

# *f*AIR CONDITIONING



## Cooling down the fair way.

The (F)air conditioning campaign was created by a confluence of consumers and associations protecting the planet's climate. Our program aims at reducing bills and greenhouse gas emissions from the indoor cooling sector.



[www.noé21.org](http://www.noé21.org)



[www.cbalance.in](http://www.cbalance.in)

The Problem: Climate Change

# CHENNAI FLOODS DUE TO IMPACT OF GLOBAL WARMING

- Centre for Science and Environment (CSE), Dec. 2015

*On Chennai:*

**3 MILLION**

people left without  
access to food and  
clean drinking water

- The Guardian

*On Chennai:*

"We are feeling the  
impact of fast-paced  
climate change."

- PM Narendra Modi

"The global average temperature has increased by less than 1 degrees. Think what  
will happen at 2 degree increase."

- Centre for Science and Environment (CSE)

## The Problem: Energy Insecurity

# 300 MILLION INDIANS LIVE WITHOUT ELECTRICITY

- Council on Energy, Environment and Water (CEEW)

India's poverty rate falls to 12.4%, electricity plays big role

- World Bank, Oct 2015

“Living without electricity is like being blind,” she says. “You move around your home and cook without being able to see. Even in the day it is the middle of the night.” -Leena, Goudaguda village in Odisha





Climate

Justice



Airconditionin  
g



Justice

# Inception

*In 2012, the Fairconditioning founding team introspected: even if environmental policies were formulated by the government ‘tomorrow’, compelling all new buildings in India to be energy efficient and have a low carbon footprint, would India’s students, professional and commercial enterprises have the motivation and skills to adhere to these progressive policies?*

*The responses of built-space experts in India to this question were resounding: clear lacunae exist in India’s academic, professional and executive decision making capacity to precipitate the changes these building energy conservation policies envisage*

*In June 2017, while launching the revised Energy Conservation Building Code (ECBC) of India, Mr. Piyush Goyal (Minister of State, Power) echoed a resonant sentiment: **“the need of the hour is to educate architects about ECBC as a part of their Bachelor’s degree”***

*The above sequence of events validates the Fairconditioning Program’s ‘beginning-of-pipe approach and focus on capacity-building (vs. a pure direct-engagement approach to intervene at a project level) as the most effective means to drastically reduce energy consumption and greenhouse gas emissions from India’s buildings*

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- *Solutions*
- *Intervention*

**the Head** – *Environment, Economy, Education, Profession*



# the Head - Economy

Figure 2. Building Energy Consumption in India

ENERGY  
CONSUMPTION



Commercial and residential buildings  
Everything else

ELECTRICITY  
CONSUMPTION



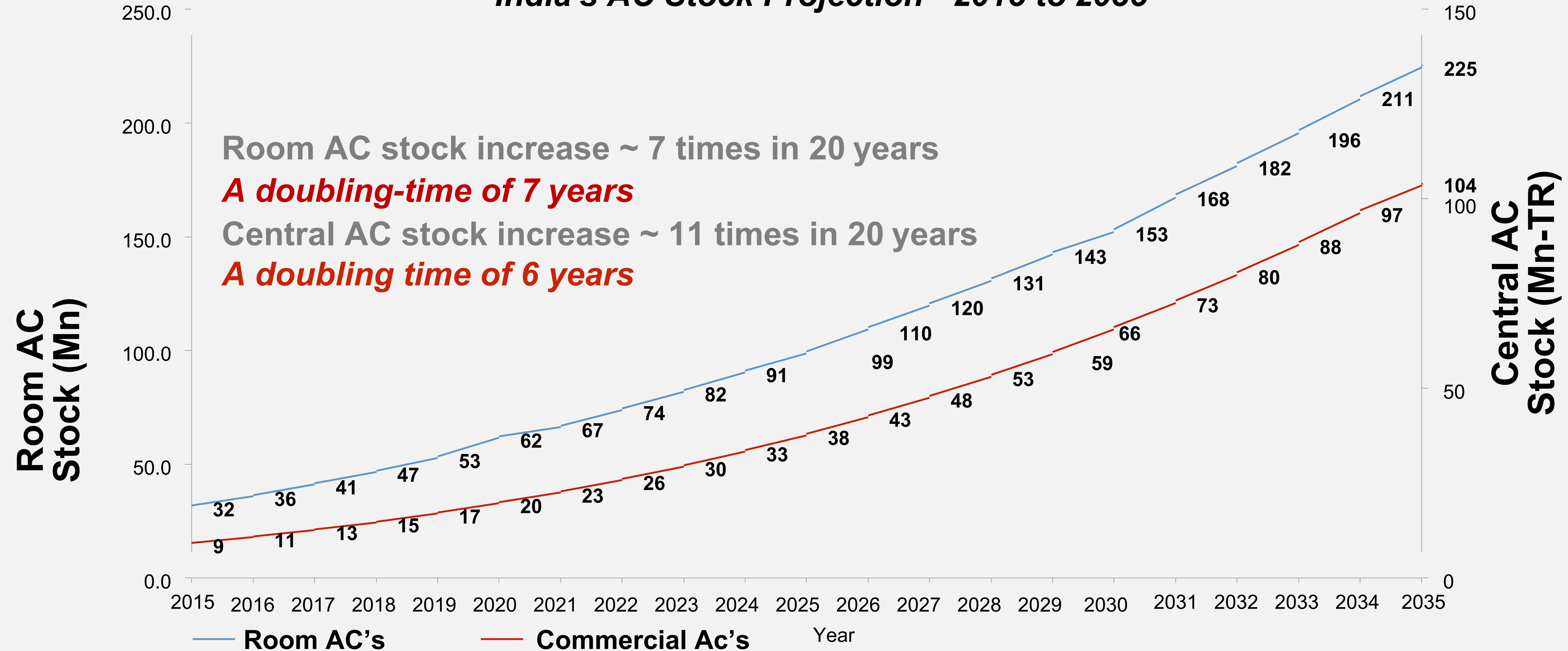
70%

OF THE BUILDINGS THAT WILL EXIST IN  
INDIA BY 2030 HAVE YET TO BE BUILT

Source: Energy Conservation and Commercialization (ECC-III), 2010.

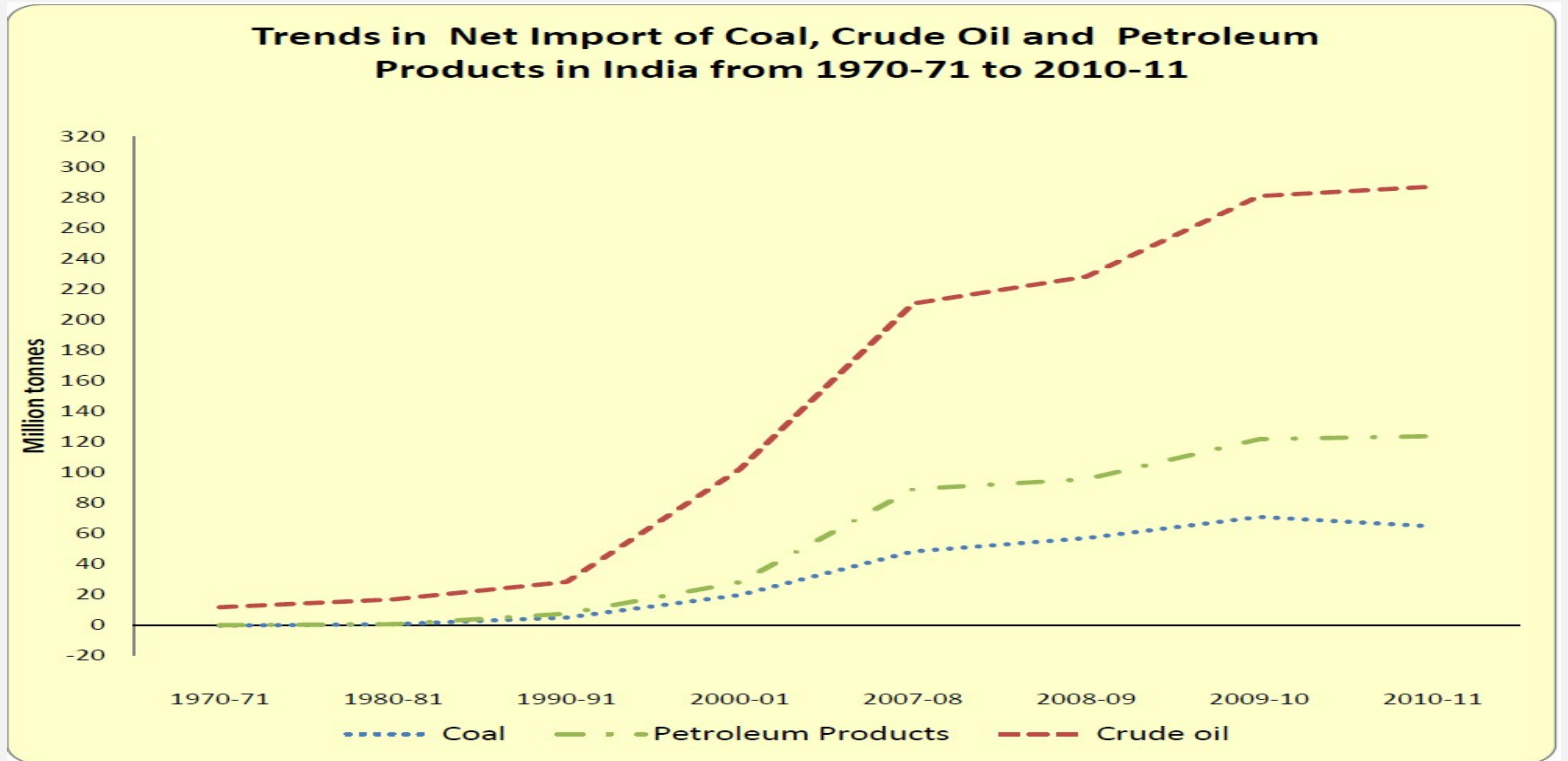
# *the Head* - Economy

## India's AC Stock Projection - 2015 to 2035



Source: Fairconditioning & Chaturvedi V, Sharma M, Chattopadhyay S, and Purohit P. HFC emission scenarios for India. CEEW report

