iFOREST

INTERNATIONAL
FORUM
FOR ENVIRONMENT,
SUSTAINABILITY
& TECHNOLOGY

*Making climate action &*
*environmental protection a peoples' movement*

# About Us

- An **independent non-profit research** and **innovation** organisation, established in 2019 to identify, promote and scale-up solutions for pressing environment-development challenges in the **global south**.

- Our work is guided by a commitment to **sustainability** and **equity**, ensuring that our solutions are socially just, environmentally responsible and economically affordable.

- We conduct evidence-based research, develop **new knowledge** and **innovative solutions**, **convene** stakeholders to increase awareness and **build consensus**, and **partner** with think tanks, civil society, government agencies, philanthropies and industry to **scale up solutions**.

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## Side Event

# Mainstreaming Not-in-Kind Technologies for Greening RAC Systems

Wednesday, 30th October 2024

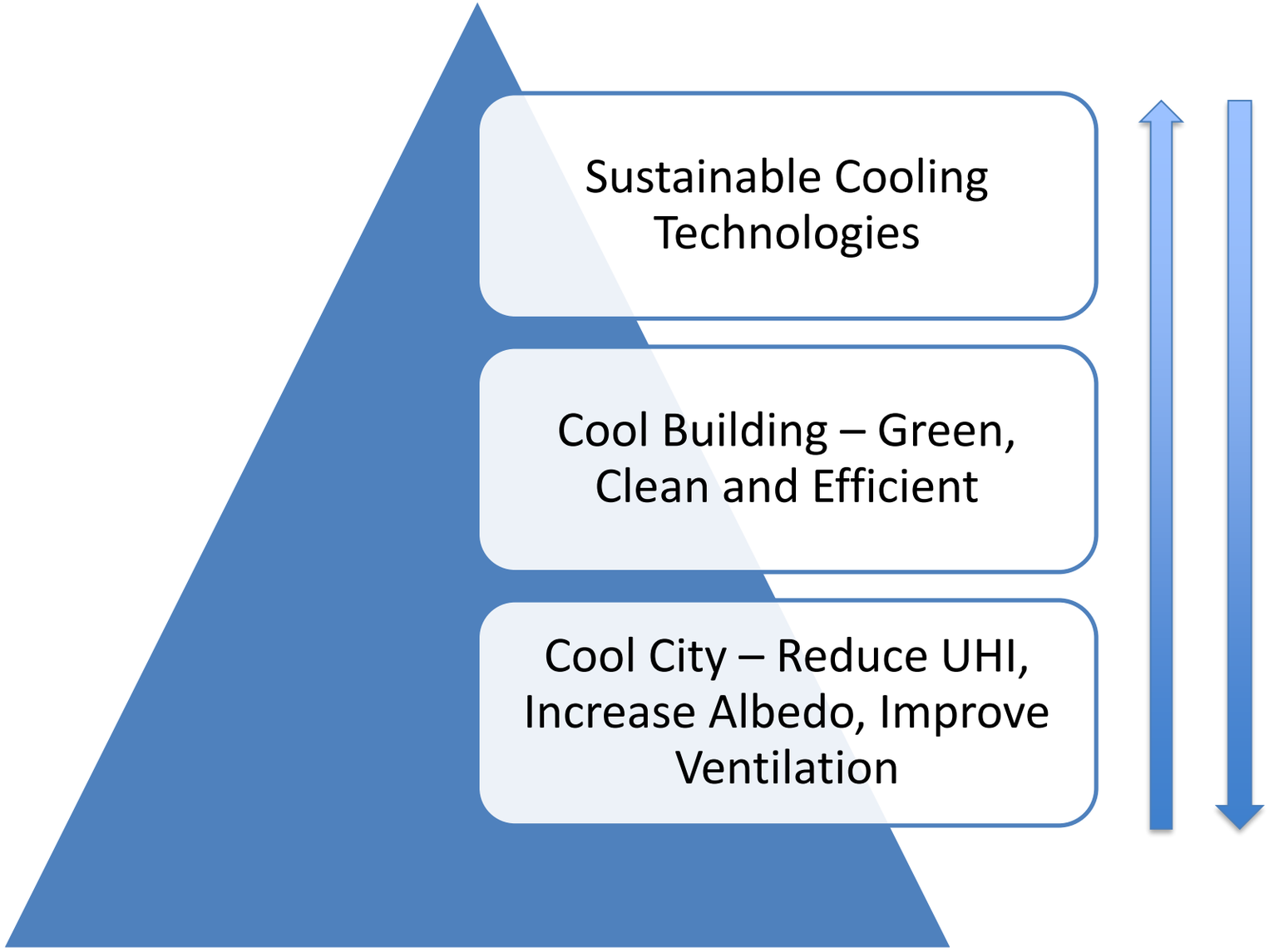
**Panellist**

1. Aditya Narayan Singh, Additional Director – Ozone Cell, MoEFCC, India
2. Chandra Bhushan, President and CEO, iFOREST, India
3. Maas Goote, Founder – Carraway Strategies, Netherlands
4. Nihar Shah, Presidential Director: Global Cooling Efficiency Program, LBNL
5. Omar Abdelaziz, TEAP Member, Egypt
6. Sukumar Devotta, TEAP Member, India

