreme heat, especially in jobs such as farming, mining, and construction (McKinsey Global Institute, 2020)[xv]. Extreme heat is projected to cause $2.4 trillion annually in global productivity losses by 2030 (World Economic Forum, 2023)[xvi].

Heat and Cooling Solutions are needed to advance development, health, and security. As extreme heat events become more frequent and more intense, bold and coordinated action is essential to protect public health, bridge the Heat Divide, and foster economic vitality for all. Important steps are already being taken in India: developing and implementing Heat Action Plans that help authorities and communities respond to heatwaves; innovative climate-friendly cooling technologies to reduce GHG emissions; and national vision documents such as the *India Cooling Action Plan* (MoEFCC, 2019)[xvii] to drive action on climate-friendly cooling, and NDMA's *National Guidelines for Preparation of Action Plans* (NDMA, 2019)[xviii] on heatwaves – both launched in 2019. However, existing efforts are often approached in isolation, with governments, industries, and experts on extreme heat and sustainable cooling working in silos – while in the Global South, hundreds of millions are suffering from a sustained lack of access to active cooling.

II. Global Heat & Cooling Forum: Solutions for a Warming World

With global temperatures on the rise, access to cooling is deeply intertwined with resilience to extreme heat. Efforts to supply cooling and reduce heat stress, each useful individually, can be more synergistic and effective when designed together. With the objective of finding long-term, integrated solutions to support heat resilience, heat adaptation, and climate-friendly cooling, the Natural Resources Defense Council (NRDC) partnered with India's National Disaster Management Authority (NDMA), Department of Science & Technology, Government of India, and the World Bank to organize the *Global Heat & Cooling Forum: Solutions for a Warming World* March 17-18, 2025 in New Delhi.

The 2025 Forum convened experts, policymakers, officials from city, state, and national governments, researchers, media, representatives of the financial sector, and other key global and domestic actors in the heat and cooling space. Discussions highlighted how an integrated approach can streamline action to build resilience to extreme heat, and at the same time provide wider access to sustainable cooling. Linked heat-cooling solutions can enhance health, equity, and economic development at local, state, and national scales.

With these pressing issues in mind, the Forum set out to explore how to develop multi-sectoral approaches to the intertwined challenges of extreme heat and access to cooling, in a warming world, via three overarching goals:

- **Identify integrated solutions** for addressing extreme heat and access to cooling;
- **Bridge persistent gaps** in knowledge, governance, finance, and implementation;
- **Foster long-term multi-sectoral collaboration** among government, civil society, industry, and international partners.

The attendees at the Forum were a robust mix of cooling technology entrepreneurs, health and community experts, policymakers, engineers, urban planners, academics, and civil society groups involved in heat resilience and community protection, providing representation from numerous sectors. The presentations, Q&As, and side conversations at the Forum reflected a sense of excitement that these two huge issues—helping build resilience to extreme heat and expanding access to climate-friendly cooling—were being addressed as a single, integrated challenge. The urgency of dealing with the extreme heat crisis was emphasized by numerous speakers, as well as the fact that access to cooling remains starkly inequitable, and that it's imperative that cooling energy sources not contribute further to climate change.

The Six Key Takeaways[1] that emerged from the Forum are:

- Cooling and extreme heat are inextricably interwoven.
- Proactive and coordinated governance is key.
- Climate resilience and cooling solutions must be inclusive, equitable, and targeted toward the most heat vulnerable.
- Solutions for cooling and heat resilience need to be multi-sectoral.
- Innovative financing solutions are crucial.
- Telling stories that link heat and cooling can catalyze action.

Many questions were raised by presenters and attendees. In months to come, the innovative solutions to these questions can delineate a framework of next steps to implement projects linking heat resilience and cooling access. The Forum attendees' newly formed network of heat-cooling experts and advisors could also articulate opportunities and obstacles to project implementation, and strategies for working around those obstacles.

How to make heat-cooling integration a sustained reality? The framework that was suggested is one constructed from multi-sectoral partnerships, with wider coordination of multi-level governance structures, innovative financing tools, and stronger collaboration across different modes of communication on the urgency of coping with the extreme heat crisis. There was concurrence that cooling access is a fundamental right, and it was noted that, "Heat is not a disaster issue, it's a development issue. Government structures must evolve to reflect that." Strategic solutions to cooling with less heating need to prioritize affordable, low-emission cooling that reaches those most at risk.

As one Forum speaker observed, "The rest of the world is looking to India – because India is a leader in thinking and doing to address this [heat] issue."

By assembling and nurturing a network of influential leaders and policy shapers from government, academia, industry, and international organizations, all of whom are invested in the prospect of promoting integrated extreme heat and cooling strategies, NRDC hopes to help:

- Define a strategic vision for implementing integrated heat and cooling solutions;
- Identify research priorities and policy recommendations;
- Establish a framework for continued collaboration among high-level stakeholders.

Tackling extreme heat requires a paradigm shift from fragmented, short-term heat or cooling interventions to more unified, coordinated policies and governance. NRDC and partners led the way a little over a decade ago in India to tackle extreme heat by implementing India's first Heat Action Plan (HAP), using heat preparedness and response actions to protect health and save lives. At the time, this was a paradigm shift toward making extreme heat a public health issue with local solutions. Now, building on those learnings, innovative heat-cooling solutions can be developed and translated into meaningful local action for the most heat-affected populations. Future convenings will consider solutions and questions raised at the Forum and ask, "Where do we think these ideas have merit, could take shape, and be implemented? What would need to happen or be aligned for a pilot project to take place? Or what would additionally need to be in place to make their implementation feasible?"

Carefully designed heat-cooling interventions can actively bridge the Heat Divide and promote more equitable access to cooling and heat resilience. Effective, sustainable cooling must build upon inclusive governance, cross-sector collaboration, and continuous learning, ensuring all solutions uplift vulnerable communities and foster collective resilience to heat exposure. Now, the utmost urgency is needed to make extreme heat everyone's and every sector's issue. The discussions at the inaugural 2025 Global Heat & Cooling Forum provide a foundation on which to build innovations, partnerships, and a community that champions the bold steps needed to tackle extreme heat comprehensively, more forcefully and more equitably.

