



Bureau of Energy Efficiency
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Key Takeaways from

REGIONAL WORKSHOP ON 'COOLING INDIA'S CITIES'

Hosted by

Bureau of Energy Efficiency (BEE),
Tabreed India
& Gesellschaft für Internationale Zusammenarbeit (GIZ)

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Knowledge Partners
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Introduction:

Rising temperatures, compounded by rapid urbanization and rising income levels has led to a sharp increase in cooling demand – projected to grow by [15-20%](#) annually in India. This in turn is driving higher energy consumption and greenhouse gas (GHG) emissions, perpetuating feedback loops for increased heat stress, further escalating the need for mechanical cooling.

By 2050, 45% of India's peak power demand is [estimated](#) to come from cooling. At present, an [estimated](#) 35% of India's energy demand comes from the built environment, of which around [40%](#) can be accounted for cooling. Maharashtra, as one of the most populous and urbanised states in the country, is one of the most affected by heatwaves that are expected to increase cooling demand.

District Cooling systems present a transformative solution, capable of aggregating cooling demand and integrating new, emerging technologies to establish energy-efficient, circular and sustainable cooling systems. It has the potential to reduce energy demand and consumption significantly, and offers energy savings of up to [50%](#). While District Cooling and related sustainable cooling solutions and technologies have been in existence for over a decade, their effective application and adoption in India requires context specific feasibility studies as well as stakeholder

engagement to understand potential challenges as well as explore potential opportunities.

To support these efforts, Bureau of Energy Efficiency (BEE), GIZ and Tabreed India, under GIZ's Energy Efficient Cooling Programme, jointly hosted this regional workshop, to bring together key stakeholders from Maharashtra, including

- **Government officials** like Mumbai Metropolitan Region Development Authority (MMRDA), Municipal Corporation of Greater Mumbai (MCGM), BEST Undertaking,
- **Private sector** such as Hiranandani Developers and Embassy Office Parks REIT,
- **Research institutes** such as IIT Madras Research Park and Tata Institute of Social Sciences,
- **Multi-laterals** such as C40, UNEP and WRI India, and
- **Media representatives** like Realty Plus and Construction Week.

This was the third in a series (following Tamil Nadu and Andhra Pradesh) of workshops designed as **stakeholder-led discussions to enable knowledge sharing and a deeper understanding of District Cooling** and related technologies, including the [potential for adoption in Maharashtra](#) to enhance energy efficiency, circularity and extending thermal comfort to all sections of society.

Key Takeaways:

The discussion in Maharashtra was geared as a broad-based dialogue to understand the state's readiness on the "energy-cooling transition" and lay the path for adoption of sustainable cooling measures.

In 2017, the feasibility of implementing a District Cooling system was assessed in [Thane](#) city under the District Energy in Cities Initiative by United Nations Environment Program (UNEP). In 2023 Tabreed India signed an MoU with Mahatma Phule Renewable Energy and Infrastructure Technology (MAHAPREIT) to develop District Cooling projects in the Mumbai region. Yet, through the discussions, the planning for cooling sustainably and holistically, as cities in Maharashtra witness growth in built environment, is in early stages.

While the Government of Maharashtra has taken proactive measures through a [State Action Plan on Climate Change and Human Health](#) (SAPCCHH), and several cities such as Nagpur, [Pimpri Chinchwad](#), [Nashik](#), and [Thane City](#) have released their district-level Heat Actions Plans, they remain more focused on the effects of heat on human health, with limited mention of cooling as an adaptive measure. The same is observed in long-term climate adaptation strategies such as the [Maharashtra State Adaptation Action Plan on Climate Change](#) (MSAAPCC), the Mumbai Climate Action Plan (MCAP) and the recently launched climate budget report.

Below we provide the summary of the discussions held at the workshop and the key takeaways that emerged.

1

Understanding the Cooling and Energy Consumption Nexus

Mumbai has experienced a 0.25 degree Celsius [temperature](#) rise per decade from around 1973. The rising heat stress in Mumbai can be attributed to dense urban built-up and materials used – such as the rising trend of **glass buildings which are not aligned to the climatic conditions of the city**, along with a high density of population and reduced green cover. **Urban heat has also been identified as one of the five climate risks under the 2022 Mumbai Climate Action Plan (MCAP).**

The majority of India's energy transition efforts have been focused on increasing its renewable energy capacity. A significant portion of the **growth in renewable energy in the last five years has predominantly gone towards meeting the country's cooling demand** from sectors such as space cooling, data centres, or for industrial purposes.