**Moderator**

Ms Nidhi Bali, Director – Clean Energy and Urban Transition, iFOREST

# Cooling Strategy



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# *Side Event – OEWG 46*

# Integrated Heat and Cooling Action Plan


Thursday, 11th July 2024

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## Side Event

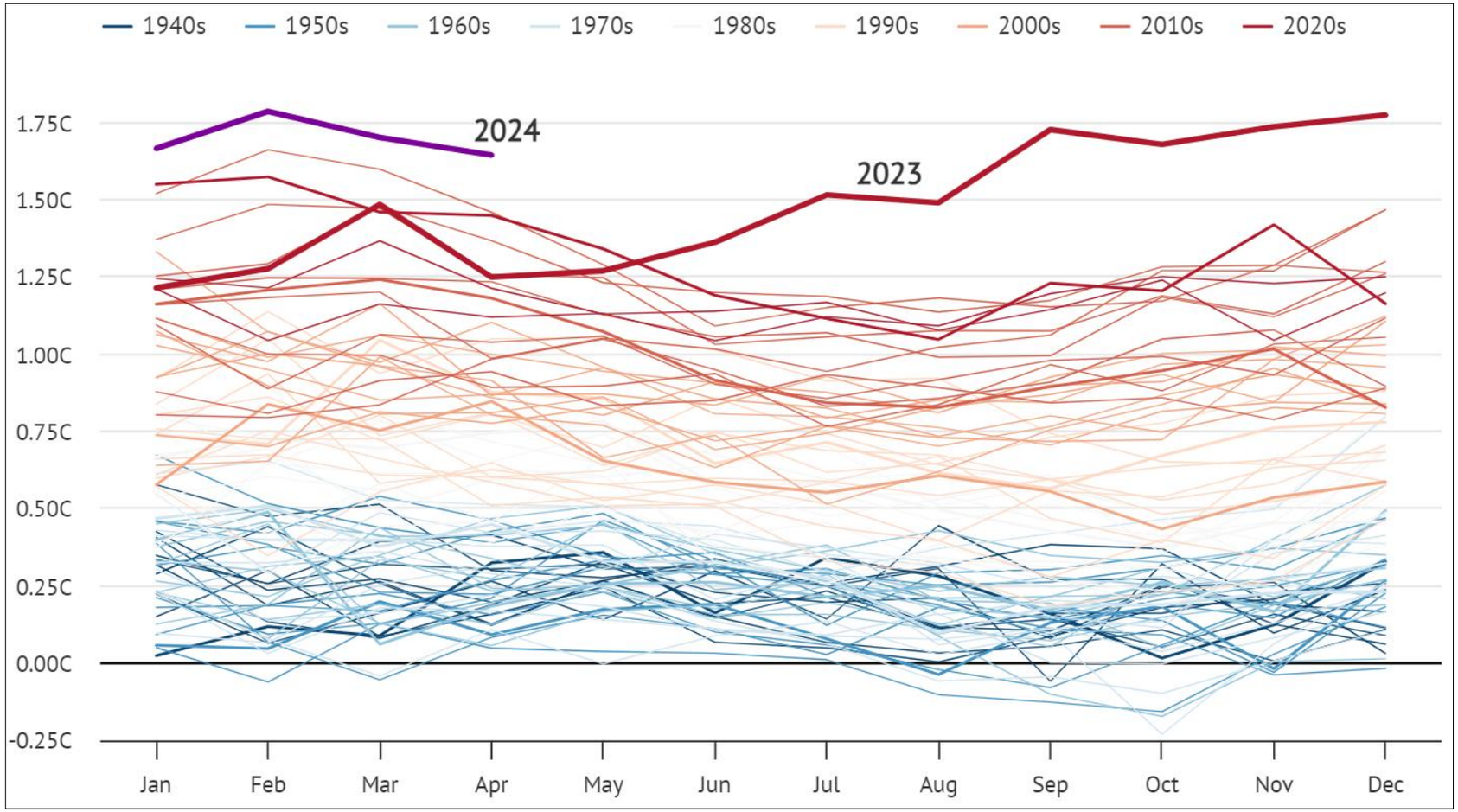
# Mainstreaming Not-in-Kind Technologies for Greening RAC Systems

