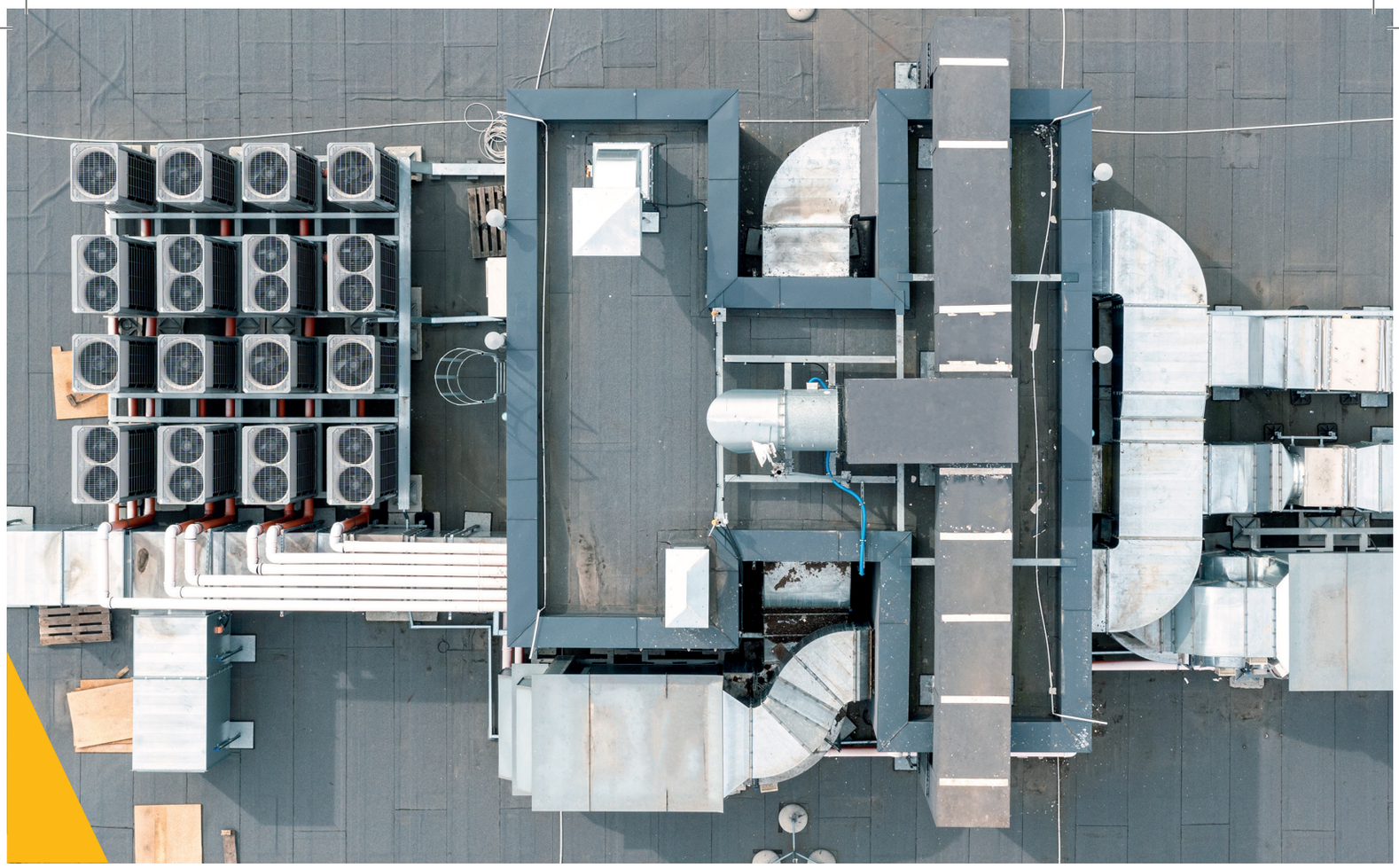


Background Brief

COP28 UAE SIDE EVENT

Promoting Green Cooling in India and the Global South

Saturday, 9th December 2023 | 5:00 PM to 6:30 PM (GST)