The Forum highlighted the importance of adapting heat and cooling solutions to local contexts with humility and sensitivity, better responding to local priorities and conditions by improving data systems. The inaugural 2025 gathering illustrated how developing momentum, collaborative action,

and knowledge-sharing among diverse stakeholders can build more sustainable, long-term solutions that integrate the dual challenges of extreme heat and access to cooling -- and lay the foundation for meaningful progress toward the 2026 Global Heat & Cooling Forum.

The following sections of this Synthesis Report will provide more detail on the sessions that took place over two days (17 and 18 March, 2025), including themes that emerged in conversation, key takeaways, important questions, noteworthy quotes, some case studies of integrated heat-cooling responses, and potential next steps. The complete Agenda, including the names and affiliations of our distinguished speakers, panelists, and moderators for each session, can be found in Annex I. In the long-term, the Forum aims to create and nurture a dynamic, collaborative network of stakeholders who envision heat and cooling as interrelated challenges. The 2025 Forum was envisioned as the inaugural convening of an annual gathering of experts and decision-makers determined to play a sustained role in shaping strategies that protect heat-vulnerable communities, deliver cooling access in more equitable ways, and ensure a more heat-resilient future for us all.

III. Reporting from the Forum's Sessions

Day 1, Session 1: Inaugural - The Urgency of Integrated Heat and Cooling Solutions

The inaugural Forum session emphasized the need for integrated, multi-sectoral solutions to address extreme heat and cooling challenges, in part as a collective response to the record-breaking heat years of 2023 and 2024-- and climate projections suggest intensifying heat trends in future.

The Heat Divide was highlighted, but also stressing that cooling access is a necessity, not a luxury, particularly for vulnerable populations. Passive and active cooling strategies were discussed, including urban greening, traditional architecture, ventilation, and energy-efficient cooling technologies. The localization of Heat Action Plans (HAPs) was emphasized, ensuring they are implemented effectively and with relevant local details, rather than remaining as high-level policy documents. The Telangana government shared its statewide greening and energy efficiency efforts, including mandating the Energy Conservation Building Code (ECBC) and allocating 10% of the budget for environmental initiatives – a shining example of combined financing and governance in service of resilience. It was stressed that rural India is both the most impacted by heat in India, and key to solutions. Speakers highlighted that 30 million climate-resilient homes were built under PM Awaas Yojna, the SHIELD project's focus on disaster-resilient rural housing, and flagship programs like MGNREGA, Jal Jeevan Mission, and Amrit Sarovar – all strategies that enhance climate adaptation through infrastructure, water security, and shade plantations. The PM Suryaghar Yojana's solar panel subsidies were noted as a way to empower rural households with self-reliant cooling solutions. The session concluded with a call for greater policy integration, financing, and knowledge-sharing to scale climate-resilient cooling interventions.

Figure 2: Inaugural panelists, Global Heat & Cooling Forum 2025 (source: NRDC)

Key Takeaways from Session 1.1:

1. **Heat is a governance and development issue, not just a disaster response challenge.** Heatwaves are often treated as short-term emergencies rather than structural challenges requiring year-round planning. Integrating heat mitigation into urban planning, housing, and public health policies is essential for long-term resilience.
2. **Most Heat Action Plans (HAPs) remain reactive rather than proactive due to governance gaps.** Local governments often lack the technical expertise, political push, and inter-departmental coordination needed for long-term heat mitigation. While 69% of cities report adequate funding, much of it is spent on short-term measures rather than systemic solutions.
3. **Localized, data-driven strategies must complement national plans.** State and city-level HAPs must be tailored to local heat conditions, integrating real-time data, early warning systems, and vulnerability mapping. Many plans lack specificity, failing to provide clear actions for municipal bodies. A legal mandate for heat governance would help institutionalize long-term solutions.
4. **Multisectoral engagement, including the private sector, is key to sustainable cooling solutions**. Most workers exposed to extreme heat are employed in the private sector, yet businesses remain largely absent from heat mitigation efforts. Engaging industries, particularly construction and manufacturing, is critical to ensuring worker safety and energy-efficient cooling adoption.
5. **Civil society and local community involvement enhances governance effectiveness.** Effective heat resilience requires decentralized planning, community participation, and behavioral shifts. Schools, health centers, and local networks should play a greater role in heat preparedness, while civil society partnerships can bridge gaps in governance and implementation.

> ***"Cooling has become a fundamental right. We need affordable and sustainable cooling solutions for all."***

Day 1, Session 2: The Heat-Cooling Paradox – Science, Gaps, and Urgency

This session explored the scientific complexities of extreme heat, highlighting that heat is the deadliest climate disaster and that cooling demand will surge globally, with India expected to have the highest need by 2030. Sustainable cooling solutions were emphasized, including passive cooling, refrigerant phase-out, energy efficiency improvements, and decarbonization of electricity grids.

The discussion highlighted the rising intensity, frequency, and geographic spread of heatwaves, stressing the need for a dedicated heat research and data centre in India. The effectiveness of HAPs was discussed, with a focus on governance structures, sector-specific early warning systems, and stronger cross-sector coordination to ensure heat adaptation is implemented effectively. The need for urban heat island (UHI) mitigation was emphasized, but challenges were noted in integrating green spaces in high-density areas. Sector-specific early warning systems were highlighted as essential for hospitals, schools, and other high-risk areas**,** ensuring that timely interventions are in place to protect vulnerable populations. The session concluded by stressing that heat adaptation should not be a seasonal effort but embedded into year-round policies through data-driven, locally contextualized solutions.

Figure 3: Manish Bapna, President and CEO, NRDC, in conversation with Dr Radhika Khosla at the Global Heat and Cooling Forum. (source: NRDC)

Key Takeaways from Session 1.2:

1. **Extreme heat is the deadliest but least visible climate hazard, requiring urgent global action.** Unlike floods or storms, heat leaves no immediate destruction but kills more people than any other extreme weather event. By 2050, 2–5 billion people will lack access to cooling, creating a humanitarian crisis that remains largely absent from global development priorities.
2. **Heat waves are not isolated events—they are part of a cascading climate crisis.** Rising ocean temperatures weaken monsoons, disrupt agriculture, intensify air pollution, and lead to water scarcity. In 2024, India halted wheat exports due to heat-induced crop failures, showing how extreme heat impacts food security and global supply chains.
3. **Cooling demand is skyrocketing, but unchecked growth will worsen the crisis.** India is the largest and fastest-growing AC market. Without passive cooling strategies, energy-efficient technologies, and the phase-out of refrigerants, the emissions from cooling will accelerate global warming rather than mitigate it.
4. **Heat resilience requires systemic change, not just seasonal emergency plans.** Current Heat Action Plans (HAPs) are often reactive, focusing on short-term relief rather than long-term adaptation. Multi-sectoral coordination—linking heat with urban planning, energy, housing, and disaster risk reduction—is essential to building resilience.
5. **Scientific knowledge gaps hinder effective policy and infrastructure solutions.** India lacks a dedicated heat research center, and existing studies on heat impacts are fragmented. Scaling up high-resolution climate forecasting, household-level heat and health monitoring, and impact-based early warning systems will be crucial for targeted interventions.