Wednesday, 30th October 2024

# Increasing Global Temperatures

**2023**
1.45°C above the pre-industrial baseline, the hottest year on record.

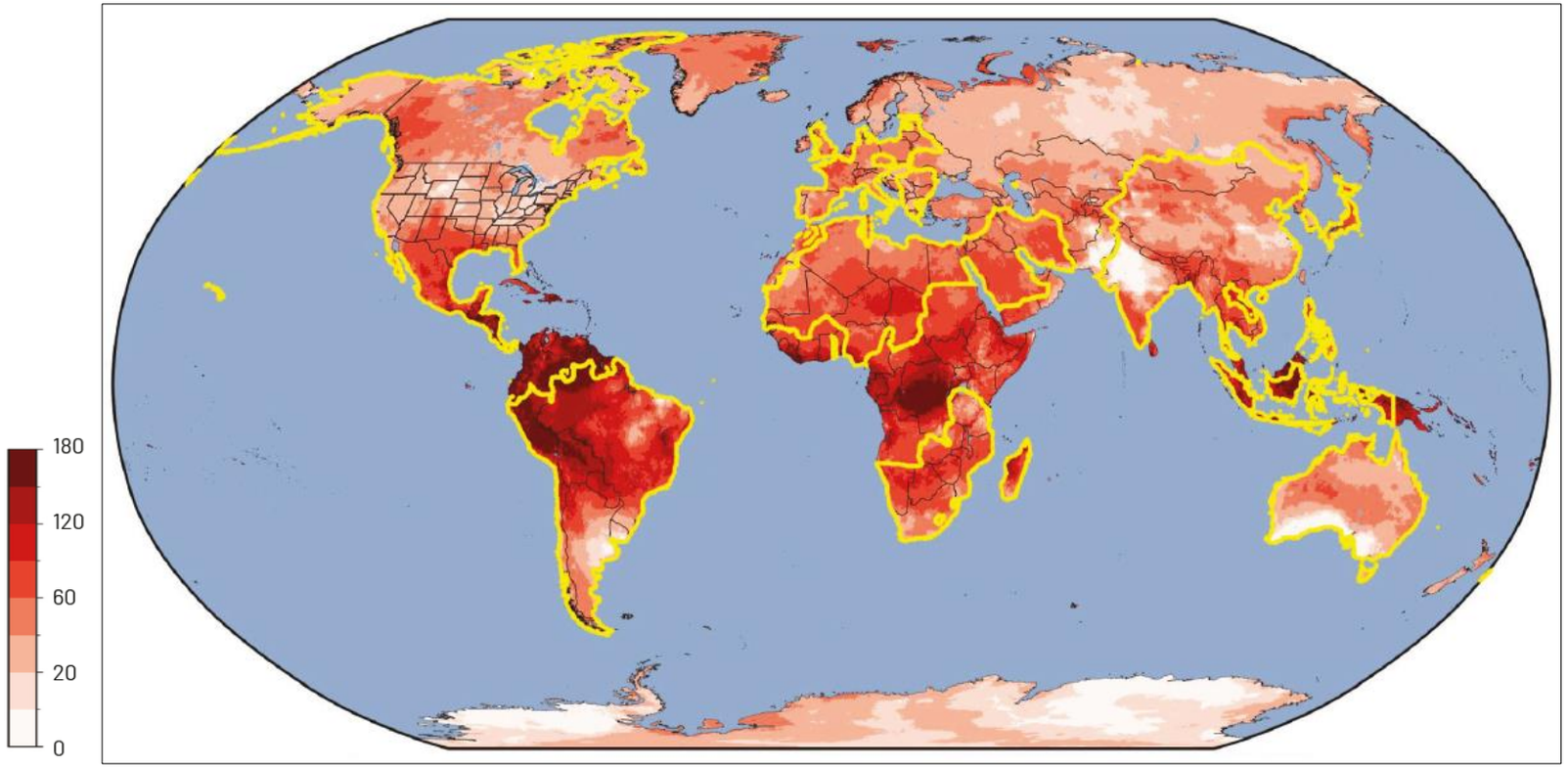
**2024–2030**
High probability of surpassing the 1.5°C guardrail.




**Monthly global average temperature anomaly from the 1940s to 2024**

# Facing the Heat

More than 6.3 billion people -- 78% of the global population -- experienced at least 31 extreme heat days between May 2023 to May 2024 *(defined as days hotter than 90% of temperatures observed in their local area over the 1991-2020 period)*.