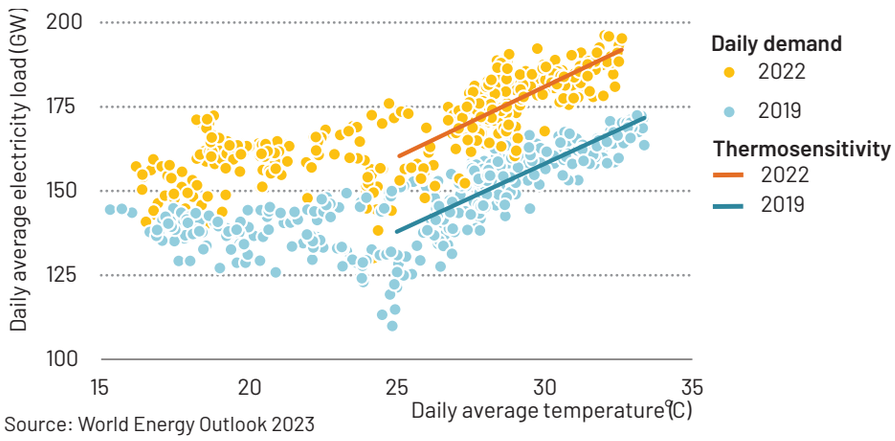
Regional Climate Foundations Pavillion (Pavillion No. TA3-145)
Blue Zone- B7, Building 88, COP28

iFOREST | INTERNATIONAL FORUM FOR ENVIRONMENT, SUSTAINABILITY & TECHNOLOGY

India's cooling landscape

- The cooling industry in India is simultaneously grappling with an multi-fold increase in demand for cooling, while being obligated to satisfying refrigerant reduction targets, and ensuring a transition to alternate refrigerants.
- Heatwave incidences in India have been steadily increasing since the 1980s, and have now engulf most of the country. The challenge is particularly worrying as temperature and humidity are rising together, leading to high wet-bulb temperatures. Absence of adequate cooling infrastructure is likely to cause significant economic damage in coming years.
- Demand for cooling has already been increasing exponentially. According to the World Energy Outlook 2023, the ownership of air conditioners (ACs) in the country has tripled since 2010 to reach 24 units per 100 households.
- Space cooling now accounts for nearly 10% of the country's electricity demand, which is now 21% higher than its share in 2019. With the increasing penetration, the electricity demand in India has been registering increased thermosensitivity.

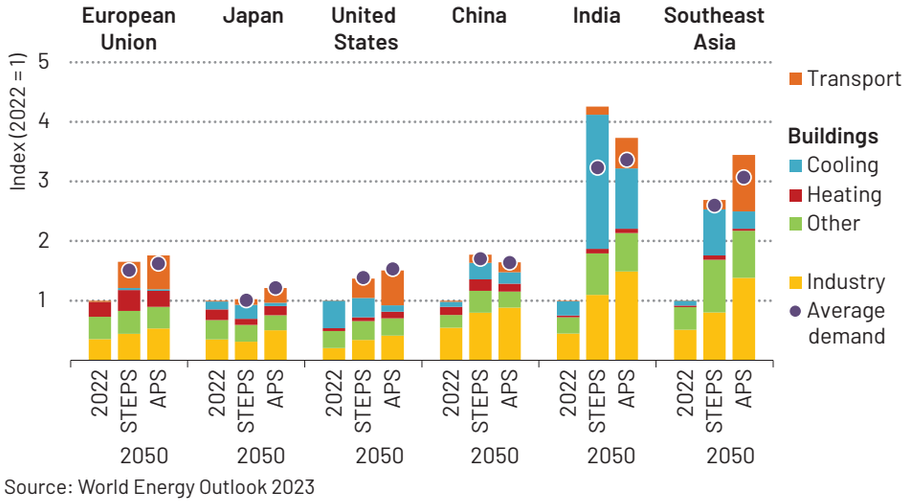
Daily average electricity load against daily temperature in India