- Over the next two decades India's cooling demand is [forecasted](#) to be equivalent to the electricity consumption of Africa. Greater **adoption of AI technology** will further contribute to **the rising energy demand**; required for computing, and preventing system heat-up.

- Vulnerable communities, which are a large segment of the population, face a critical challenge of the **affordability** of sustainable cooling solutions. As a result, in Kerala for example, there is a rise in adoption of low-rated air conditioning systems, which are large energy guzzlers. The state of Maharashtra also faces similar challenges.
- **IIT Madras Research Park showcases a demonstrable example of District Cooling** – cooling requirements of about 3000 RT for the entire campus are met through a single District Cooling-like setup. This centralized cooling system is on average 20-30% more cost and energy efficient than conventional systems. A combination of technological innovation that includes thermal and battery storage systems, integration of on-site and off-site renewable power, reuse of waste heat in the form of hot water in the cafeteria, smart analytics, and monitoring and control, has helped further energy efficiency gains by 50%, and reduce cost of electricity from ₹12.31 to ₹9.8 per unit, **resulting in savings of ₹4.3 crores and a reduction of 7840 tons of CO2 emissions.**



2

Building Political Will and Awareness for Sustainability in Development

Rapid urbanisation in India—unlike in countries such as China—has largely been demand-driven, with infrastructure struggling to keep pace. As centre and state governments are still focused on meeting fundamental needs (like housing, water, sanitation and transport), sustainability including within the cooling context is not at the forefront of political agendas.

- **Sustainability and climate change are not priority electoral issues.** Through awareness and education, with the help of CSOs and think tanks, these issues can be brought to the forefront, which would give policymakers the required push to make this a part of the political agenda.
- To change this, there needs to be a push from an informed and educated electorate that understands the long-term value and fundamental need for sustainable development. **Political will and interest typically follow public demand.**
- Further, air conditioning is still perceived as a luxury, and remains outside the lived experience of many policymakers, especially those from rural backgrounds. As a result, there is limited incentive for governments to prioritize or subsidize cooling solutions like District Cooling. **To build political will, it is crucial to reframe cooling as a public health necessity rather than a luxury.**
- At the local government level, particularly in Mumbai where the climate department is still growing, **there is a need for capacity building on climate change and climate-responsive solutions.** This includes developing a deeper understanding of centralised cooling systems like District Cooling—how they function, their cost structures and their benefits.
- At the user and customer level, **limited awareness and misconceptions** about demand aggregation, implementation and perceived higher costs, can create resistance. Addressing these gaps through institutional capacity building, transparent communication and user education is essential to foster trust and encourage wider adoption of sustainable cooling solutions.

3

Incubating Innovation in Technology and Business Models for Market Evolution

Scaling District Cooling in Maharashtra requires **innovation in both technology and business models**, supported by **government leadership, private sector participation, and strategic policy interventions**. A key example is Tamil Nadu's **District Cooling Steering (DCS) Committee**, which has brought together **government, industry, and academia** to drive early-stage planning for efficient and scalable adoption. Maharashtra can take a similar approach to accelerate market evolution.