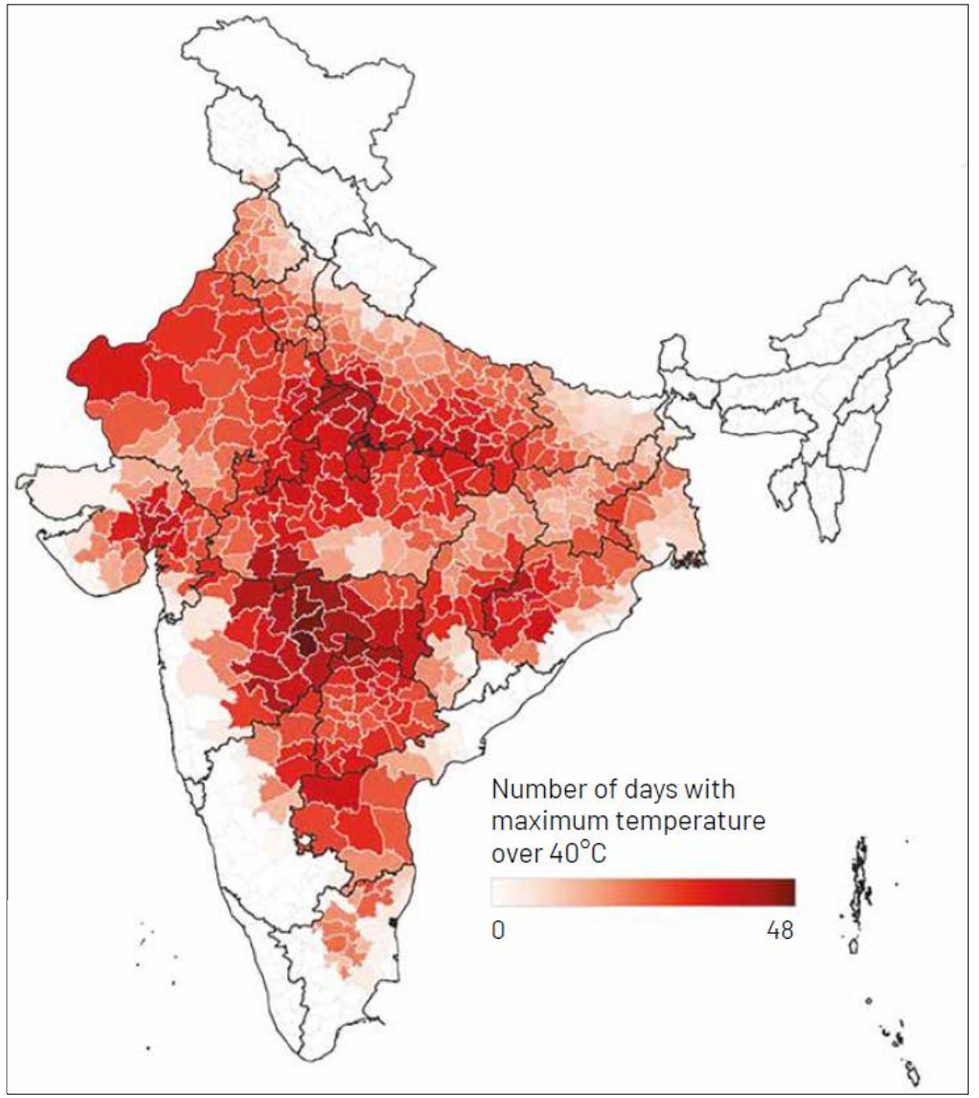



**Number of increased extreme heat days across the world in 2023-2024**

# Unprecedented Heat Extreme in India in 2024

From April until July, India experienced one of its worst-ever and longest-running heat waves.

- Temperatures during this period reached 50°C, with a night-time low of 37°C, the highest ever recorded.
- It left at least 40,000 people with heatstroke and over 100 dead (an underestimation).
- During April and May, over 500 of the 741 districts in India, 70% of the total districts, reported a daily maximum temperature of 40°C at least once.