Source: World Energy Outlook 2023

- The steep cooling demand growth is projected to continue in coming decades. By 2050, the household AC ownership in India is projected to increase nine-fold, leading to a nine-fold increase in energy demand for cooling.
- Across major countries, India is likely to witness the maximum growth in peak demand owing largely to the growth in cooling demand. Even an energy efficient pathway is projected to contain the energy demand by only about 15%. Thus, for climate mitigation, scaling up green cooling is crucial.

Electricity peak demand projections



Source: World Energy Outlook 2023

- India's expanding cooling demand represents a massive market and investment opportunity. World Bank in its 2022 report on Climate Investment Opportunities in India's Cooling Sector estimates it to be $1.5 trillion in space cooling, $29 billion in cold chair and refrigeration, and $8 billion in passenger transport.
- At present, India is in the third stage of refrigerant transition. The phase out of chlorofluorocarbons (CFC) is complete. The hydrochlorofluorocarbons (HCFC) are expected to be phased out in India by 2030. Simultaneously, with a freeze in 2028 under the Kigali Amendment to the Montreal Protocol, hydrofluorocarbons (HFC), with no ozone depletion potential (ODP) but with large global warming potentials (GWP), are set for a phase-down in India. However, penetration of natural refrigerant-based cooling and not-in-kind (NIK) technologies in the market remains limited.
- To support structured measures, given the massive challenge of meeting the existing and future cooling demand sustainably, India in March 2019 launched the India Cooling Action Plan (ICAP). The first of its kind plan provides a 20-year perspective and outlines actions needed to provide access to sustainable cooling aligned with Montreal Protocol and Kigali Amendment mandated refrigerant transition.

India Cooling Action Plan

- ICAP provides the roadmap for sustainable cooling in India through a multi-stakeholder, multi-sectoral approach to "synergise actions for addressing the cooling demand across all sectors". The overarching goal is to achieve sustainable cooling and thermal comfort for all while securing environmental and socio-economic benefits for the society.
- The plan assess and identifies the way forward for sustainable cooling across key segments – space cooling, cold chain, transport air-conditioning, servicing sector, refrigerant demand and manual, and R&D. For each sector, short-term recommendations are identified for 2019-24, while medium and long-term recommendations are scheduled for 2024-29 and 2029-38, respectively.
- It prescribes implementation of recommendations through collaborative efforts by leveraging existing policies and programmes, instead of creating a new umbrella of policies for sustainable cooling.

Objectives	Targets
• Assess sectoral cooling requirements across for 20 years, and the associated refrigerant demand and energy use. • Map available technologies including passive interventions, refrigerant-based technologies, and alternative technologies. • Suggest interventions across sectors for sustainable cooling and thermal comfort. • Focus on skilling of service technicians. • Develop an R&D innovation ecosystem for indigenous development of alternative technologies.	• Reduce cooling demand across sectors by 20-25% by 2037-38. • Reduce cooling energy requirements by 25-40% by 2037-38. • Reduce refrigerant demand by 25-30% by 2037-38. • Recognise cooling and related areas as a thrust area of research. • Train and certify 100,000 servicing sector technicians by 2022-23.