"Extreme heat kills more than any other extreme weather event — but there are no before-and-after images. It's silent, and deadly."
"We must move from solutions 1.0 to solutions 5.0. Cooling infrastructure needs to be turbocharged — with innovation, data, and design."

Day 1, Session 3: Governance for Heat and Cooling – Strengthening National and Subnational Action Plans

This session focused on the governance challenges of heat adaptation, stressing that heat is not just a disaster response issue but a long-term development challenge. Localized, sustained implementation of HAPs was identified as a major gap, with recommendations for city- and district-level planning to begin at least six months before the heat season. Stronger data collection, accountability frameworks, and historical trend analysis were recommended to improve policy effectiveness. Governance diversity was highlighted as a form of resilience.

It was highlighted that no single department can manage heat resilience alone, emphasizing the need for multi-partner collaboration. The importance of legal mandates for HAPs was discussed, along with the need for key performance indicators (KPIs) and intersectoral task forces to drive implementation. The private sector's role in heat resilience was also a key focus, with recommendations to incentivize energy-efficient appliances, integrate cooling measures into corporate sustainability programs, and establish public-private partnerships to improve affordability. The session concluded by reinforcing that heat governance must transition from short-term responses to long-term institutional planning, integrating civil society partnerships, state-led innovation, and climate finance mechanisms to ensure equitable and scalable cooling solutions.

In a multi-city analysis of heat actions, over 50% were short-term and reactive. Long-term responses are typically underdeveloped due to coordination failures, lack of political prioritization, and weak technical capacity. But institutional preparedness, tech-driven data gathering, and Standard Operating Procedures (SOPs) for recurring heatwaves can give cities the edge on resiliency. Clear leadership in each phase of local HAPs and developing relevant Key Performance Indicators (KPIs) can set up an enabling environment for public-private collaboration. Coordinated HAPs have shown a drop in heat-related mortality. Technical support for front-line heat workers and incentives tied to smooth heat plan implementation would go a long way toward encouraging coordination.

Under the PMAY-G project, 27 million rural homes have been built, offering convergence with other schemes like solar, water, and sanitation. Demonstration studies of projects like cool roofing can build community involvement. And legal mandates for HAPs are essential for gaining bureaucratic traction. Lack of public awareness, sustained proactive planning, and institutional clarity remain bottlenecks to scaling HAPs.

Figure 4: Panelists for the session on Governance for Heat and Cooling: Strengthening National and Subnational Action Plans (source: NRDC)

Key takeaways from Session 1.3:

1. **Heat is a governance and development issue, not just a disaster response challenge.** Heatwaves are often treated as short-term emergencies rather than structural challenges requiring year-round planning. Integrating heat mitigation into urban planning, housing, and public health policies is essential for long-term resilience.
2. **Most Heat Action Plans (HAPs) remain reactive rather than proactive due to governance gaps.** Local governments often lack the technical expertise, political push, and inter-departmental coordination needed for long-term heat mitigation. While 69% of cities report adequate funding, much of it is spent on short-term measures rather than systemic solutions.
3. **Localized, data-driven strategies must complement national plans.** State and city-level HAPs must be tailored to local heat conditions, integrating real-time data, early warning systems, and vulnerability mapping. Many plans lack specificity, failing to provide clear actions for municipal bodies. A legal mandate for heat governance would help institutionalize long-term solutions.
4. **Multisectoral engagement, including the private sector, is key to sustainable cooling solutions.** Most workers exposed to extreme heat are employed in the private sector, yet businesses remain largely absent from heat mitigation efforts. Engaging industries, particularly construction and manufacturing, is critical to ensuring worker safety and energy-efficient cooling adoption.
5. **Civil society and local community involvement enhances governance effectiveness.** Effective heat resilience requires decentralized planning, community participation, and behavioral shifts. Schools, health centers, and local networks should play a greater role in heat preparedness, while civil society partnerships can bridge gaps in governance and implementation.

6. **In some places, regulations about buildings can help improve heat resilience** - in terms of the design, green roofs, white roofs, the orientation of the building, ventilation across the building, how windows are structured, the materials that buildings are made of - these will certainly change over time, to be more responsive to the hotter temperatures we're facing. Regulation can build this into our systems today, so that buildings will be more comfortable in a warmer future. Better to build heat-responsive features into new construction; retrofitting is always more complicated.

"Heat is not a disaster issue — it's a development issue. Governance structures must evolve to reflect that."
"We're used to this [extreme heat] — and that mindset leads to a lack of urgency."
"The legal mandate for heat action plans is extremely important in the current bureaucratic system — that's what pushes things to the top."

Day 1, Session 4: Simplifying Climate Science

This session helped make the language and science of climate change more accessible and created a common ground of understanding for attendees. Heat is one among many climate-environment-human health impacts; others include floods, droughts, harm to food systems and food security, water supply problems, rising sea levels, infrastructure flooding and damage, being displaced from homes and communities, new emerging infectious diseases. Taken together, each type of climate-health effect will make it tougher to cope with the others, creating a cascading, compound set of challenges for societies to maintain health, economic vibrancy and stability.

Figure 5: Mr Rajan Mehta addressing the audience. (source: NRDC)

Figure 6: Mr Rajan Mehta's book, 'Backstage Climate'. (source: Amazon.com)

Day 1, Session 5: Rising Heat, Rising Hope – Building Climate Resilience for All

Community-led, locally tailored solutions — including school gardens, participatory greening, and climate-informed livelihood support – can broaden community support for heat-cooling initiatives. Creating safe, intergenerational spaces where youth feel heard and supported is critical to building trust and must be actively cultivated. Panelists emphasized the need for transparent, inclusive platforms that grow trust between governments and communities. And the Youth Climate Justice Fund was mentioned as a promising new model to broaden intergenerational financial access.