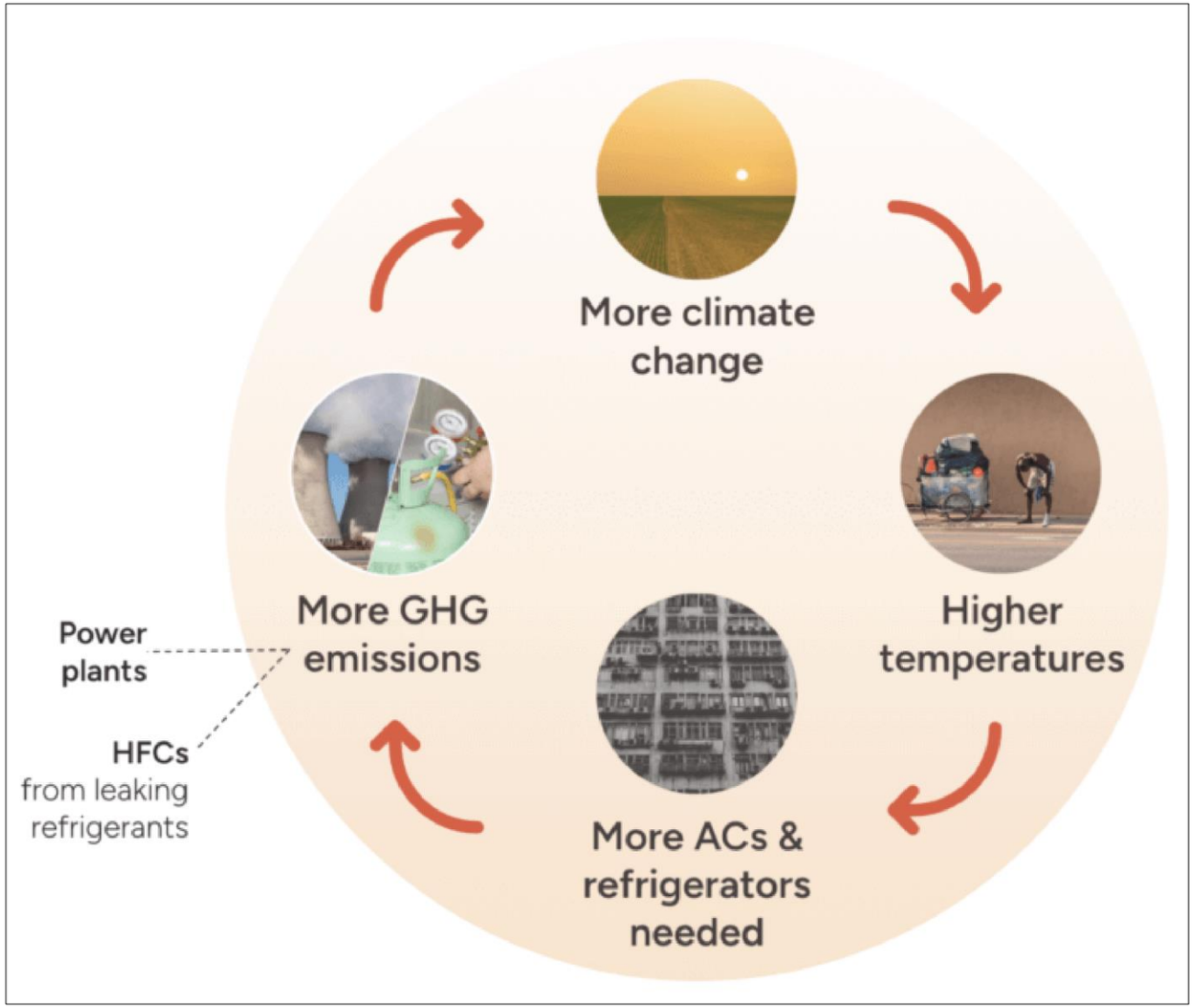

**Number of days with maximum temperature over 40°C**

# Vicious Heating and Cooling Cycle

**Due to increasing temperatures, cooling has become a necessity.**

The increased demand for cooling is resulting in more global warming and creating the need for even more cooling.

We must break this cycle and transform how we cool.




**Vicious heating and cooling cycle**

# The Unprecedented Growth in AC Sales

THE ECONOMIC TIMES | Industry

## AC sales may touch new record of 14 million units annual sales in 2024: CEAMA

The blistering heatwave this year has skyrocketed the **demand** for room **air-conditioners** across the country, expecting a **record** annual sale of around 14 million units, according to the Consumer Electronics and Appliances Manufacturers Association.