# *the Head* - Economy

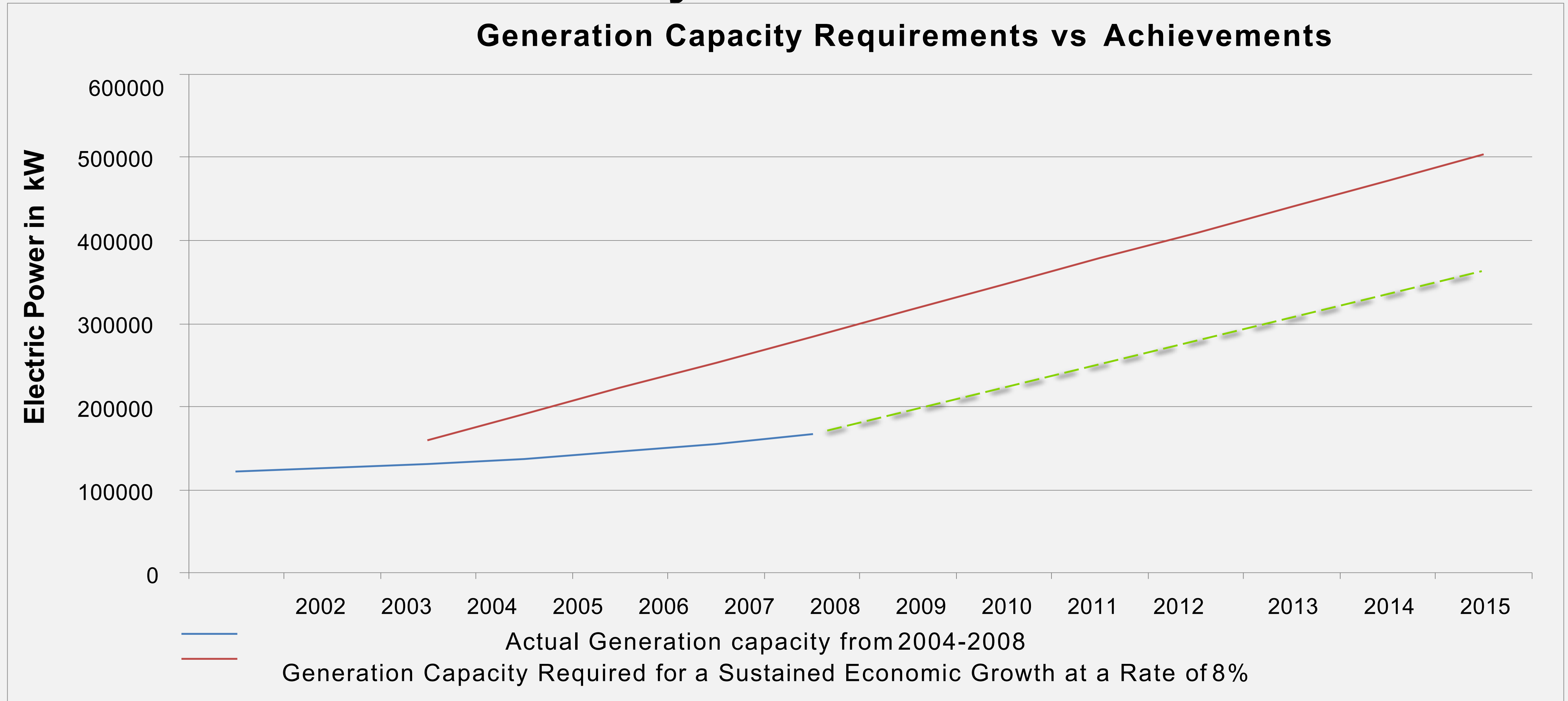


Source: Energy Statistics 2012 Central Statistics Office, Ministry Of Statistics And Programme Implementation , Govt. of India

# *the Head* - Economy

## Electricity Scenario in India

### Generation Capacity Requirements vs Achievements



Source: Central Electricity Authority General Review 2006 & 2009 and Planning Commission's Integrated Energy Policy Report 2006

# *the Head - Economy*

Energy Demand in India by 2030

The requirement

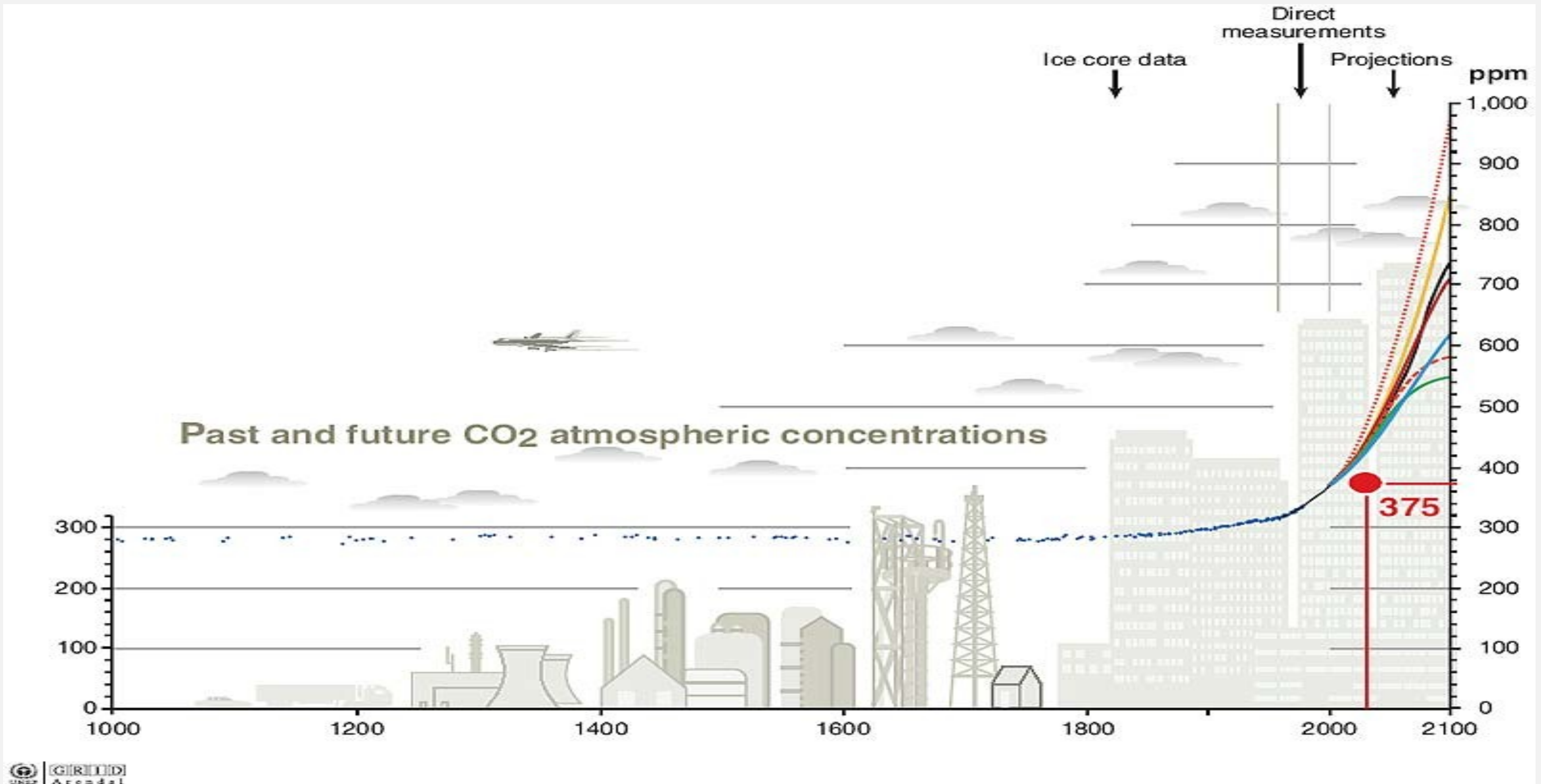
× 4

The availability

?

Source: Schneider Electric:Energy Efficiency

# *the Head* - Environment



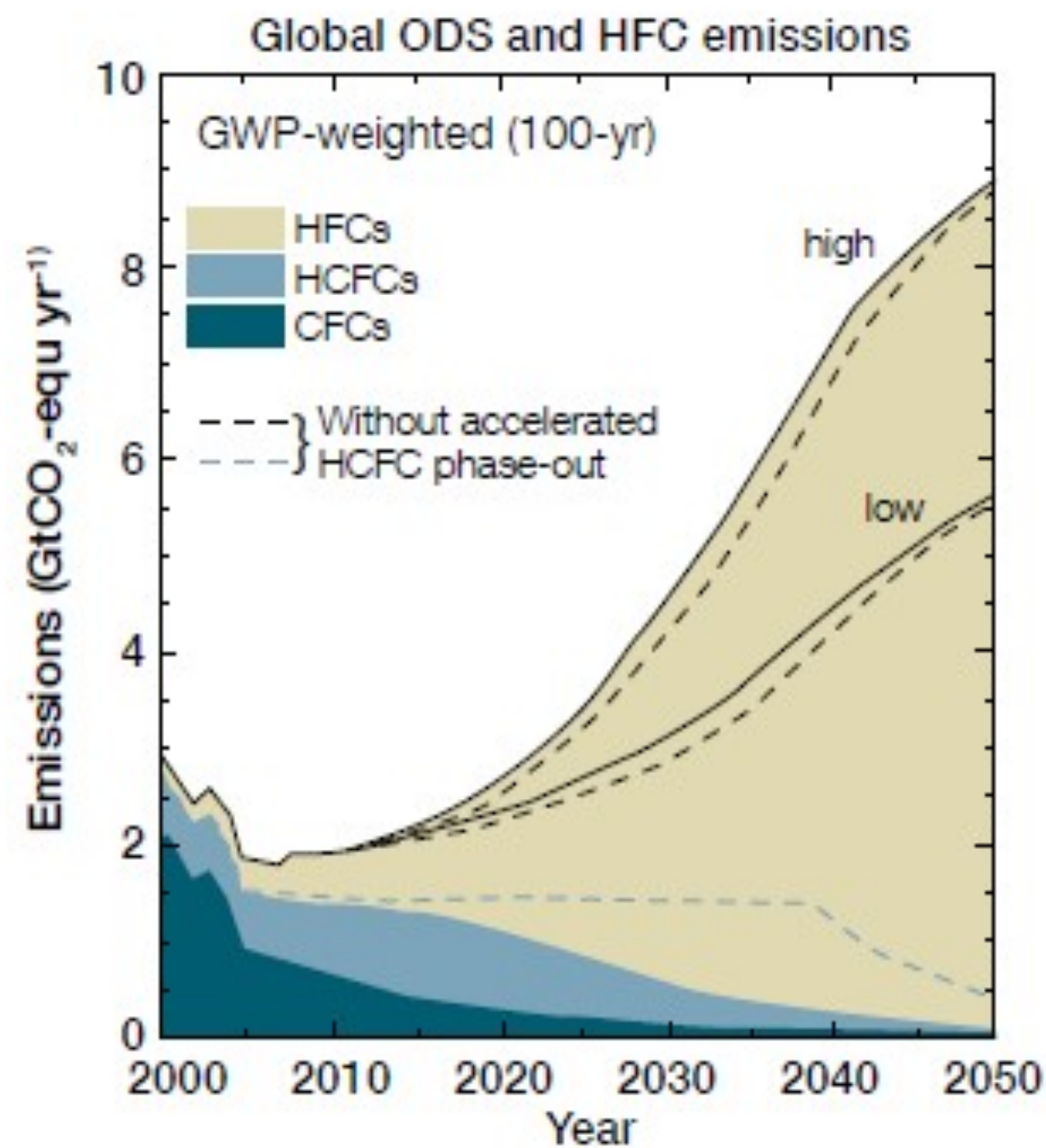
Source: Vital Climate Graphics based on the IPCC's Third Assessment Report (TAR) Copyright © 2005: UNEP, UNEP/GRID-Arendal