Figure 7: (L to R) Ms Archana Soreng, Ms Dia Mirza and Ms Sarah Jacob, panelists for the session (source: NRDC)

Key Takeaways from Session 1.5:

1. **Climate justice is social justice, and indigenous communities must be central to solutions.** Indigenous people protect 80% of the world's biodiversity yet are excluded from climate policymaking. Recognizing land rights, integrating traditional cooling methods, and ensuring direct climate finance access are critical to equitable resilience.
2. **Extreme heat is deepening inequality, disproportionately impacting women, children, and marginalized workers.** In some parts of India, women spend up to 180 days a year collecting water, and seasonal livelihoods depend on climate-sensitive resources. Yet, most climate policies fail to address gendered vulnerabilities. Inclusive governance must prioritize community-led solutions.
3. **Youth leadership and local initiatives must be empowered with funding and decision-making authority.** Young activists face barriers in accessing financial and institutional support. Initiatives like the Youth Climate Justice Fund aim to expand small grants, but global climate financing must shift toward direct, youth-friendly mechanisms.

4. **Sustainable cooling is a global challenge, and India will be at its center. By 2050, India will be the largest consumer of cooling.** Programs like the UNEP Cool Coalition and India Cooling Action Plan (ICAP) are key to ensuring equitable, low-emission cooling solutions that don't worsen the climate crisis.

"Indigenous peoples are not victims of climate change — they are leaders in climate action. But without land rights, they remain on the verge of eviction and exclusion."
"Climate justice is social justice. Women and children are at the center of this crisis — and of the solutions."
"I see glimmers of hope every day — in the way young people and communities are showing up for each other."

Day 2, Session 1: Discussion on World Bank's Urban Heat Handbook

At the beginning of Forum Day 2, an upcoming publication from the World Bank, "The Urban Heat Handbook (draft)," was discussed in an interactive workshop with Forum attendees. Feedback throughout the session highlighted some practical demands from people who are hands-on implementers of urban heat preparedness and action plans. Heat resilience guidance documents must be practical, actionable, and adaptable to local contexts, "something a city official can actually use," said one workshop attendee. City governments need step-by-step guidance that is easy to implement, not dense policy documents. Visual summaries, flowcharts, practical advice for structural and behavioral measures, knowing who is responsible for what, and standardized data formats enhance usability.

Figure 8: Representatives from AtkinsRealiz and Red Cross Red Crescent Climate Centre introducing the Urban Heat Handbook (source: NRDC)

Day 2, Session 2 (keynote): A Matrix of Solutions: Cooling & Heat Resilience Through Multi-Faceted Approaches

This session's keynote address emphasized that heat response systems now must move beyond just providing early warnings and instead, deliver practical actions, especially actions tailored to specific sectors. Coordination across departments and all levels of government is critical—engaging health ministries, mayors, and city planners - and the advice to, "Aim as high as you can," suggests that having a high-level mandate can drive more local programming. Consistency in early warning systems and coordination across national borders is essential for consistent heat warnings and response systems.

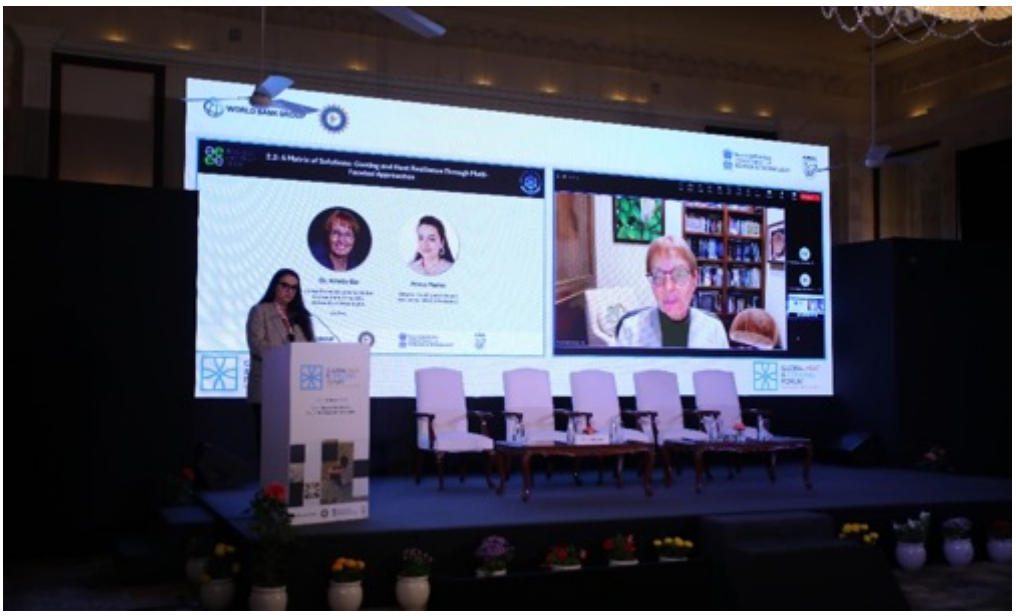

Figure 9: Dr Kristie Ebi delivers a keynote speech as Ms Prima Madan moderates (source: NRDC)

Key takeaways from Session 2.2 keynote:

1. **Heat adaptation and cooling must be integrated into long-term governance structures.** Individual efforts often drive initial climate adaptation work, but institutionalizing heat resilience within government mandates ensures continuity despite political changes. Cross-sectoral coordination, involving city mayors, health ministries, and environmental agencies, is key to sustained impact.
2. **Heat Action Plans (HAPs) must evolve beyond early warnings to proactive response and infrastructure change.** Future-ready HAPs should emphasize green roofs, tree-planting, and infrastructure resilience while ensuring vulnerable communities can access resources during heatwaves. Bold, coordinated action must integrate technology, nature-based solutions, and equity.

> ***"Institutional memory matters — we need plans that outlast political cycles and champions."***

The "Matrix of Solutions" to address cooling and heat resilience was explored in more depth in three thematic sub-sessions on: Passive and energy-efficient urban (Theme 1); Protection for outdoor workers (up to 75% of India's labor force) (Theme 2); and Women-led community engagement for resilience building (Theme 3). Live audience polling during the sessions provided further insights into attendees' perspectives.