## Revolutionizing Comfort: The Future of Europe's Air Conditioning Market

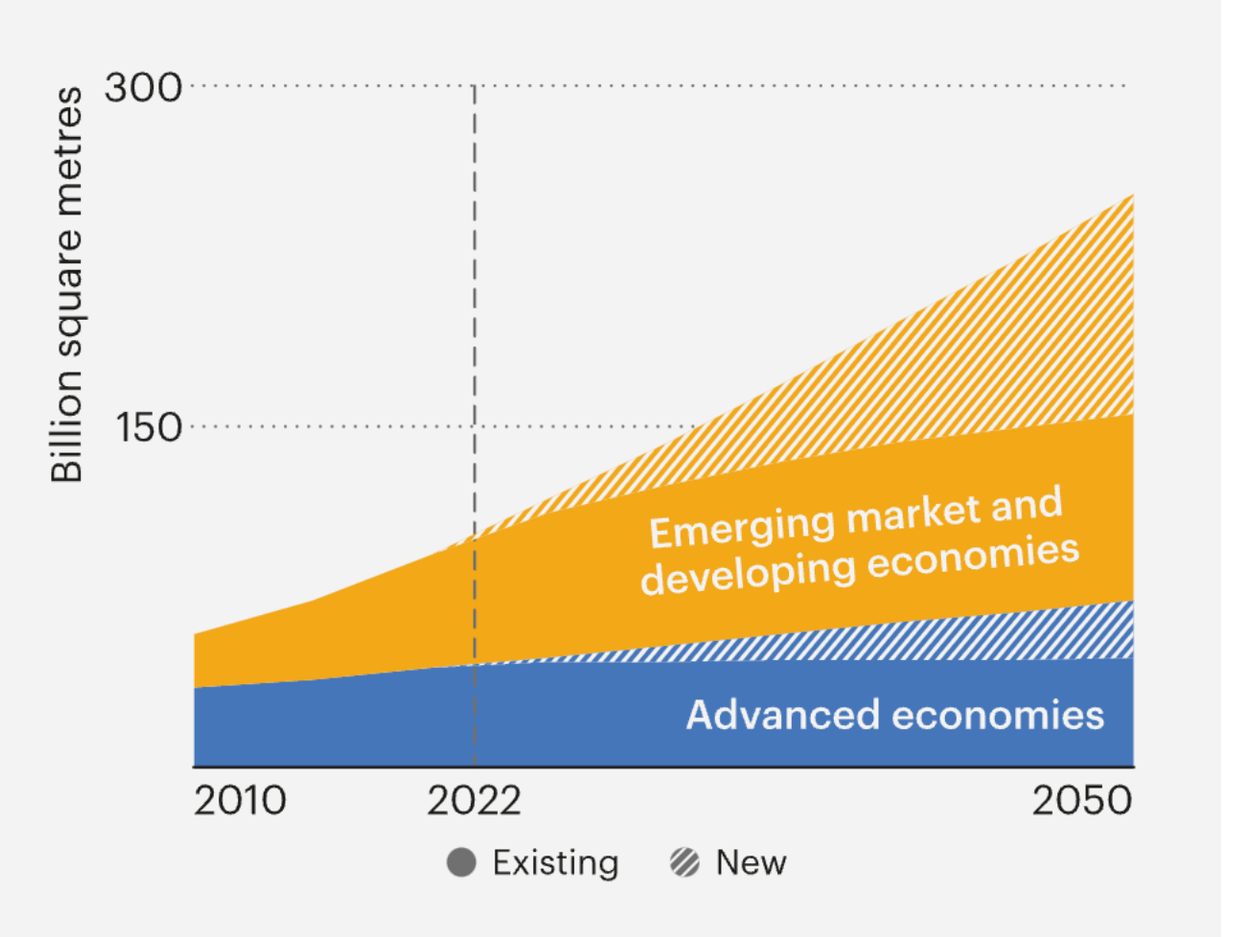
Meticulous Research®
11,558 followers

December 26, 2023

Embarking on a journey toward unprecedented growth, the Europe Air Conditioners Market is poised to reach an astounding **$46.8 billion by 2030**, showcasing a remarkable Compound Annual Growth Rate (CAGR) of 6% during the forecast period from 2023 to 2030. This surge is propelled by a confluence of factors, including escalating temperatures, consumers' escalating need for comfort, and an upsurge in the demand for energy-efficient cooling systems. Yet, amid this ascent, the market grapples with challenges such as the prohibitive costs of air conditioners.

# Increasing Cooling Demands

Cooled floor area more than doubles by 2050 – 105 billion sq.m in 2022 to 250 billion sq.m in 2050