# *the Head* - Environment

## Increased Refrigerant Emissions

**Fig 1: Growing HFC emissions**

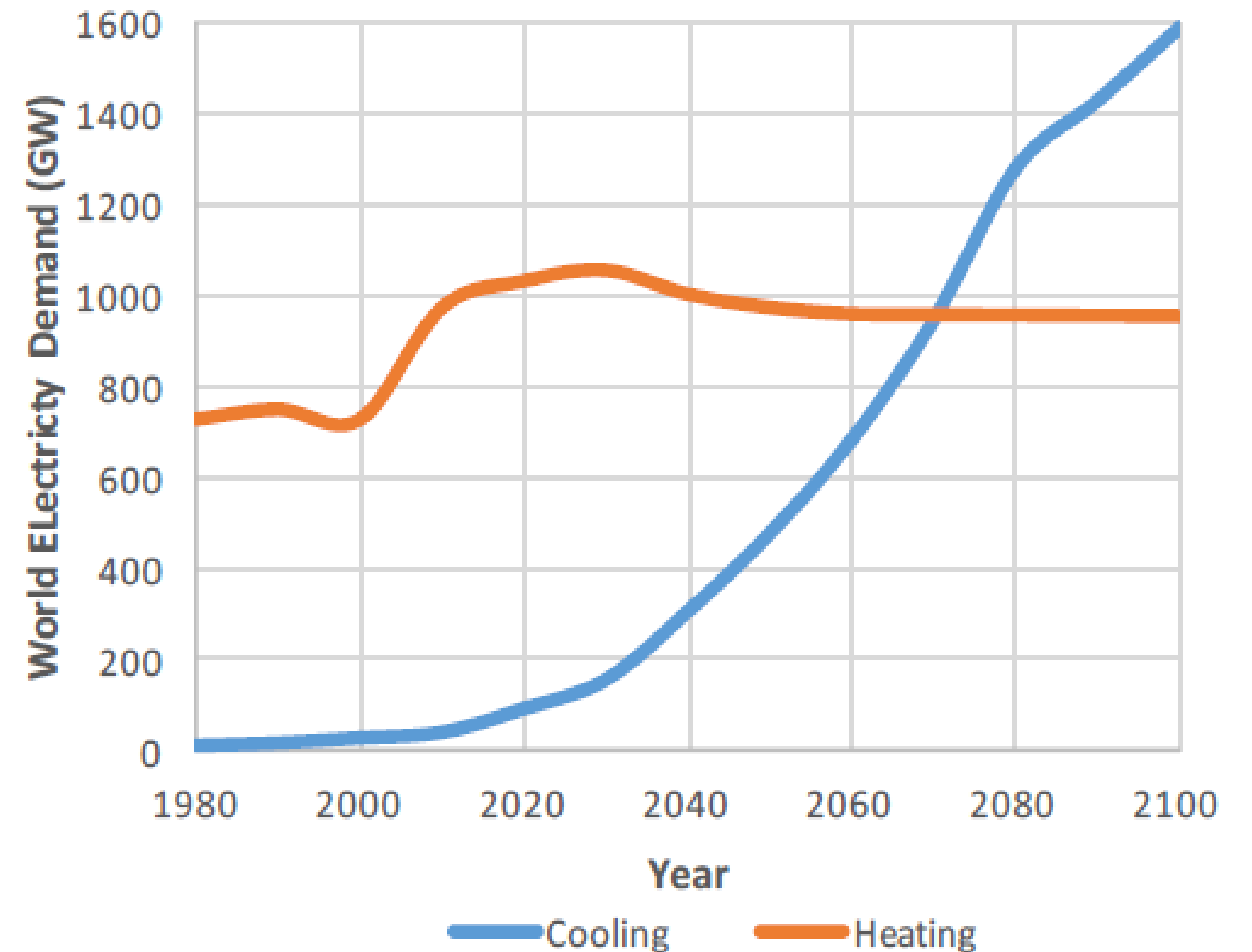
This graph shows that while CFC and HCFC emissions go down (the light-blue blocks), HFC emissions (the light-brown block) will overtake them by around 2025, and rapidly increase up towards 2050.



SOURCE: Velders et al, 2009

## Increased Cooling Demand

**World Electricity demand (GW)**



# *the Head* - Environment

– in fact, since the implementation of the UNFCCC's Kyoto Protocol, HFC emissions have risen by 15% a year.<sup>3</sup>

HFCs don't deplete the ozone layer like their predecessors, but they are very powerful greenhouse gases.

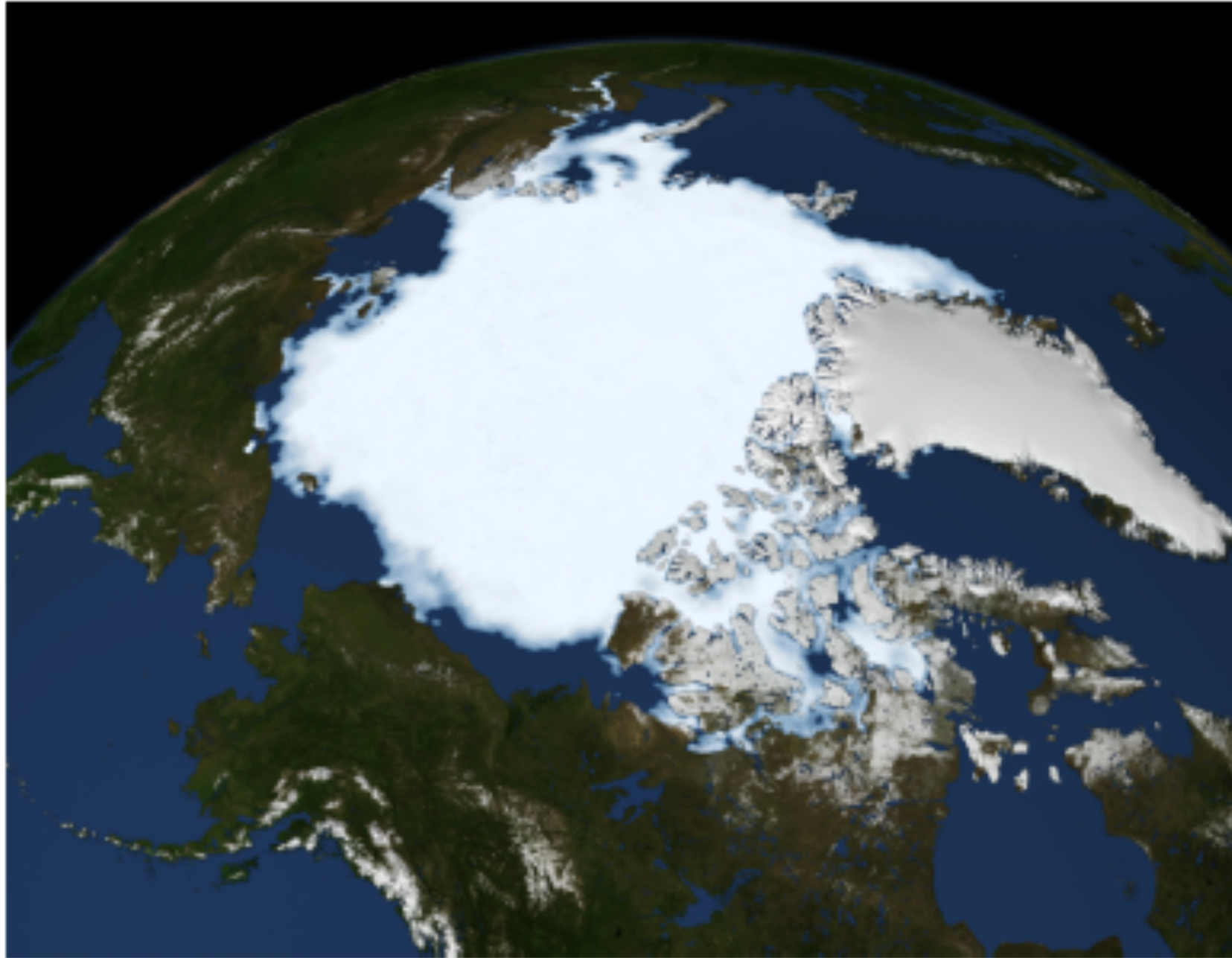
## **If left unchecked, HFCs will counteract other global climate action**

The consequences of the rapid growth in HFC emissions are shocking - a recent peer-reviewed report by top scientists shows that if we only focus on reducing CO<sub>2</sub> and do nothing about HFCs, they will be responsible for between **28% and 45%** of carbon-equivalent emissions by 2050. Even if we don't act on CO<sub>2</sub>, HFCs would still be responsible for between **10% and 20%** of carbon-equivalent emissions by 2050.