Day 2, Session 2 (Theme 1): Urban Design, Built Environment, and Technology

The India Cooling Action Plan (ICAP) projects a 20% reduction in space cooling energy consumption through efficient building designs and improved cold chain infrastructure. With urban areas experiencing extreme heat, nature-based solutions (NbS) are essential. Studies indicate that informal settlements can be up to 5°C hotter than surrounding neighbourhoods, necessitating targeted interventions. Faulty urban planning contributes to rising cooling demand and greenhouse gas emissions, forming a self-reinforcing cycle. The built environment must integrate passive cooling strategies, including reflective roofing, shaded windows, cross-ventilation, and blue-green infrastructure. Building codes such as the Energy Conservation Building Code (ECBC) should extend beyond high-end developments to mainstream housing, with municipal mandates for adoption. The power sector faces growing vulnerabilities as high temperatures damage infrastructure and reduce solar energy efficiency. Without demand-side reforms, supply-side measures alone are insufficient. Integrated Resource Resilience Planning (IRRP) and district cooling systems are necessary for sustainable cooling, but success depends equally on policy enforcement and behavioural shifts.

Figure 10: Panelists for the session on Urban Design, Built Environment, and Technology (source: NRDC)

Key Takeaways from Session 2.2.1:

1. **India's cooling demand is set to skyrocket, requiring urgent integration of nature-based and energy-efficient solutions.** With urban areas heating at nearly twice the global average, sustainable cooling strategies like passive building design, urban greening, and reflective roofs must be embedded in city planning and slum rehabilitation programs. Climate change is disrupting energy infrastructure, melting cables and causing grids to fail.
2. **Heat mitigation must be prioritized in infrastructure, power grids, and urban planning.** Cities must balance rising demand with resilience strategies. Urban planning and building codes must shift to passive design principles: green roofs and surfaces, shaded windows, better ventilation—and regulation and financing structures must incentivize sustainable design. District cooling systems (which are more feasible during development cycles), grid stability planning, and low-carbon materials should be mainstreamed into building codes and development policies. There is a pressing need for power sector resilience and localized generation models.
3. **India is the first country with a national cooling action plan** (ICAP, 2019). It was developed through extensive stakeholder engagement, emphasizes building codes (like the Energy Conservation Building Code) and long-term economic and social benefits, and targets thermal comfort for all by 2037-28.
4. **Low-cost passive cooling is essential for dense, low-income housing.** Cooling design features should be mandated in all new development. Public pressure can drive regulatory change: a live Forum audience poll found that "passive building design" was #1 priority cooling strategy for the Global South, considering capacity and resource constraints.

"More cooling leads to more heat – we must break this cycle with better design and planning."
"Seventy-five percent of 2050 infrastructure is yet to be bult – the opportunity to climate-proof our future is right now."

Day 2, Session 2 (Theme 2): Resilient Workforce

Heat stress mitigation requires scalable, data-backed solutions, and the workplace is no exception. Productivity losses rise by 2% for every 1°C increase in temperature. Heat-induced labour losses may cut GDP by 4–6%. Insulated cooling shelters at construction sites can reduce heat exposure by 5–7°C, improving worker conditions. The informal sector, which includes 70% of non-agricultural workers, lacks legal heat protections, complicating policy enforcement. Extreme heat events can increase delivery workers' heat stroke risk by 60%. Home-based workers face indoor temperatures 3–5°C higher than outdoors. Extreme heat also has adverse effects on maternal health, cascading in turn to child and infant health. OSHA's 80°F heat index threshold emphasizes hydration, rest, and acclimatization. Investing in rest, education, and hydration for workers can boost efficiency by 15%.

Figure 11: Panelists for the session on Resilient Workforce (source: NRDC)

Key takeaways from Session 2.2.2:

1. **The informal workforce faces extreme heat exposure but lacks legal protections and adaptation support**. With 70% of India's non-agricultural workforce in the informal sector, most lack contracts or access to heat-safe working conditions. Heat-related illness must be recognized as a workplace hazard, requiring employer-driven safeguards. A live Forum audience poll found overwhelming support for "stronger regulations and policies for heat protection" as most critical for improving workforce resilience to heat.
2. **Workforce resilience must combine stronger regulations with community-based adaptation strategies**. Policy measures such as mandated cooling breaks, flexible working hours, and employer-provided shade and hydration must be reinforced through behavioral training and local cooling infrastructures, particularly for outdoor and migrant workers.

"Even an imperfect heat-health dataset is the superpower we need — it can raise urgency and drive real action."
"We cannot accept the status quo. Most employers still fall short of protecting their workers from extreme heat."

Day 2, Session 2 (Theme 3): Community Engagement & Information Dissemination

Speakers highlighted the ability of women-led models of heat resilience to engage across community (*samaaj*), state (*sarkaar*), and markets (*bazaar*). These models work across multiple scales — household (cool roofs), community (urban forestry), city (heat mapping).

Women bear disproportionate burdens from heat but have found that "aspirational, accessible, and affordable" solutions work best. Parametric insurance was discussed as one risk-transfer tool, but

not as a standalone solution. Grassroots, bottom-up pressure on governments from local communities can push plans into action. Scaling of larger plans requires federal backing, shared premium models, and integration with other protections.

An audience poll showed that the top-priority concerns in community campaigns are health and financial impacts, especially on women and vulnerable groups.