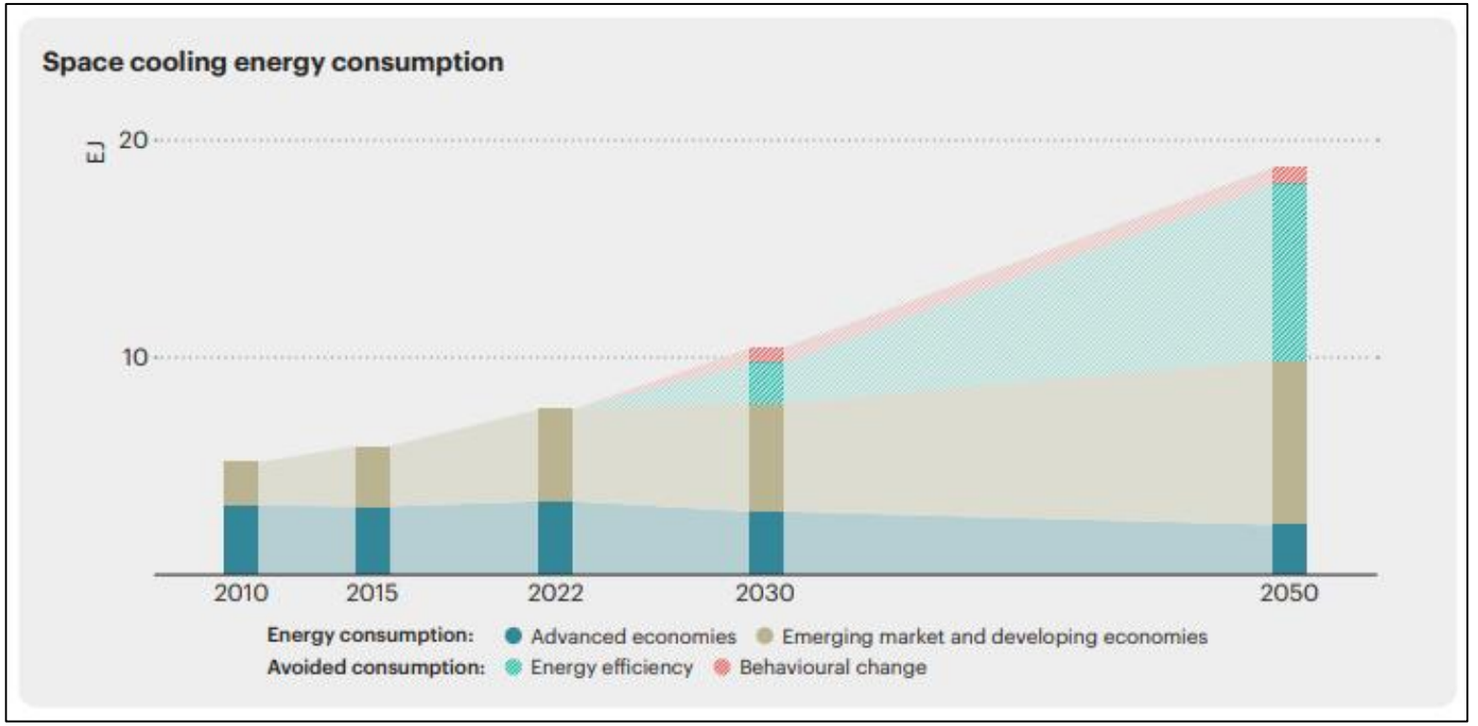



IEA Report – Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach 2023 update

# Increasing Energy Demands

Space cooling energy consumption is set to more than double by 2050 with no action taken.

The increased energy demands for cooling have led to the installation of new fossil-fuel power plants. **This has slowed the decarbonisation process and heightened reliance on fossil fuels for power generation.**