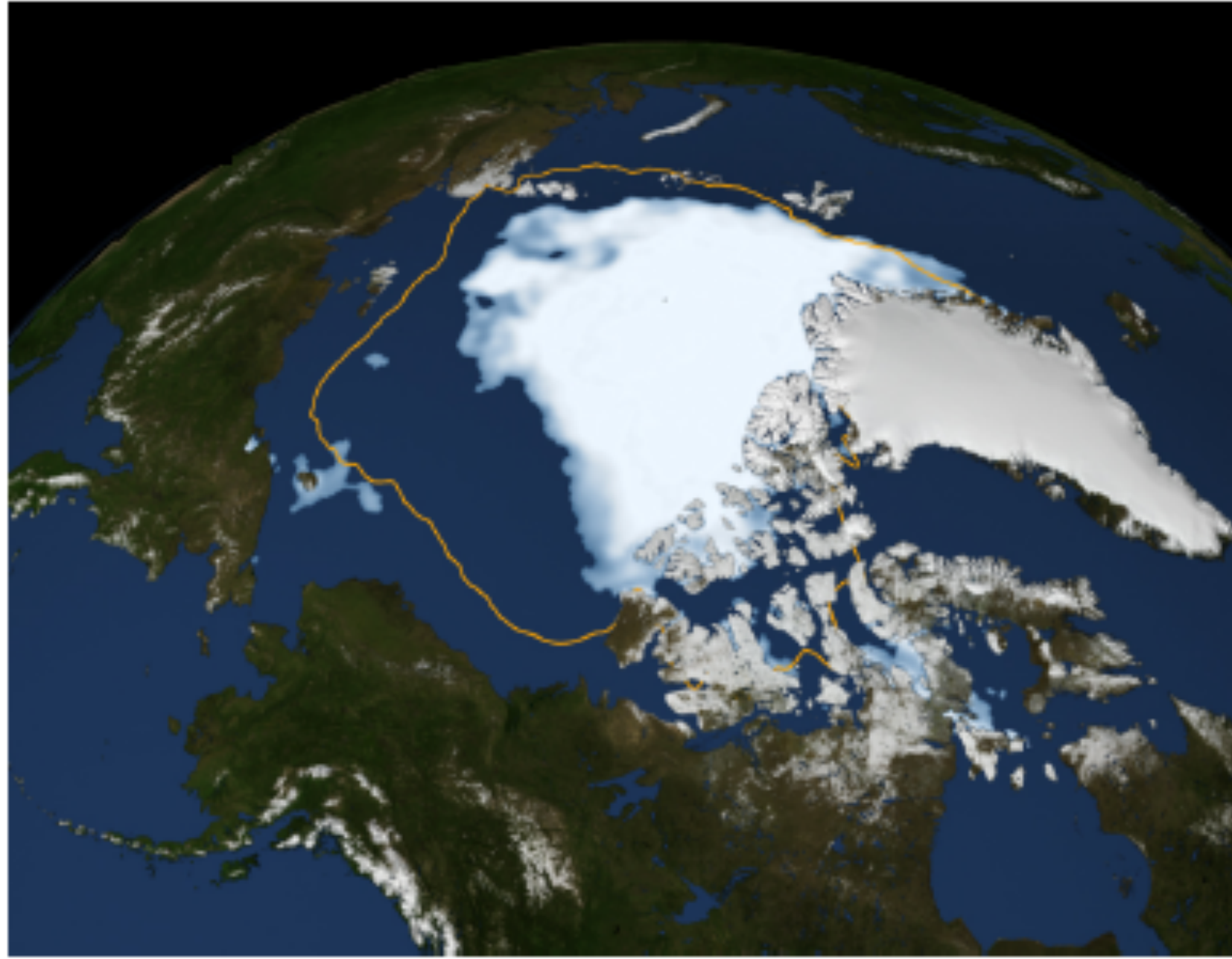


# *the Head* - Environment

1980

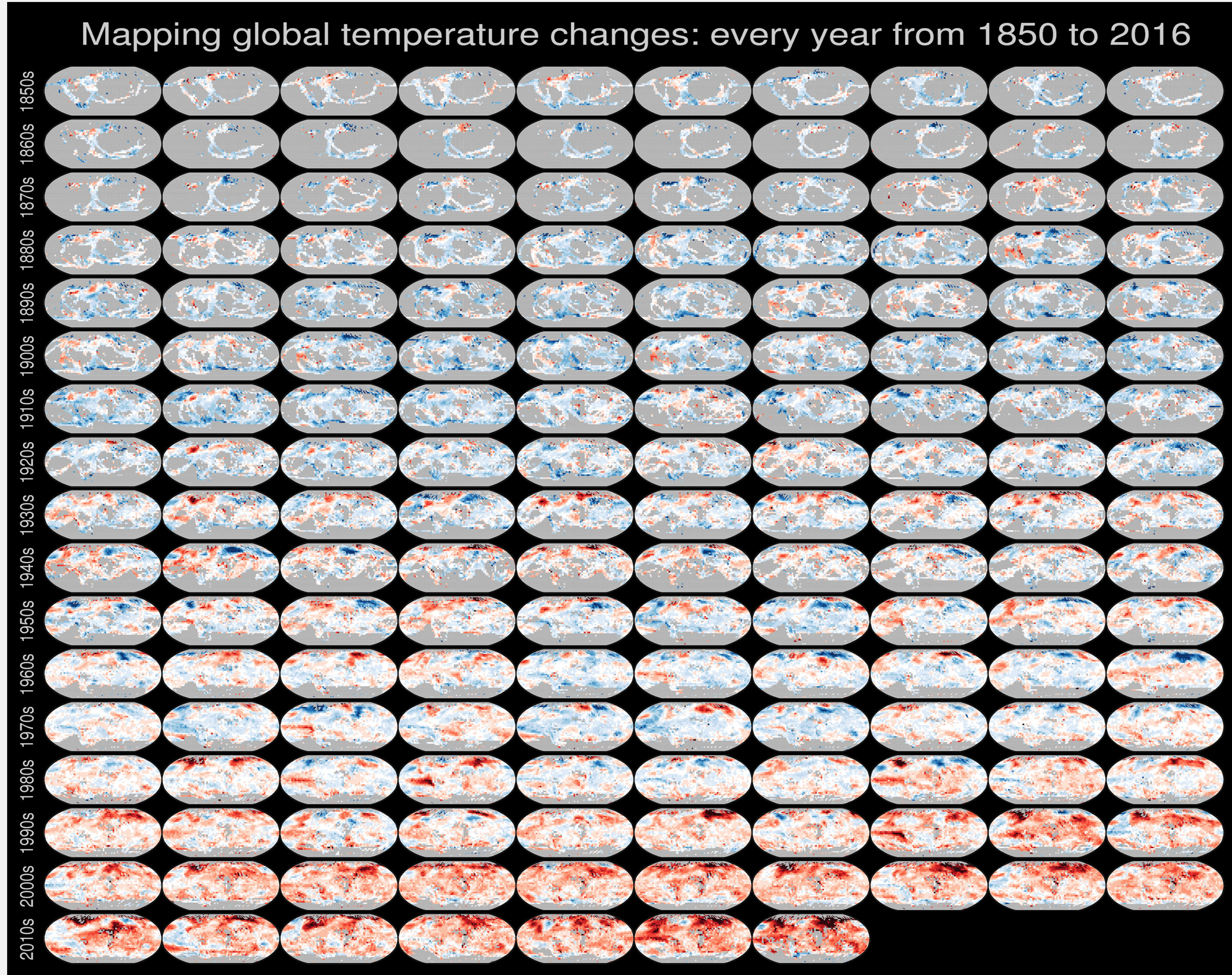


2012



Source: NASA, 2013

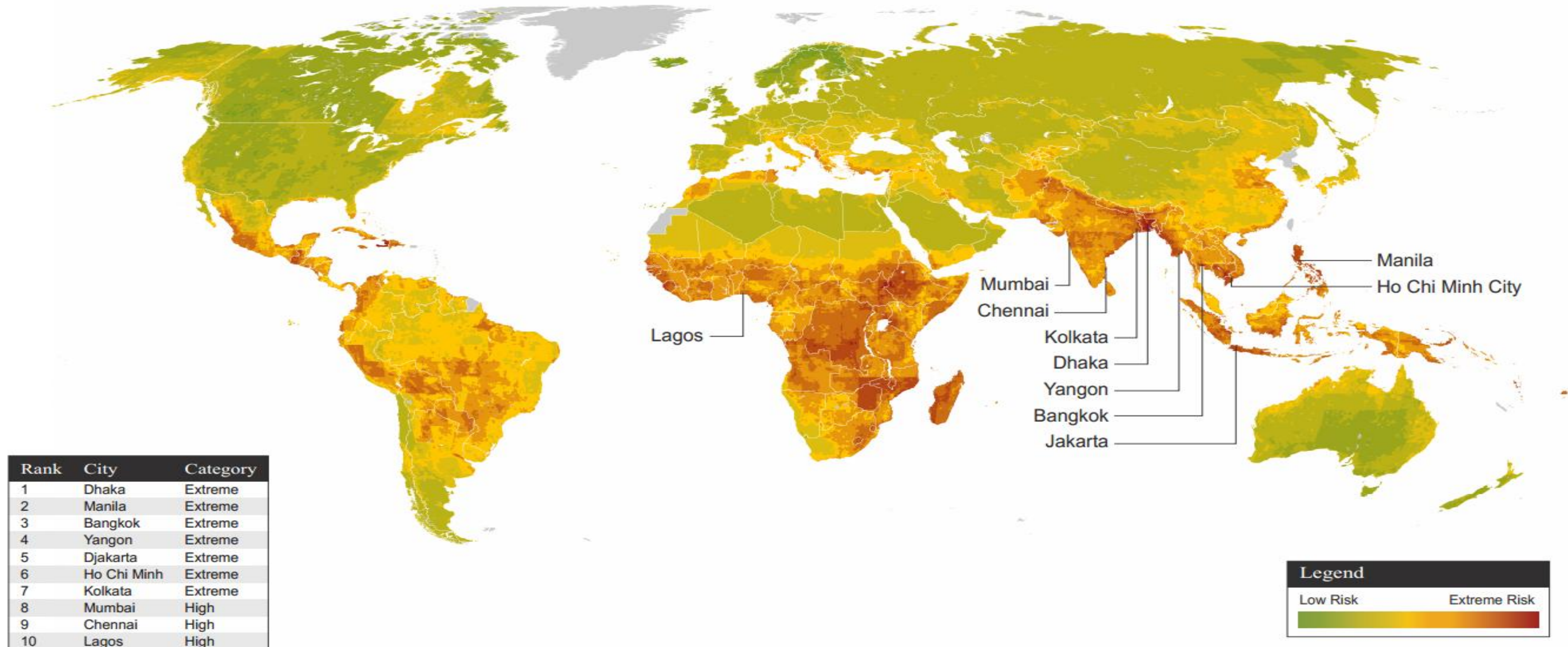
# *the Head* - Environment



Source: HadCRUT4.4 dataset, Ed Hawkins Climate scientist  
in the National Centre for Atmospheric Science (NCAS),  
University of Reading