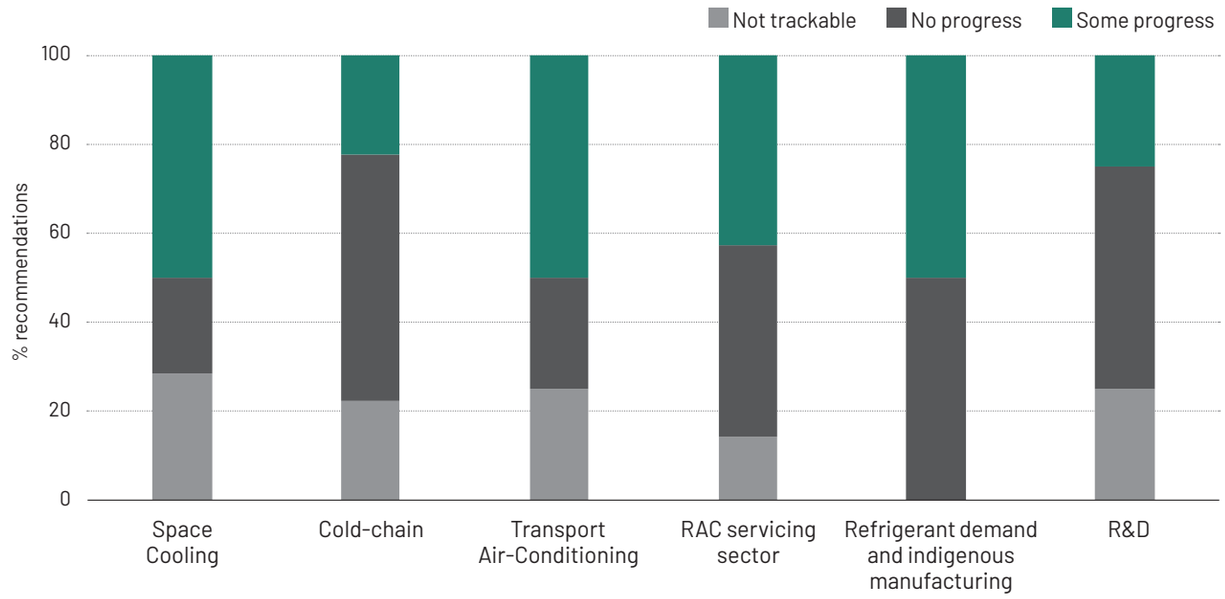
Status of the ICAP implementation

- An assessment of relevant policy/programmatic actions with respect to specific short-term recommendations of ICAP suggests that four years since its release, the plan remains largely unimplemented.
- ICAP lists 14, nine and seven short-term recommendations for space cooling, cold-chain and servicing sector respectively; four each for transport air-conditioning and R&D and two for refrigerant demand and indigenous

manufacturing. None of the recommendations have been fully realised, that is, so far only incremental progress has been achieved.

- Most progress has been made for space cooling focusing on energy star labelling and energy conservation for buildings. However, this progress is not at par with the goals. For instance, the ICAP recommends ratcheting up of Minimum Energy Performance Standards (MEPS) for room air-conditioners, which has not been implemented so far due to industry opposition.
- Recommendations related to standards (e.g., MEPS, safety standards, CAFE) have shown relatively more progress. Other areas such as compliance, infrastructural improvements and capacity building have seen least momentum in terms of policy action.
- Government agencies actively involved in ICAP implementation have been the BEE, BIS, and ESSCI. To this end, in implementing mandatory and voluntary standards for various cooling appliances and equipment, the BEE often invokes the ICAP in meeting documentation.
- Several recommendations of the ICAP provide ambiguous guidance and are thus difficult to track. Further deliberations are necessary to define targets and quantifiable outcomes.
- Overall, the implementation of ICAP has suffered because of lack of formal mechanism to facilitate coordination and ensure a deliberate push; lack of a clear funding mechanism for implementation; as well as limited awareness of ICAP at sub-national levels.

Progress made on ICAP's short-term recommendations



Note: Some progress implies that at least an executive order or amendment has been made in the desired direction.
Source: iFOREST Analysis, as of 2021

The way forward

- ICAP should clearly identify priority sectors in its implementation plan.
  - » Short-term recommendations must be broken down into clear and measurable targets.
  - » As sectors and short-term goals are prioritised, mechanisms needs to be put in place to prepare for other sectors and goals.
  - » Synergies for each sector need to be clearly linked.
  - » MoEF&CC and the Ozone Cell must leverage policies and programmes under their direct control.