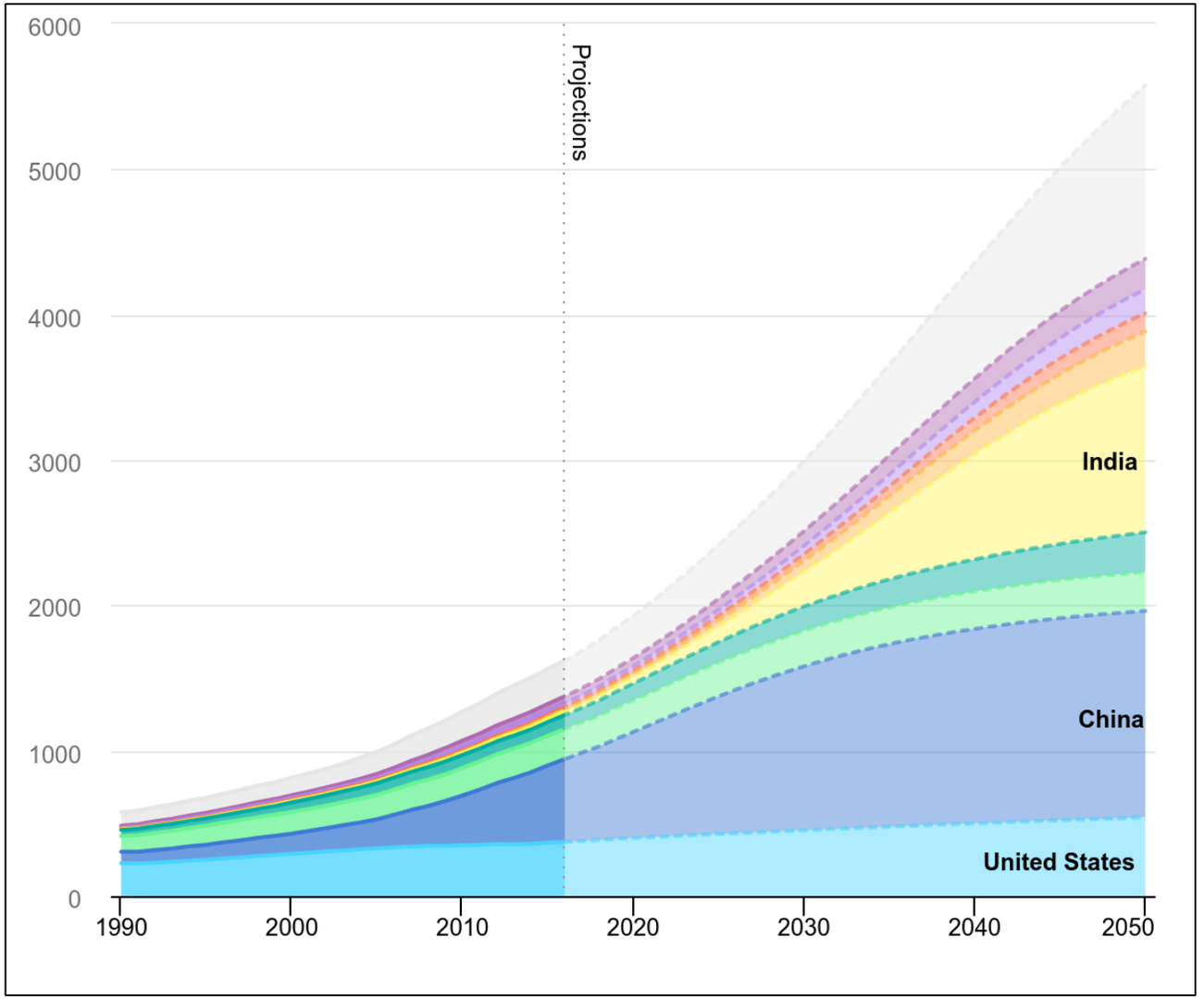



**Increase in energy consumption from space cooling globally**

IEA Report – Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach 2023 update

# AC Growth Projection

The number of air conditioners in the world are projected to increase from 246 million units in 2016 to 1,194 million units in 2050.




**Global air conditioner stock, 1990-2050**

# The Two Pathways

## The Incremental Approach

Incremental improvements in Vapour Compression Technology to enhance EE and reduce refrigerant emissions.

**OR**

## The Transformational Approach

Pole-vaulting to NIK/Alternate technologies, which does not utilise refrigerants and are far more energy efficient.

# NIK/ Alternate Technology

Adopting non-vapour compression systems and centralised cooling methods like district cooling should be accelerated.

According to ASHRAE research, several alternative cooling technologies are significant energy savings to vapour compression technology.

**RTOC Assessment 2022:** When comparing the Operational Lifetime Cost (OLC) of the 17 widely available technologies (12 NIK and 5 MVC technologies), exhaust recovery evaporative cooling with desiccant medium and direct/ indirect evaporative cooling shows the best OLC.

| NON-VAPOR-COMPRESSION TECHNOLOGY | HEATING OPERATION | COOLING OPERATION | DEVELOPMENT STATUS | EXPECTED COST/ COMPLEXITY[b] | NON-ENERGY BENEFITS | MARKET BARRIERS |
|---|---|---|---|---|---|---|
| Thermoelastic[c] | ✓ | ✓ | R&D | Comparable | | Reliability Risks |
| Membrane Heat Pump[c] | | ✓ | R&D | Comparable | Air Quality, Demand Reduction | Water Use |
| Absorption Heat Pump | ✓ | ✓ | Commercially Available | Moderately Higher | Can Use Low-Grade Thermal Energy, Demand Reduction | Toxicity and/Or Reliability of Working Fluids |
| Evaporative Cooling | | ✓ | Commercially Available | Comparable | Demand Reduction | Water Use, Reliability Risks, Only Applicable in Hot-Dry Climate Regions |
| Evaporative Liquid Desiccant AC | | ✓ | R&D | Significantly Higher | Demand Reduction | Water Use, Reliability Risks |
| Magnetocaloric | ✓ | ✓ | Emerging | Moderately Higher | Noise Reduction | |
| Ground-Coupled Solid Desiccant AC | | ✓ | R&D | Significantly Higher | Can Use Low-Grade Thermal Energy, Air Quality, Demand Reduction | Only Applicable In Hot-Humid Climate Regions |
| Vuilleumier Heat Pump | ✓ | ✓ | Emerging | Slightly Higher | Improved Reliability, Demand Reduction | |

**Alternative technologies to vapour compression system**

# Way ahead for the Montreal Protocol

- Bring more technical capacity on NIK/Alternate technologies in RTOC and TEAP.
- MLF to develop matrix to fund NIK as equivalent to MVC
- Build capacity of countries on NIK/Alternate technologies