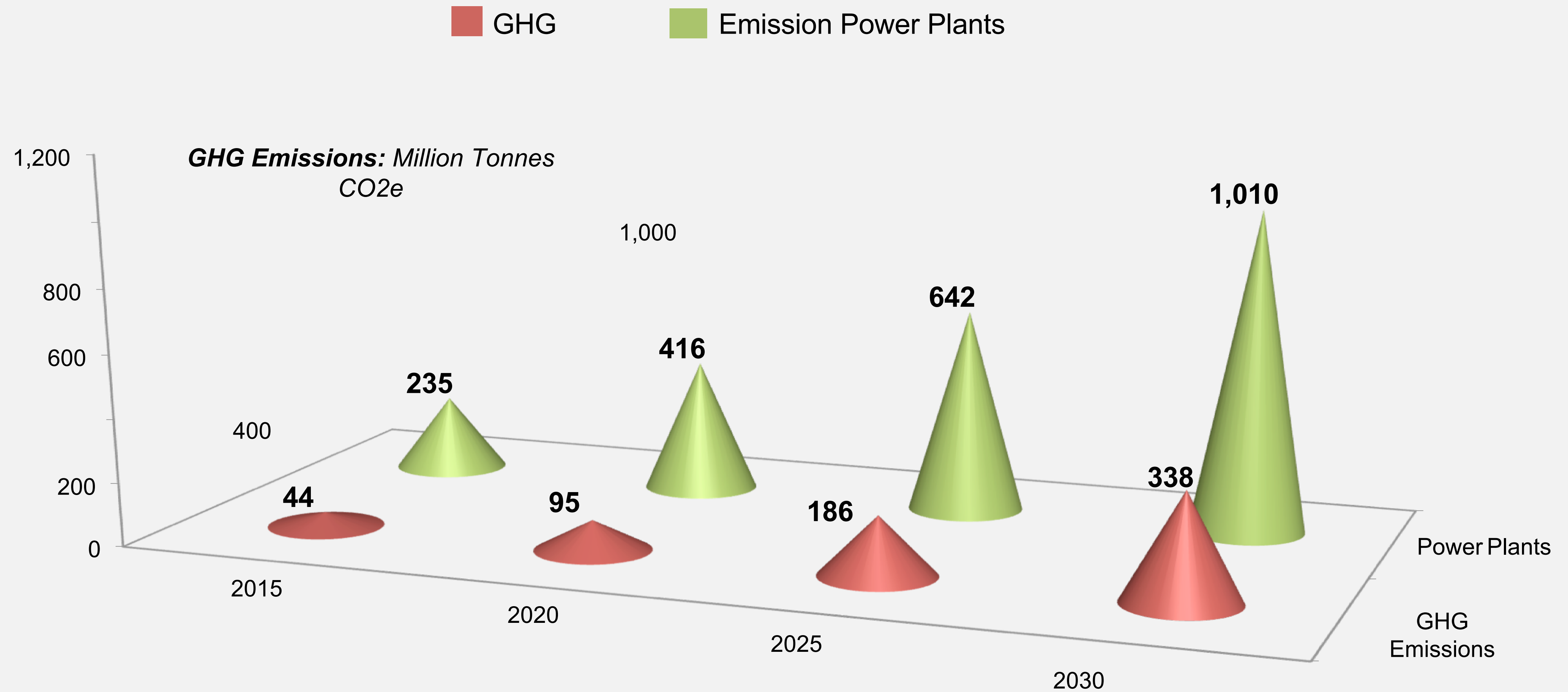
# the Head - Environment

Climate Change Vulnerability Index 2013 – Most at risk cities

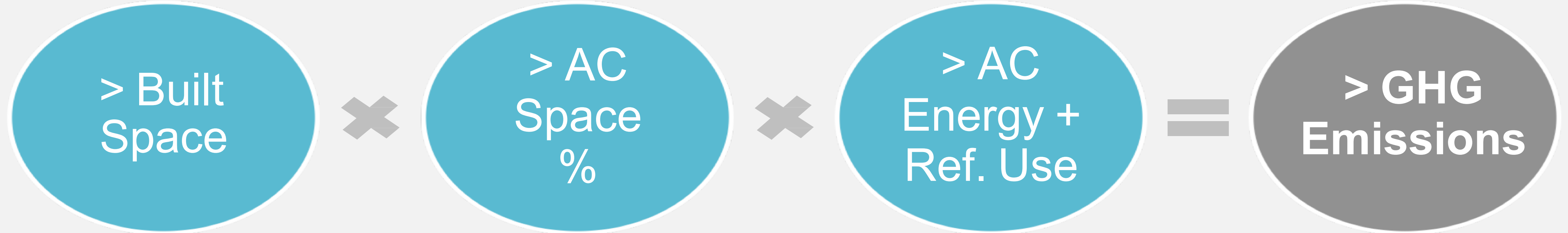


# *the Head* - Environment & Economy

## Power Plants & GHG Emissions from ACs - 2015 to 2030

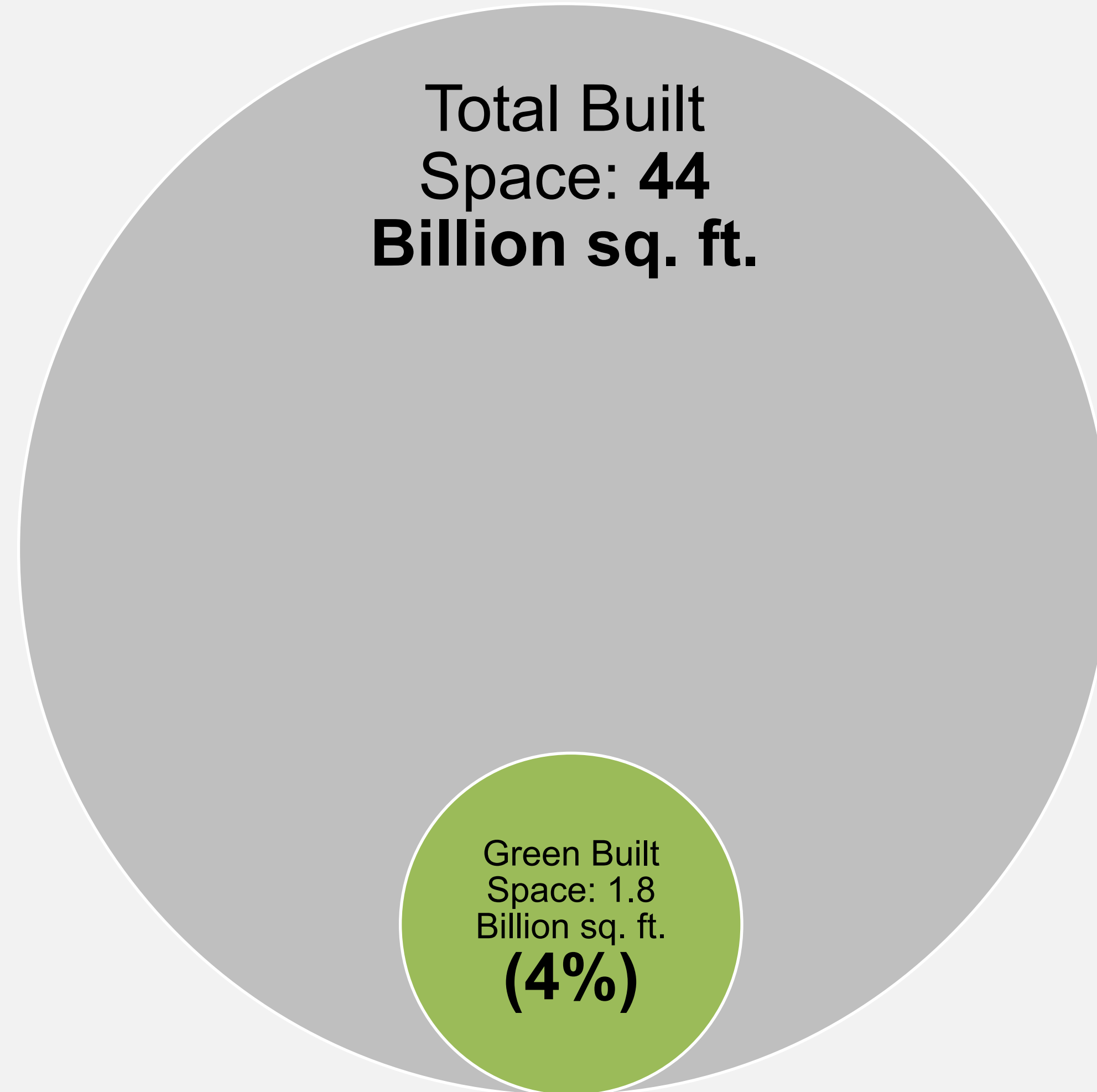


# *the Head* - Environment & Economy



# *the Head* - Industry

## Green Building Rating Systems – Enough?



# *the Head*

Given the limited professional capacity in India to design energy efficient buildings, the **real-estate** economy must exert a **greater ‘pull’** for these **thoughtfully designed buildings**.

**If large developers, builders, renters, and buyers do nothing, however,**

In 2030

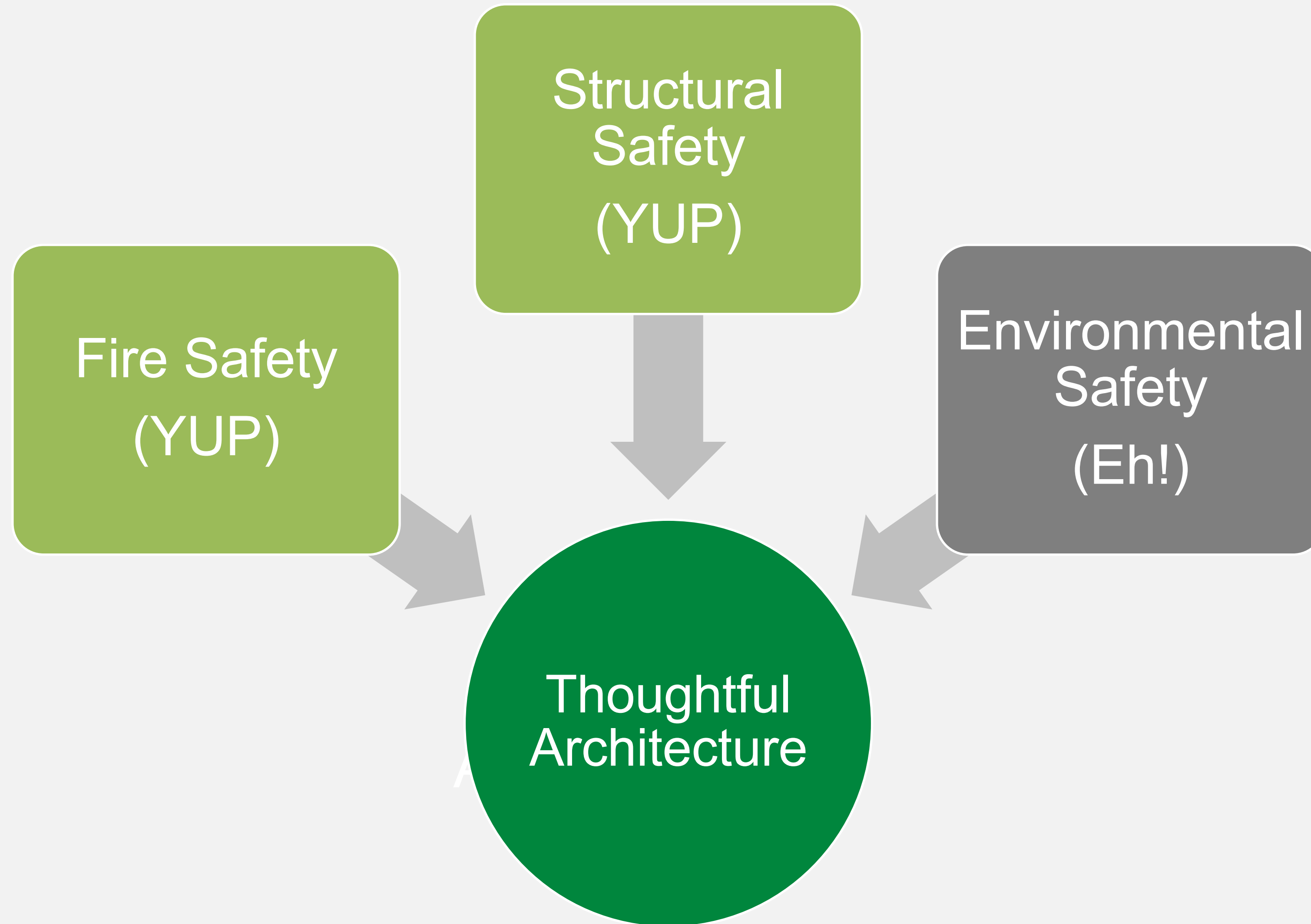
Airconditioning's Carbon Pollution from India ~ 338 Million Tonnes CO<sub>2</sub>e per year