- Localisation of ICAP is crucial for implementation, both through capacity building as well as by leveraging existing mechanisms.
  - » Public procurement must focus on energy efficient and low-GWP refrigerant-based cooling technologies as well as NIK technologies.
  - » Cooling demand must be addressed at a local-level (state and municipality), through ECBC, building by-laws, and legislations on energy conservation.
  - » Sustainable cooling should be integrated under smart cities and allied efforts.
  - » Demand side management by Energy Departments should aim at optimising cooling energy demand.
  - » Environment Impact Assessment, 2016 should be leveraged for the installation, use and maintenance of cooling equipment.

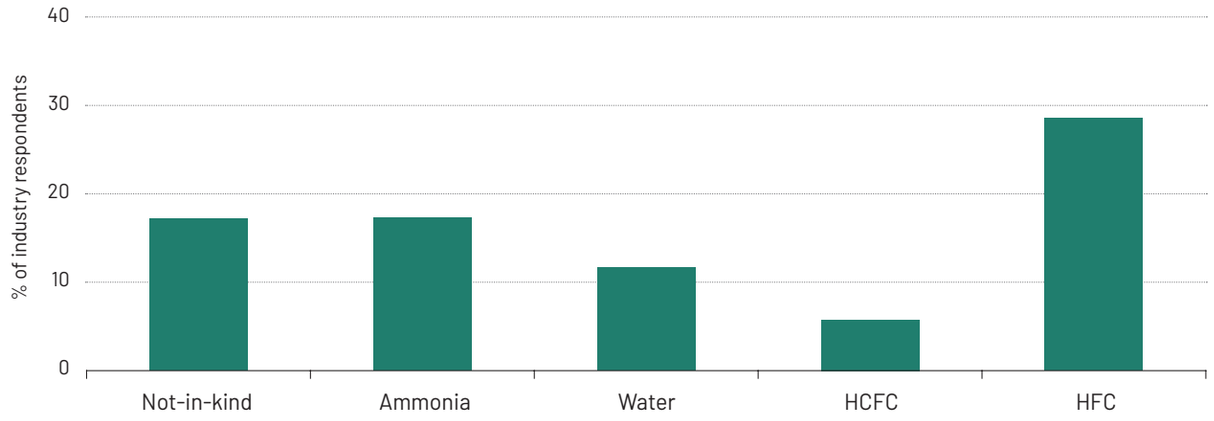
- Explicit mechanisms are needed for operationalising synergies for implementation and funding.
  - » Integrate cooling into the agenda of existing policies and programmes, and enrol government officials in this integration.
  - » Integrate cooling into India's INDCs, both from mitigation and adaptation perspectives.
  - » Access to cooling should be approached as an issue of equity and sustainable development (in line with the INDC's doctrine of climate justice)

- Strengthen ICAP for explicit support for green technologies.
  - » Identify natural refrigerants as essential for India's refrigerant transition, and include explicit need for R&D and/or demonstration projects.
  - » Explicitly promote climate-friendly technologies like natural refrigerant-based cold chain or not-in-kind technologies for residential clusters.
  - » Expand the plan beyond housing to include public buildings (e.g., court houses, government offices) and infrastructure projects (e.g., railway stations, bus stations) to demonstrate green cooling technologies.
  - » Address retrofitting green cooling technology in the existing infrastructure.

Natural refrigerants in India

- Low-GWP natural refrigerant based cooling technologies remain on the fringes of adoption in India, while high-GWP refrigerants remain the mainstream choice, despite low climate impact, patent free status and being market ready.
- iFOREST survey of businesses in 2021 had indicated predominant use of HFC. While the businesses showed an intention to move to natural refrigerants, none were using HC or CO2 refrigerants, while some were using NH3 and water as refrigerant.
- Some success has been registered in specific applications – room air conditioners with HC 290 constitute around 6% of penetration, residential refrigerators are increasingly HC 600a based, and about 90% of cold storages are ammonia based.