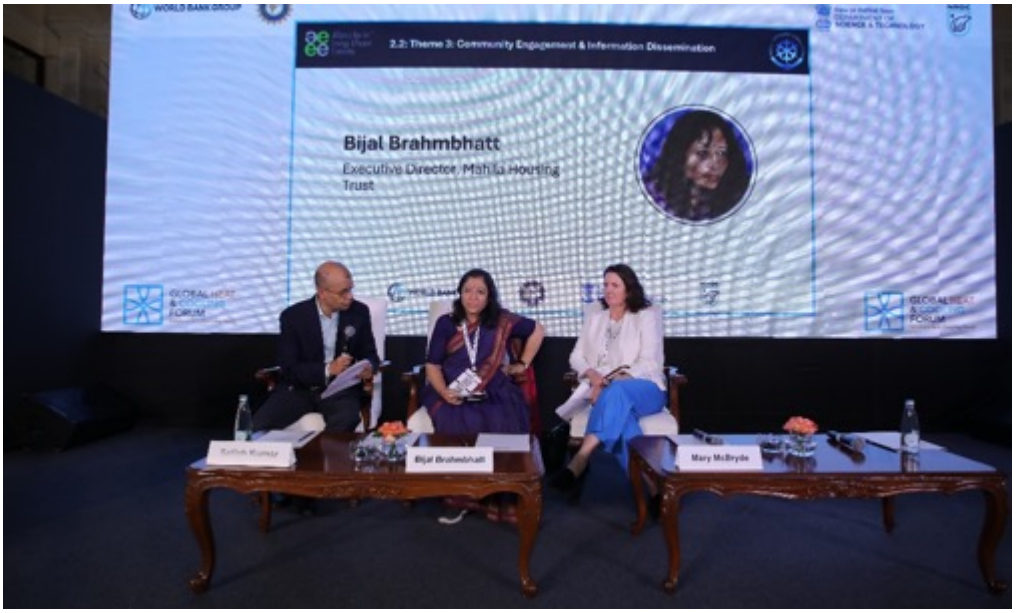

Figure 12: (L to R) Mr Satish Kumar, Ms Bijal Brahmbhatt and Ms Mary McBryde, panelists for the session on Community Engagement & Information Dissemination (source: NRDC)

Key Takeaways from Session 2.2.3:

1. **Women are disproportionately affected by extreme heat, making gender-sensitive adaptation strategies crucial**. In many urban poor communities, women bear the brunt of climate shocks, balancing livelihoods, water collection, and caregiving responsibilities. Heat resilience initiatives must integrate women-led solutions, affordable cooling technologies, and financial safety nets.
2. **Community-driven climate adaptation must be scaled with inclusive financing and policy integration**. Programs like parametric heat insurance and community-run cooling shelters can provide immediate relief, but long-term sustainability requires government backing and public-private partnerships to ensure heat adaptation becomes a mainstream development priority.

> ***"Sustainability has to come off the paper and into people's lives. Technologies must be user-friendly, affordable, and aspirational."***

Day 2, Session 3: Financing the Future – Mechanisms for Scaling Heat Resilience & Cooling Solutions in the Global South

This session identified and discussed innovative funding mechanisms that can support the implementation of sustainable heat adaptation and cooling solutions in the Global South. Showcase successful case studies of financing models from the Global South and their application in addressing extreme heat and sustainable cooling challenges. Climate funding focuses on mitigation more because of quick results, because in adaptation one must focus on low-cost solutions. The panelists talked about public finance. Disaster risk financing still focuses mainly on post-disaster relief rather than prevention. For example, while India's 15th Finance Commission recommended $30 billion in public finance be allocated over five years (2021-2026) to fund disaster response (post-disaster) and mitigation (pre-disaster preparedness and risk reduction), just $6 billion of that was for pre-disaster mitigation. There is great room for growth in innovative adaptation and preparedness financing.

Figure 13: Panelists for the session on Financing the Future – Mechanisms for Scaling Heat Resilience & Cooling Solutions in the Global South (source: NRDC)

Key Takeaways from Session 2.3:

1. **Adaptation is critically underfunded compared to mitigation, demanding new financing models**. Most climate finance still prioritizes mitigation, especially renewable energy projects. Innovative mechanisms—like blended finance, parametric insurance, and climate PPPs—are urgently required to scale up financing for heat resilience and adaptation in the Global South.
2. **Private sector participation is vital but underutilized in heat resilience.** Private capital primarily supports mitigation projects, such as renewable energy, due to clear financial incentives. Creating financial instruments and incentives that reduce investment risks (e.g.,

concessional capital, guarantees) can encourage private-sector involvement in heat adaptation, infrastructure resilience, and community-level solutions.

3. **Public funding and philanthropy must be strategically leveraged to catalyze climate resilience**. Only 2% of global philanthropic capital targets climate action. Public funds should focus on de-risking investments and unlocking private and philanthropic capital to support innovations like district cooling, energy-efficient buildings, and passive cooling infrastructure, ensuring long-term scalability and affordability.
4. **Localized financial solutions and incentives are crucial to successful implementation.** Parametric insurance and direct cash transfers to vulnerable groups (such as street vendors) represent practical, immediate solutions, allowing rapid recovery from heat-induced economic losses. However, these solutions must be complemented by physical infrastructure financing—cool roofs, cooling shelters, and urban greening—to reduce overall vulnerability sustainably.
5. **Effective heat resilience financing demands innovative cross-sector governance.** Funding strategies must integrate heat resilience within urban planning, housing, public health, and infrastructure investments. Strong governance frameworks—mandating compliance, standardizing risk assessments, and institutionalizing heat as a policy priority—are essential to ensure investments translate effectively into resilience.

> ***"We need to treat heat action like streetlights and sewage—core public infrastructure requiring blended finance and long-term planning."***

Day 2, Session 4: Heat-Cooling Synergies: Stories That Matter

This session focused on integrating multiple perspectives, including rural and marginalized communities, to ensure inclusive and effective climate storytelling. Speakers discussed how strategic, behavior-informed communication is essential to translating climate awareness into meaningful policy and societal change. Despite growing awareness, communication around heat and cooling remains seasonal, fragmented, and problem-focused. The session explored how to shift narratives toward solution-driven, localized, and emotionally resonant storytelling. Forums focused on communication strategy are rare; journalistic communication is time-bound, and knowledge gaps are common, even among seasoned reporters. There's a need for consistent, accessible briefings and an improved media-science interface.

Heat coverage largely peaks during heatwaves, and the media lacks a 360° view. Ideally, the media would share data periodically, not just during crises. Reframing climate messages through personal, economic, and emotional goals attracts more viewers (for example: “Set AC to 24°C” becomes “Save 6% on electricity.”). View cooling as a basic need—not just a luxury; as a right and a tool for productivity. Current narratives fail to center rural and vulnerable communities, and to do that, we need to shift from isolated facts to coherent, people-first stories.