**~ 1.35 Billion Trees** required per year<sup>1</sup>

# **the Heart** – *Responsibility, Justice, and Ethics*



# *the Heart* - Responsibility



# *the Heart* - Ethics

A typical Split-Unit AC in India ~ 24 ceiling fans<sup>1</sup>

**41 million AC users cause power cuts depriving 25-fold the number of persons of power to operate fans during India's harsh summers**

1. A1.5 TR, 3-Star Split AC consuming approximately 1200 W equals the power consumption of 24 fans consuming 50 W each

# the Heart -Justice

<b>Vulnerable Region</b>	<b>Migrant Levels in 2100</b>
West Bengal	~10 million
Coastal Maharashtra (around Mumbai)	~10-12 million
Coastal Tamil Nadu	~10 million
Coastal Andhra Pradesh	~6 million
Gujarat	~5.5 million
Coastal Orissa	~4 million
Western Rajasthan	~1.4 million
Northern Karnataka	~1.3 million
Madhya Pradesh	~1.2 million
Interior Maharashtra	~1 million
Northern Andhra Pradesh	~1 million
Southern Bihar	~1 million

**TABLE 3.**

**REGIONS IN INDIA THAT WILL LIKELY EXPERIENCE THE HIGHEST LEVELS OF OUT-MIGRATION DUE TO SEA LEVEL RISE AND DROUGHT/GLOBALIZATION.**

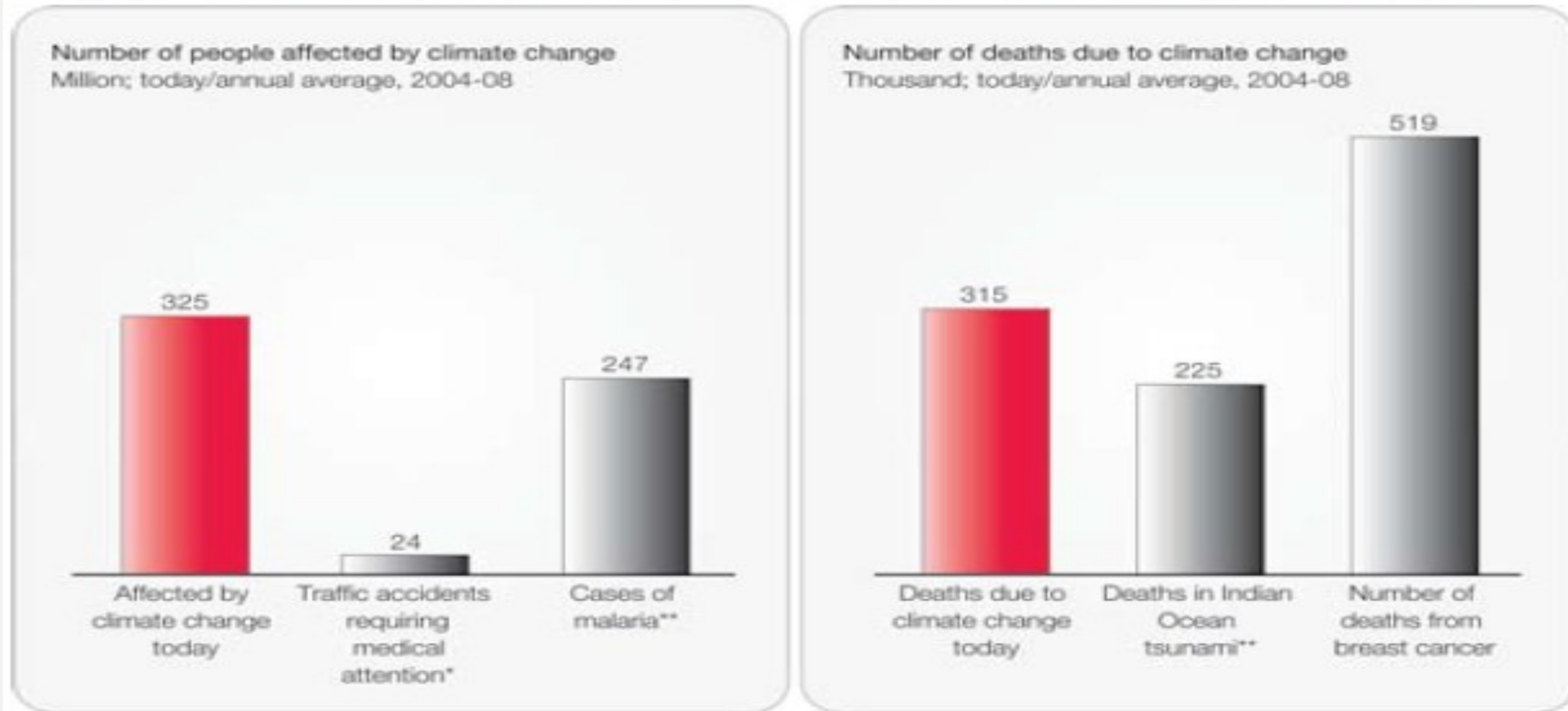


**CLIMATE MIGRANTS IN SOUTH ASIA:  
ESTIMATES AND SOLUTIONS**

Department of Humanities and Social Sciences,  
Indian Institute of Technology Madras.

# the Heart - Justice

**Figure 1** — Comparing human impact of climate change today with other global challenges

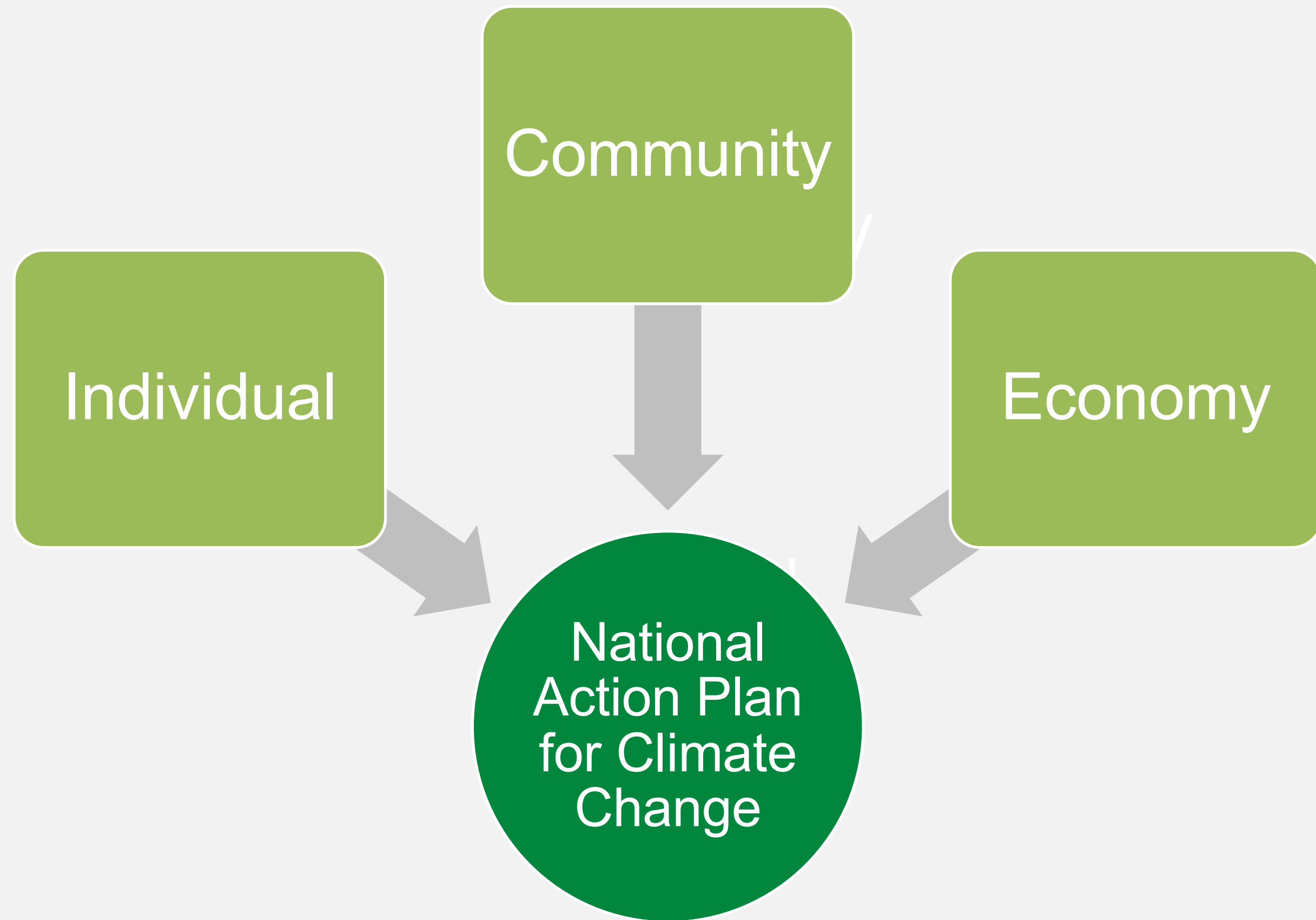


\* 2004 \*\*2006

Source: WHO World Malaria Report, 2008; WHO. (2004): "The global burden of disease: 2004 update."; McMichael, A.J., et al (2004): "Chapter 20: Global Climate Change" in Comparative Quantification of Health Risks. WHO; Munich Re; CRED database; Dalberg analysis

# **the Hands** – *Targets & Solutions*

# *the Hands - Targets*



## ***Global GHG Mitigation GOAL***

- **50% reduction by 2050** to restrict temperature rise to 2 deg C
- 15 billion tonnes of CO<sub>2</sub>e reduction per year