Refrigerant usage of industry respondents



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Source: iFOREST, 2021

- Incremental progress has been made through two important actions – the ICAP's promotion of 'sustainable' and 'climate-friendly' cooling; and through Bureau of Indian Standard's (BIS) adoption of safety standards for natural refrigerants.
- The uptake of natural refrigerants remains limited due to lack of awareness among residential and commercial consumers, high initial cost, limited manufacturing base and challenges with retrofitting.
- Going forward, targeted interventions in the form of economic incentives, policy action, technology support and education, training and capacity building are needed for mainstreaming natural refrigerants.

Economic incentives	Policy action
• Provide subsidies to equipment and refrigerant manufactures to shift to natural refrigerants; as well as to consumers for increasing demand. • Provide incentives for setting up testing facilities and R&D centres; as well as for offsetting high working capital. • Provide tax exemption and/or higher depreciation on natural refrigerants based equipment. • Prioritize natural refrigerants under public procurement programmes.	• Place GWP limit on refrigerants or a limit on quantity of synthetic refrigerants used in cooling equipment. • Mandate a minimum % use of these in systems through timelines. • Provide fast track approval of standards for natural refrigerants and allied technology. • Create in-situ demonstrations of these technologies in government and corporate houses and public procurement. • Reduce import duty for compressors for natural refrigerants.

Technology support	Education, training and capacity building
• Create a single window domain for technology access for acquisition. • Promote technology transfer projects through collaborations between industry and academics, sanctioning R&D and international collaboration. • Create a conducive environment for start-ups. • Some areas for R&D are ammonia refrigerant for industrial refrigeration, reduced HFC charge size in mobile cooling application; and carbon dioxide refrigerant for MAC.	• Provide technical training to service technicians, plant operators and engineers; architects, consultants and dealers; factory inspectors and PCB officials. • Provide awareness based educations for consumers, senior management in the corporates, policymakers.

Not-in-Kind Cooling in India

- Over the past two decades, owing to rapid research and development in this space, NIK technologies have made a significant breakthrough resulting in a decrease to their cost and enhanced performance.
- iFOREST's scoping study on existing eleven NIK technologies in India and their market preparedness found that for space cooling many of these NIKs are well developed technologies that are finding use in different parts of the country. Many of these are ready for deployment, and many are already being demonstrated by government projects.
- Despite successful pilots, NIK technology adoption and deployment is not scaling up due to several impeding factors:
  - » Lack of awareness among end-users, architects, engineers and builders.
  - » Greater weightage on aesthetic aspects, rather than principles of green building.
  - » Lack of standards to monitor the quality, for testing and safety aspects of the technology.
  - » Lack of energy efficiency rating to benchmark the energy consumption.
  - » Limited number of manufacturers/suppliers, largely reliant on imports from the EU and China.
  - » Limited serviceability due to insufficient know-how among users and operators.
  - » High-costs relative to conventional cooling technologies.
- Mainstreaming NIK technologies requires comprehensive set of interventions at economic, policy, technology and capacity levels.

Economic incentives	Policy action
• Incentivise efficiency-based behaviours, such as through discounted tariffs. • Offer tax reduction to builders for NIK adoption. • Support start-ups through seed funds, setting up of R&D and testing facilities and changing/establishing manufacturing lines. • Provide higher depreciation rates on NIK technologies.	• Create policy mandates in a phase-wise manner. • Impose energy use limitations for buildings. • Impose penalty on buildings that do not use energy efficient cooling technology.
Technology support	**Education, training and capacity building**
• Establish testing facilities to ratify the performance of NIK technologies, develop standards and extend energy star rating to these systems. • Support demonstration of NIK technology and R&D. • Develop aesthetic NIK systems. • Undertake systematic mapping of NIK technologies and suitable climatic conditions.	• Provide technical training on NIK technologies to all supply and service side stakeholders. • Disseminate knowledge about various options available and possibilities for techno-economically viable options.

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