Figure 14: Panelists for the session on Heat-Cooling Synergies (source: NRDC)

Key takeaways for Session 2.4:

1. **Effective communication on heat resilience requires relevance, immediacy, and relatability.** Messaging should clearly connect climate impacts directly to people’s lives and daily priorities, using simple language, tangible examples, and relatable narratives rather than abstract climate terminology.
2. **Shifting from fragmented communication to collaborative storytelling is essential.** Overcoming short news cycles and limited public attention requires collaboration among

governments, businesses, media, and civil society to consistently frame heat resilience as integral to economic, social, and public health priorities—not just a seasonal climate event.

3. **Private-sector engagement must evolve from Corporate Social Responsibility (CSR) initiatives to core business strategy.** Businesses should recognize extreme heat as a direct threat to their operations and workforce productivity, making climate resilience not just a CSR initiative but a critical element of their core business strategy for long-term sustainability and profitability.

> ***"We talk about heat, but rarely about what to do about it. We need to shift from awareness to action."***

Day 2, Session 5: Toward the Global Heat & Cooling Forum 2026

The concluding session summarized the convening's takeaways and emphasized the critical need to approach cooling solutions with humility and sensitivity to local contexts. Effective, sustainable cooling needs to build upon inclusive governance, cross-sector collaboration, and continuous learning from each year's efforts. Examining the year's successes and failures allows programs to be continually improved, ensuring that future solutions uplift vulnerable communities and foster collective resilience. The Forum underscored the importance of creating and sustaining momentum, collaborative action, and knowledge-sharing among diverse stakeholders, hopefully laying the foundation for meaningful progress ahead of next year's Global Heat and Cooling Forum 2026.

Key implementation challenges persist:

- Making millions of PMAY-R houses heat-resilient.
- Aligning government, private sector, and philanthropy to drive scalable innovation.
- Navigating the complexity of ground-level execution in a vast and diverse country like India

Figure 15: Panelists for the concluding session, 'Towards Global Heat and Cooling Forum 2026'

Key Takeaways from Session 2.5:

1. **Heat resilience must move to the forefront of global climate conversations**—it can no longer be treated as a side issue.
2. **Cooling solutions must not worsen the problem** of extreme heat from global warming — we must prioritize sustainable, equity-focused approaches.
3. **Humility, innovation, and collaboration are essential** to designing and scaling effective, context-sensitive interventions.
4. **The real test lies in implementation**—translating insights into scalable action across geographies and governance levels.

"This convening must be more than an event—it has to become a movement, a shared commitment to act."
"The challenge now is not ideas—it's implementation, and doing it at scale in a country as vast as India."

Figure 16: The organizing team at the Global Heat & Cooling Forum 2025 (source: NRDC)

Annexure I – Agenda for the Forum

Agenda for 2025 Global Heat & Cooling Forum, including names and affiliations of our distinguished speakers, panelists, and moderators for each session.

Global Heat & Cooling Forum

17-18 March 2025

New Delhi, India

AGENDA

DAY 1: Monday, 17 March 2025
Venue: The Leaders Lounge, Bharat Mandapam (13:00 – 21:00)

Registration and Lunch
Inaugural: Lighting the Lamp **1.1 Heat and Cooling: Interwoven Challenges in a Warming World** **Welcome and Context-setting:** **Sameer Kwatra**, Senior Director – India, Natural Resources Defense Council (NRDC) **Dipa Bagai**, Country Head, NRDC India **Special Remarks:** **Arvind Kumar**, Special Chief Secretary (Disaster Management), Government of Telangana (online) **Dr. Anita Gupta,** Head of Scientific Divisions, Department of Science and Technology, Government of India **Abhas Jha,** Practice Manager, Climate Change and Disaster Risk Management, South Asia Region, The World Bank

Safi Ahsan Rizvi, Advisor, National Disaster Management Authority (NDMA), Government of India

Keynote Address:

Dr. Chandra Sekhar Pemmasani, Hon'ble Minister of State, Ministry of Rural Development and Ministry of Communications, Government of India

Vote of Thanks and Closing Remarks:

Manish Bapna, President and CEO, NRDC

Immersive Discussion

1.2 The Heat-Cooling Paradox: Science, Gaps, and Urgency

- *Highlight current trends in rising heat and increasing demand for cooling, using climate projections*
- *Identify critical gaps in scientific understanding, policy frameworks, and technology deployment, emphasizing the urgency for immediate action*

Dr. Radhika Khosla, Associate Professor and Research Director, Oxford India Centre for Sustainable Development, University of Oxford (featured presentation)
Manish Bapna, President and CEO, NRDC (moderator)
Dr. Roxy Mathew Koll, Climate Scientist, Indian Institute of Tropical Meteorology
Dr. Joy Shumake-Guillemot, Lead, World Health Organization/World Meteorological Organization, Joint Office for Climate and Health
Amit Prothi, Director General, Coalition for Disaster Resilient Infrastructure

Tea Break + Energizer

Immersive Discussion

1.3 Governance for Heat and Cooling: Strengthening National and Subnational Action Plans

- *Emphasize the need for cross-sectoral partnerships among various government departments and other stakeholders to drive comprehensive and sustainable heat and cooling actions*
- *Focus on the critical role of local governments in implementing heat and cooling measures, and how they can be empowered with resources, technical support, and policy guidance*
- *Expand the geographical scope of HAPs, strengthen state-wide heat health monitoring systems, standardize the need/role of chief heat officers, etc.*

Abhiyant Tiwari, Lead – Health and Climate Resilience, NRDC India (context-setting)
Saurabh Kumar, Vice President, India, Global Energy Alliance for People and Planet (moderator)
Dr. Ashley Ward, Director, Heat Policy Innovation Hub Nicholas Institute for Energy, Environment, & Sustainability, Duke University
Sandra Akua Akpene Adayemi Freitas, CEO, Sustainable Solutions for Africa
Dr. Aakash Srivastava, Additional Director, National Program on Climate Change and Human Health, National Centre of Disease Control, Ministry of Health and Family Welfare, Government of India

Gaya Prasad, Deputy Director General (Rural Housing), Ministry of Rural Development, Government of India
Aditya Valiathan Pillai, Visiting Fellow, Adaptation & Resilience, Sustainable Futures Collaborative
Dr. Sujata Saunik, Chief Secretary, Government of Maharashtra (online)
Dr. Tejas Shah, Nodal Officer for Ahmedabad's Heat Action Plan, Ahmedabad Municipal Corporation