## ***Indian Commitment to UNFCCC @ COP21***

- **33-35% reduction in GHG emissions** relative to GDP from 2005 levels by 2030

## ***Indian Commitment to Montreal Protocol @ Kigali***

- **Freeze HFC consumption by 2028**
- **Emission Cuts Timeline (2024-26 baseline):**
  - 2032 – 10%
  - 2037 – 20%
  - 2042 – 30%
  - 2047 – 85% (plateau)

# *the Hands* - Solutions

## Be Lean

- reducing building cooling loads
- adaptive thermal comfort
- **passive cooling**
- building code
- **affordable thermal comfort in low-income housing**

## Be Mean

- energy efficient/star-labelled HVAC
- district cooling
- **sustainable cooling technologies**
- smart HVAC controls
- **demand reduction programmes**

## Be Green

- natural/low-GWP refrigerants
- **solar air-conditioning**
- trigeneration

# **the Hands - *Program***



# fAIR CONDITIONING

An initiative supported by



- Fairconditioning is a Building-Cooling Demand-Side-Management (DSM) related education, capacity building, and pilot implementation programme.
- It is an evidence-based policy support programme that is creating a cohesive sustainable cooling eco-system and deriving from it, a critical mass of evidence for institutionalizing academic, professional, and corporate-level transformations to achieve behaviour change amongst occupants of conditioned indoor spaces, reduce building heat loads (cooling demands), reduce energy and GHG intensity of artificial cooling systems.
- In operation since October 2012, Fairconditioning aims to deeply integrate sustainability and efficiency into architectural and HVAC-engineering higher education curricula, into practicing architecture & HVAC consulting firms, and into commercial enterprises.

# fAIR CONDITIONING

Fairconditioning is part of the **Smart and Sustainable Space Cooling Coalition** of India which advises the Government of India and is helping shape India's National Cooling Action Plan



# SUSTAINABLE COOLING ADOPTION NETWORK

This project responds to the following lacunae detected amongst commercial actors (manufacturers and HVAC-related executive decision makers) in the ecosystem:

- SCT manufacturers function as siloes of creativity, knowledge, and best practices
- SCT manufacturers are perceived as sub-standard cooling technology manufacturers who' solutions provide inadequate cooling
- SCT manufacturers cannot leverage economies of scale available to large manufacturers and are usually costlier to implement in terms of first-costs
- SCT manufacturers are perceived to be providers without a wide service and maintenance network, and generally fall outside the purview of BEE's Standards and Labelling Programs so as to make comparison with conventional cooling technologies difficult
- Amongst executive decision makers, a dearth of technical/financial awareness of off-the-shelf technologies and systems with lower life-cycle operating cost, GHG emissions, and verifiable track record of performance,
- Amongst executive decision makers, information asymmetry perpetuated by dominant enterprises which throttles transition to technologies which challenge their relevance,
- Amongst executive decision makers in the residential real estate realm, the split-incentive or principal-agent conflict in the residential building space
- Amongst Energy Performance Contracting Companies (ESCOs), the perception of difficulty to guarantee cost savings due to absence of contextualized measurement and verification protocols to estimate energy savings.

# Goal

## Short

- Explicit commitment to adopting a sustainable cooling policy as part of the 'non-negotiable' environmental values of the organization by executive decision makers (CEO's, Managing Directors, and Owners) of environmentally exemplary Hospitality Companies, Hospital Chains, Educational Institutes, Banks, IT/BPO Companies and Real Estate Developers and their respective trade-associations.

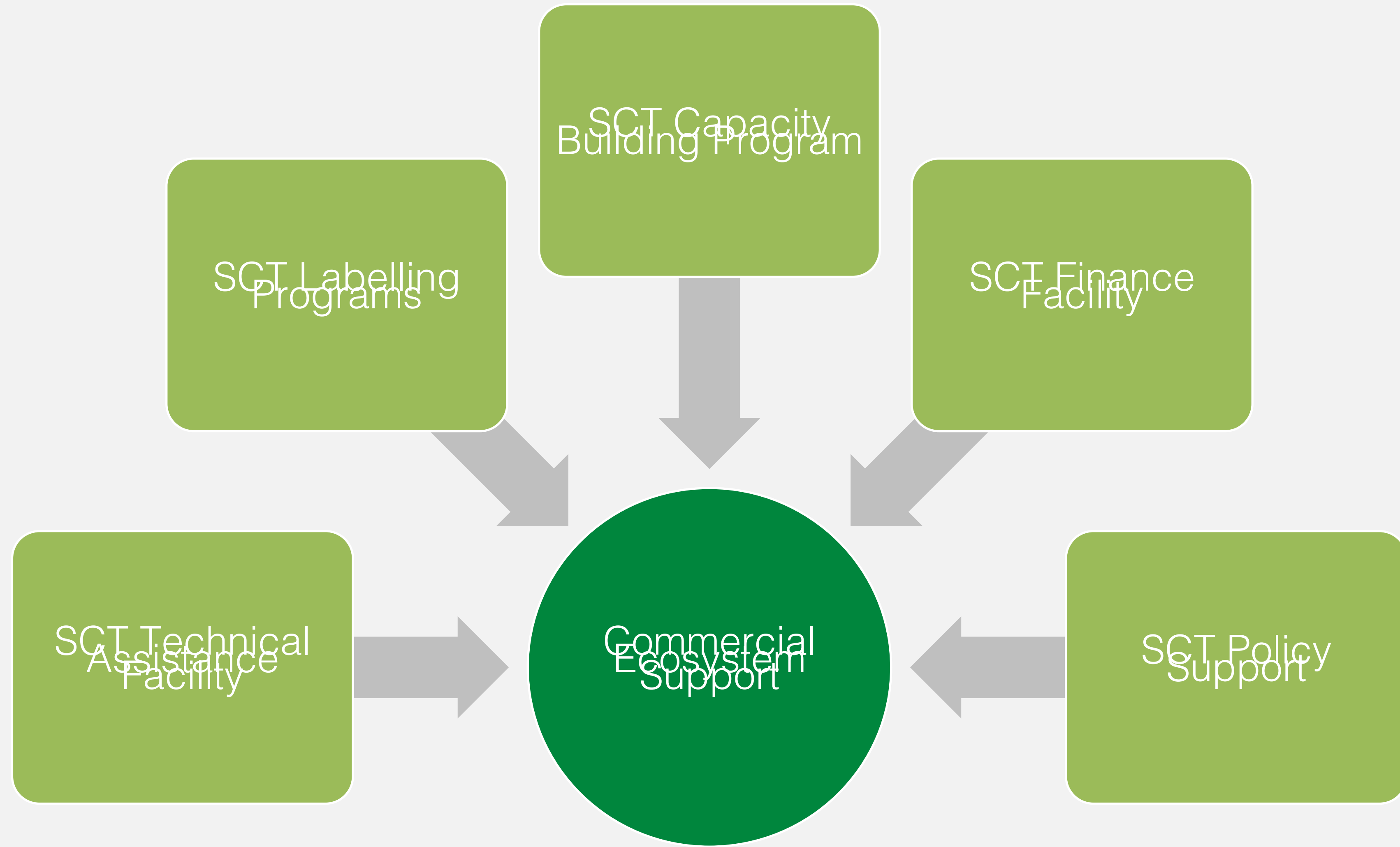
## Medium

- 75% of all new built space bought, leased, designed or constructed by 4 companies in each of the above 6 sectors file 24 companies) since signing up with the Sustainable Cooling Adoption Network is classifiable as sustainably cooled based on a cooling-EPI metric.

## Long

- Increased market share of sustainable cooling technologies relative to unsustainable f-gas based fluorinated technologies from the current value of approximately 5% to 15% by 2025 (tripling their current year-on-year growth rate)

# Benefits



# SCT Technical Assistance Facility

Fairconditioning provides **pro-bono Technical Assistance:**

- 1. preliminary cooling system design*
- 2. workshops for capacity building, and*
- 3. handholding for pilot implementation*

to any **large Builder, Renter, Aggregator, Facility Management Company** in India that agrees to install a building energy efficiency solution in at least 1 current or future building and thereafter makes it part of their 'non-negotiable' set of values while building or selecting real-estate.