- **Leveraging Redevelopment Projects:** An [estimated 2000](#) redevelopment projects are **currently ongoing in Mumbai**, where there is a huge opportunity to incorporate sustainability practices. Redevelopment projects in Mumbai are 12-13 times larger than in other cities like Delhi, Bangalore, and Chennai. The mills area in Parel region, for example, is giving way to large skyscrapers that can be planned more sustainably. Similarly, in Maharashtra, cluster redevelopment has become a norm for a certain size of land and population density, providing **immense potential to include passive design measures suitable for Maharashtra's climate, and active cooling interventions for thermal comfort**.
- **Strategic Growth Areas:** Opportunities for adoption exist in SMART cities like Nagpur, along Maharashtra Industrial Development Corporation (MIDC) corridors, SEZs, and mixed-use zones. Navi Mumbai, with its upcoming airport and rapid infrastructure development—including large-scale data centre projects—presents significant potential for integrating District Cooling solutions.
- **Governments must actively foster innovation in both technology and business models** to drive sustainable cooling solutions. There is no one-size-fits-all approach—strategies must reflect the unique conditions of each region, incorporating elements such as sustainable power generation leveraging local resources, energy storage solutions, green cover enhancement, passive design measures for urban cooling and so on.
- **Demonstration Projects: Maharashtra requires model projects to demonstrate benefits from District Cooling**, including in its ability to integrate renewable energy, Sewage Treatment Plants (STPs) and Waste-to-Energy Plants which highlight the potential of reducing grid-reliance and potable water demand. Such projects will enhance the understanding for **policy makers and consumers at large**, much like how early renewable energy projects helped drive market confidence in 2014. Well-structured **Public-Private Partnerships (PPPs)** can play a crucial role in de-risking investments and aligning stakeholder interests.
- **Cross-Sectoral Champions:** District Cooling adoption needs strong advocates across government, industry, commercial, residential, and institutional sectors to drive momentum at multiple levels.
- **Private Sector as a Driver: Public policies in India—and in Maharashtra in particular—have often been shaped and advanced through active private sector participation.** The private sector has played a central role in driving change and fostering innovation. For District Cooling too, private sector leadership will be key to accelerating adoption, demonstrating viable business models and supporting wider policy integration. Innovative business models such as Cooling as a Service (CaaS) must be considered to address the slow uptake of District Cooling.
- While District Cooling provides an efficient and scalable solution, **equitable access to cooling** must ensure that cooling access is not limited to those who can afford premium solutions; it must consider **livelihoods of workers in the existing cooling industry**, ensuring a smooth transition without job displacement; and address **differentiated cooling needs**, particularly for outdoor workers, where conventional cooling methods may not be feasible.



4 Integrating Cooling in the Policy Landscape

Through the [2019](#) India Cooling Action Plan (ICAP) launched by the Ministry of Environment, Forest and Climate Change (MoEFCC), **India has set out targets for reducing cooling energy demand by 25-40%**, refrigerant demand by 25-30% and cooling energy requirement by 20-25% over a 20-year horizon with 2017-18 as the baseline year. District Cooling is mentioned as one of the alternative technologies for India's cooling strategy under the ICAP. In 2023, the Bureau of Energy Efficiency (BEE) developed the District Cooling Guidelines in collaboration with GIZ. BEE has also developed the Energy Conservation Building Code (ECBC) in 2017 and the Energy Conservation and Sustainable Building Code in 2024.

In 2024, Mumbai was the first city in India and the fourth in the world to introduce a Climate Budget ([CB](#)) where 32.18% of the capital budget expenditure of the corporation is towards activities which directly align with MCAP. However, the MCAP currently addresses urban heat mainly from a health and safety perspective.

To align with these goals, policy frameworks must go beyond high-level recommendations and integrate **concrete regulatory provisions** that promote sustainable cooling, including District Cooling and passive design measures.

- **Mandating Sustainable Cooling in New Developments:** Regulatory provisions should require early-stage integration of sustainable cooling solutions in large-scale urban projects. This should include a combination of **enforceable mandates** and **targeted incentives**, such as **fast-track approvals, tax benefits, and direct**

subsidies. Floor Space Index (FSI) incentives alone are insufficient and must be supplemented with mechanisms tailored to developer and end-user needs across different urban contexts.

- **District Cooling for High-Density Developments:** In urban clusters, cooling solutions should be embedded at the **master planning stage**, rather than treated as an afterthought. Government agencies and private stakeholders must be made aware of the economic and climate benefits of integrating District Cooling from project inception.
- **Bridging Gaps in Climate Resilience Strategies:** MCAP promotes several initiatives, including heat warnings, urban forests, resilient pedestrian infrastructure, and net-zero buildings. However, there is **little emphasis on expanding access to sustainable cooling for vulnerable communities**. A dedicated Heat Action Plan is currently under development—this presents an opportunity to incorporate sustainable cooling as a core component of climate resilience efforts.
- **Regulatory change is essential**, with a focus on incentives and mandates to accelerate widespread adoption and scale-up of the technologies. Devolution of power to local governments will enable tailored, city-specific action plans. Meanwhile, the centre's budget allocations to states, if linked to clear performance metrics, can drive accountability and fast-track implementation. A **carrot-and-stick approach** ensures that early movers are rewarded, while laggards are pushed to act.