Break

Spotlight

1.4 Simplifying Climate Science

Rajan Mehta, Author, Backstage Climate

Firestarter

1.5 Rising Heat, Rising Hope: Building Climate Resilience for All

- *Highlighting the impact of extreme heat on vulnerable communities and ecosystems*
- *Communicating on nature-based and indigenous cooling solutions*
- *Empowering communities through innovation, cooperation and international leadership*

Sarah Jacob, Independent Journalist, France 24 (moderator)
Dia Mirza, Goodwill Ambassador – India, UNEP, and Model & Actress
Archana Soreng, Former Member of United Nations Secretary General's Youth Advisory Group on Climate Change 2020-2023

Networking Dinner and Cocktails

DAY 2: Tuesday, 18 March 2025
Venue: The Ballroom, The Imperial (9:00– 18:00)

Registration

Immersive Discussion

2.1 Discussion on Urban Heat Handbook

The World Bank, with technical support from AtkinsRealis and Red Cross Red Crescent Climate Centre, is developing a Handbook for Urban Heat Management focused on Cities in the Global South. It provides step-by-step guidance for local governments to assess urban heat, plan strategically for heat resilience, and respond effectively during heatwaves. This session is an interactive workshop to road-test the draft handbook and receive feedback from government representatives, practitioners and academics working on climate resilience and urban development in the South Asian context.

Mehul Jain, Senior Disaster Risk Specialist, World Bank Group
Siddharth Nadkarny, Associate Director, AtkinsRealis
Viktoria Pues, Senior Consultant, AtkinsRealis
Ramiz Khan, Urban Adviser, Red Cross Red Crecent Climate Centre
Sahil Kanekar, Urban Designer, AtkinsRéalis

Spotlight

2.2. A Matrix of Solutions: Cooling and Heat Resilience Through Multi-Faceted Approaches

- *Highlight urban design, cool surfaces, and green solutions for heat mitigation*
- *Review energy-efficient and climate-friendly cooling technologies*
- *Address occupational heat stress and labor standards for vulnerable workers*
- *Showcase inclusive, gender-responsive, and grassroots heat resilience models*

Firestarter and Context-setting

Prima Madan, Director, Cooling and Climate Resilience, NRDC (moderator)
Dr. Kristie Ebi, Center for Health and the Global Environment (CHanGE), University of Washington (online)
Akash Goenka, Building & Urban Cooling Specialist, NRDC India

Theme 1: Urban Design, Built Environment, and Technology

Prima Madan, Director, Cooling and Climate Resilience, NRDC (moderator)
Aditya Narayan Singh, Director, Ozone Cell, Ministry of Environment, Forest and Climate Change, Government of India
Priya Narayanan, Senior Program Manager, Cities Program, WRI India
Ashok Lall, Founder, Ashok B Lall Architects
Minni Sastry, Advisor - Extreme Heat & Sustainable Cooling, UNEP
Melanie Slade, Senior Programme Manager, International Energy Agency (online)
Pramod Singh, Senior Director- Program, Alliance for Energy Efficient Economy (AEEE)

Tea Break

Theme 2: Resilient Workforce

Dr. Satish Kumar, President and Executive Director, AEEE (moderator)
Dr. Jason Lee, Associate Professor, National University of Singapore
Shruti M. Deorah, Executive Director, India Energy & Climate Center, Goldman School of Public Policy, UC Berkeley
Dr. Aditi Surie, Senior Consultant, Indian Institute for Human Settlements
James Frederick, Former Deputy Assistant Secretary, US Department of Labor

Theme 3: Community Engagement & Information Dissemination

Dr. Satish Kumar, President and Executive Director, AEEE (moderator)

Bijal Brahmbhatt, Executive Director, Mahila Housing Trust
Mary McBryde, Chief Program Officer, Climate Resilience for All

Lunch

Immersive Discussion

2.3 Financing the Future: Mechanisms for Scaling Heat Resilience and Cooling Solutions in the Global South

- *Identify and discuss innovative funding mechanisms that can support the implementation of sustainable heat adaptation and cooling solutions in the Global South*
- *Showcase successful case studies of financing models from the Global South and their application in addressing extreme heat and sustainable cooling challenges*

Safi Ahsan Rizvi, Advisor, NDMA, Government of India (moderator)
Aaran Patel, Executive Director, Climate, The Nand & Jeet Khemka Foundation
Nidhi Upadhyaya, Deputy Director for Global Policy and Finance, Climate Resilience Center, Atlantic Council
Shravan Shankar, Co-founder, Climake
Dr. Dhruba Purkayastha, Director for Growth and Institutional Advancement, Council on Energy, Environment and Water
Dr Husamuddin Ahmadzai, Partner, Mensa Milieu HB, and Advisor, UNDP (online)

Networking Tea

Immersive Discussion

2.4 The Heat-Cooling Synergies: Stories That Matter

- *Many Mandates, One Message – Despite diverse mandates across channels, aligning narratives can enhance coherence, maximize impact, and drive collective action.*
- *Narratives and Storytelling – Integrating multiple perspectives, including rural and marginalized communities, ensures inclusive and effective climate storytelling.*
- *Communication Challenges – Overcoming short news cycles and fragmented messaging through collaboration for long-term engagement.*
- *From Awareness to Action – Strategic, behavior-informed communication is essential to translating climate awareness into meaningful policy and societal change.*

Urmi Goswami, Climate and Environment Journalist, The Economic Times (moderator)
Mihir Shah, Director – Strategic Communications, CEEW (online)
Kartiki Negi, Climate Impacts Lead, Climate Trends
Harvir Singh, Editor-in-Chief, Rural Voice

Pooja Haldea, Co-founder and Senior Advisor, Centre for Social and Behaviour Change, Ashoka University
Vasudevan Rangarajan, India Lead, Edelman

Continuing the momentum

2.5 Towards Global Heat and Cooling Forum 2026

- *Summarizing the overall convening*
- *Survey of the participants*

Chinmaya Acharya, Director, Program, NRDC India (moderator)
Dr. Daniel P Schrag, Professor, Department of Earth and Planetary Sciences, Harvard University
Dipa Bagai, Country Head, NRDC India
Archana Soreng, Former Member of United Nations Secretary General's Youth Advisory Group on Climate Change 2020-2023

Endnotes

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