5

Awareness and Capacity Building to Address Industry Pain Points

India is undergoing a significant construction boom, adding an estimated **1 billion sq. meters** annually—second only to China. Of this, approximately **20%** requires air conditioning. Assuming a cooling demand of **200 sq. ft. per ton of refrigeration (RT)**, India needs to add **10 million RT** of capacity each year. In Maharashtra alone, the annual cooling demand is estimated at **1.5 million RT**, presenting a **District Cooling opportunity of 75,000–150,000 RT per year**.

Developers evaluating District Cooling often grapple with **uncertainties around usage patterns and financial feasibility**. While cooling costs are eventually passed to consumers, fluctuations in occupancy and demand—especially in **residential townships that take decades to mature**—create concerns about long-term viability. Furthermore, District Cooling is far easier to integrate into **greenfield developments**, where centralized systems can be planned from the outset. In contrast, **brownfield projects** face technical and financial barriers, including resistance due to prior investments in conventional cooling. A **structured approach**—such as **mandating pre-feasibility studies** for developments over a certain

threshold, as practiced in **Abu Dhabi and Dubai**—can bridge this knowledge gap and dispel misconceptions. District Cooling allows for **incremental expansion**, reducing large upfront investments while enabling **the integration of newer, more efficient technologies** as demand grows. In brownfield settings, **smart design interventions** can consolidate cooling loads and repurpose relatively new equipment, improving financial viability.

For **data centres**, reliability is paramount. Operators prioritize **systems with no single points of failure**, and while District Cooling offers efficiency benefits, there is hesitancy due to **water availability concerns**. Over the past five years, many data centres have **shifted from water-cooled to air-cooled chillers**, opting for solutions that reduce water dependency despite **higher energy consumption**. District Cooling can mitigate water concerns by integrating **Sewage Treatment Plants (STPs)** or utilizing seawater cooling, eliminating reliance on potable water. With **Mumbai emerging as a major data centre hub**, it is essential to evaluate **less mainstream cooling technologies like District Cooling** for their **economic and energy efficiency benefits**.

Conclusion and Next Steps:

The discussions at the Maharashtra regional workshop highlighted the urgent need for a **structured, multi-stakeholder approach to sustainable cooling**. While Maharashtra has taken **progressive steps in climate action**, cooling remains an **under-addressed yet critical challenge** in its urban and industrial development. The state's rising cooling demand, increasing urban heat stress, and evolving energy transition underscore the need for proactive, rather than reactive, planning. District Cooling presents a scalable, efficient, and sustainable solution, but its adoption requires political will, market confidence, policy integration, and industry alignment.

Moving forward, the following **key next steps** will be essential in translating insights into action:

- 1 Institutionalising Sustainable Cooling in Policy and Planning**
 - Integrate sustainable cooling mandates into urban development policies, especially in redevelopment projects, SEZs, and high-density clusters.
 - Align climate resilience strategies (e.g. Mumbai Climate Action Plan, Heat Action Plans) with sustainable cooling solutions, including District Cooling.
 - Ensure that state-level policies, such as Maharashtra's climate budget and adaptation plans, explicitly incorporate cooling as a key mitigation and adaptation measure.
- 2 Demonstration Projects and Market Development**
 - Implement pilot District Cooling projects in strategic locations (e.g. Navi Mumbai, Mumbai redevelopment clusters, MIDC corridors) to showcase energy efficiency and economic viability.
 - Explore Public-Private Partnerships (PPPs), and financing models such as Cooling as a Service (CaaS) to de-risk investments and support large-scale adoption.
- 3 Enhancing Awareness, Capacity Building, and Consumer Trust**
 - Strengthen local government capacity to incorporate climate-responsive cooling into master planning, policy frameworks, and procurement processes.
 - Launch targeted awareness programs for developers, policymakers, and industries, addressing misconceptions about cost, feasibility, and implementation.
 - Establish a cross-sectoral working group, involving government, private sector, and research institutions, to coordinate long-term planning and knowledge exchange.

Maharashtra has a unique opportunity to become a leader in sustainable cooling by mainstreaming District Cooling in urban and industrial growth strategies. The next phase should focus on **policy alignment, pilot projects, and active private sector engagement**, ensuring that cooling is not just an afterthought but a central pillar of climate resilience and energy efficiency efforts.