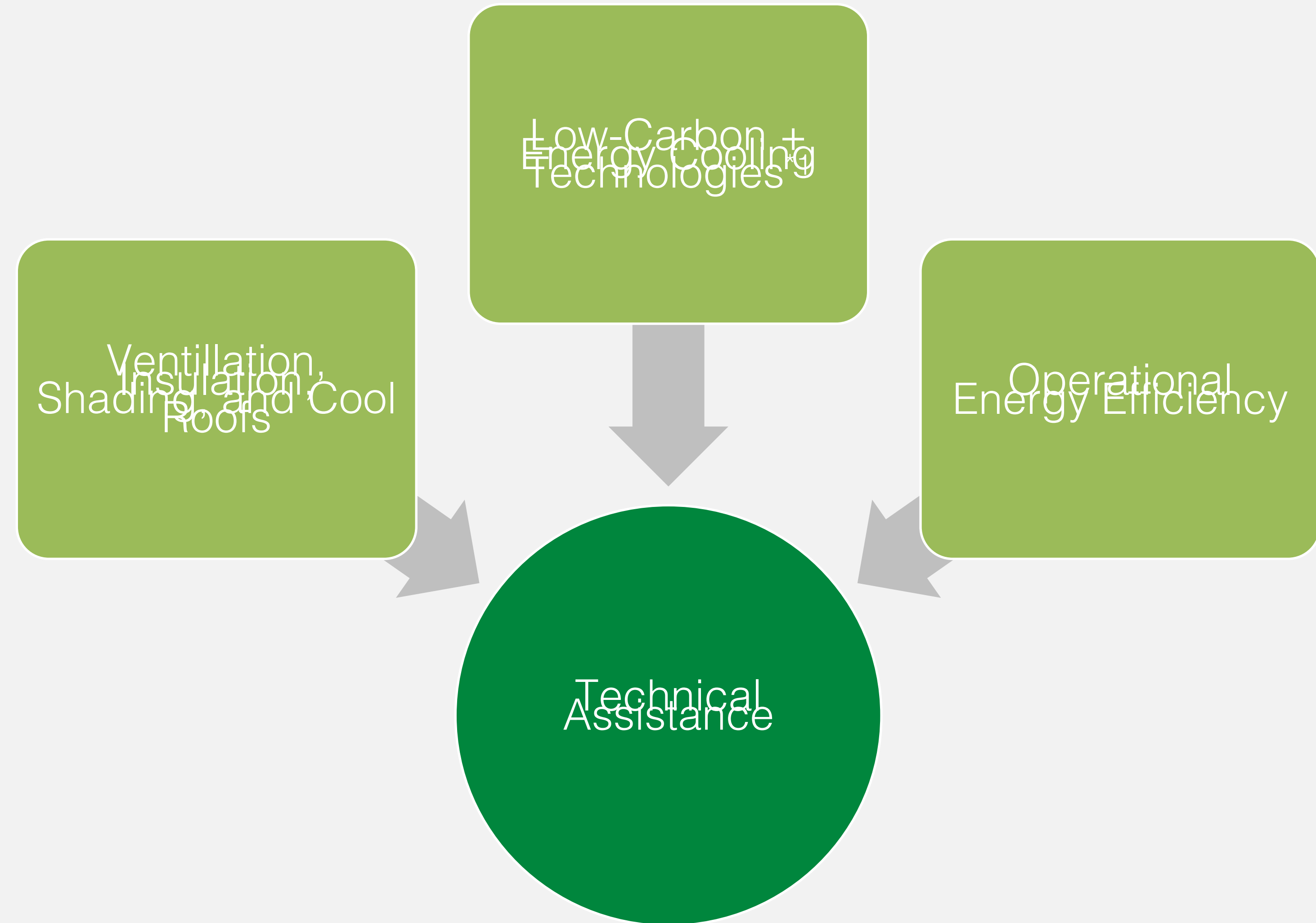
# SCT Technical Assistance Facility

- A 'facility' comprising motivated, trained and competent building energy consultants and building energy modelers that provide sophisticated early-stage technical assistance to devise sustainable cooling strategies for the most replicated building typologies designed/owned/operated by participating companies.
- For existing buildings: conducts energy audit of the building HVAC system, building energy modelling, and life-cycle energy analysis performed using industry-standard Building Energy Modelling Software.
- For design-stage buildings: conducts building energy scenario modelling to recommend options to beneficiary's building design and construction consultants.
- Develops 'Technical Feasibility Reports' outlining the energy/cost/GHG emissions reduction opportunities through implementation of passive cooling design and sustainable cooling technologies.
- Evaluates conventional (only monetary) and true (including avoided externalities of environmental and social impacts) Return on Investment (ROI) for recommended alternatives
- Identifies vetted technical solution providers and interested ESCO companies to establish a project micro-system to implement and finance sustainable cooling projects through energy performance contracting or shared saving mechanisms.

# Low-Carbon & Energy Efficient Scenarios

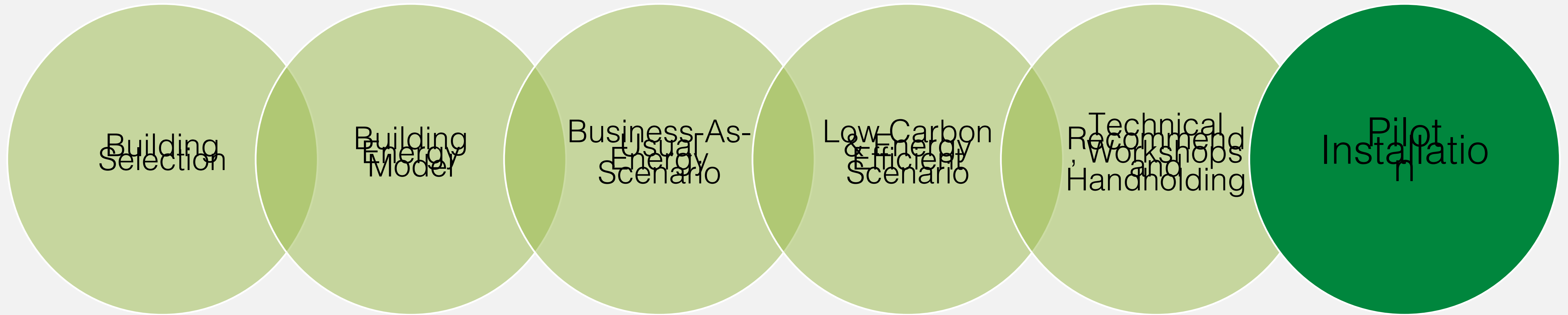
*Low-Carbon and Energy Technologies we focus on include*

- 1. R290 Split ACs**
- 2. Direct/Indirect Evaporative Cooling**
- 3. Structure Cooling**
- 4. Radiant Cooling**





# SCT Technical Assistance Facility



# SCT Labelling Programs

## Eco-Labeling

- Sustainable cooling technologies currently do not come under the purview of BEE's Standards and Labelling Programs and hence making energy efficiency performance and operating cost comparison with conventional cooling technologies is partly speculative
- Absence of standardized performance metrics, verified through third-party entities regulated by a neutral authority, hampers comparison amongst alternatives within a specific technology type and does not incentivize autonomous performance enhancement amongst sustainable cooling technology manufacturers
- This project aims to establish a pilot-scale ecolabeling program for 2 mainstream sustainable cooling technologies and their variants: radiant cooling and evaporative cooling
- The ecolabelling service will identify overall environmental preference of sustainable cooling products based on life cycle GHG emission considerations in accordance with transparent Ecolabelling Methodologies ratified by a Technical Steering Committee comprising competent and qualified domain experts

## Cost-Labeling

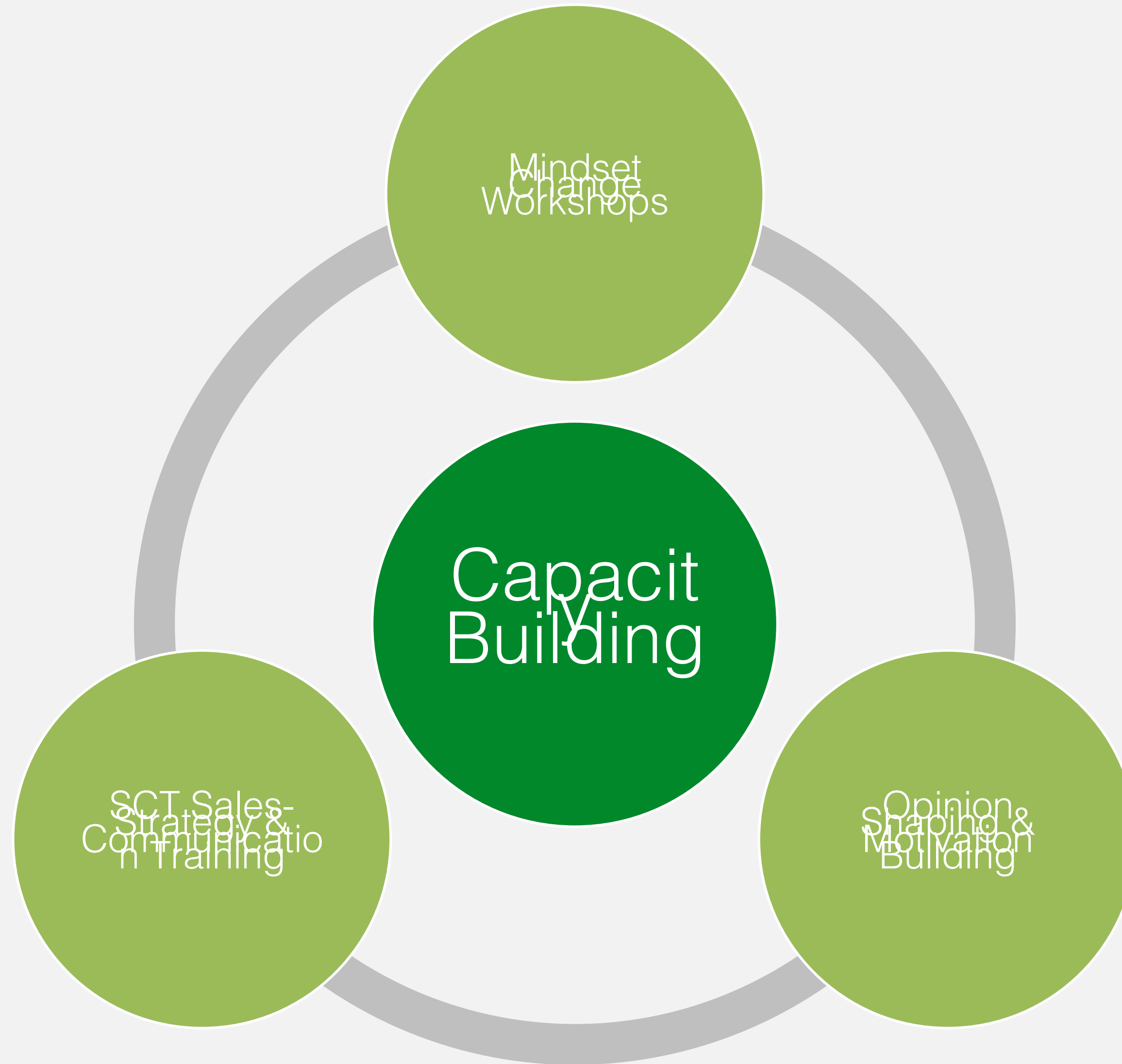
- The program will operate, in conjunction with local CREDAI Young-Builder Chapters in Mumbai, Pune and Bangalore, a sustainably-cooled building energy cost labelling program for builders that can allow them to communicate precise anticipated energy costs for owning/renting apartments in their premises vs. peers.

# SCT Labelling Programs

## Well-Being Labelling

- The program will aim to embed resident 'well-being' as a primary decision making criterion in the collective consciousness of high-income home-buyers in large metros of India - to indirectly enhance uptake of sustainably cooled buildings without explicitly advocating for it
- In conjunction with CREDAI Young-Builder Chapters in Mumbai, Pune and Bangalore, the program will devise a India-specific occupant well-being 'standard' in pursuit of a voluntary well-being certification program
- The program will establish a certification body that will issue auto-lapsing real-estate 'company portfolio-level well-being ratings' for their current building portfolio using voluntary online data-disclosure mechanisms & 3<sup>rd</sup> party verification through empaneled evaluators

# SCT Capacity Building Program



# SCT Capacity Building Program

## SCT Sales-Strategy & Communication Training

- Sales force training to enhance uptake of sustainable and energy efficient homes amongst home-buyers in Mumbai, Pune and Bangalore to reduce project risk and increase cost-sharing of increased upfront construction cost of energy efficient homes between builders and buyer
- The program will educate sales and advertising teams of builders who have committed to and conceived new energy efficient/sustainable residential projects. Education will lead to sales team being able to persuasively articulate the cost, environmental and well-being benefits of the project homes vs. conventional homes approximately equal or marginally lower upfront costs, to prospective home-buyers.
- Sales teams will be supported with and taught the use simple science-based verifiable facts, animations, physical models and other behavioral-science based approaches to captivatingly communicate all merits of the specific sustainable design features of the project and showcase them on par with other 'lifestyle' features of the project (eg. parking spaces, quality of bathroom fittings, recreation facilities etc.)

## Mindset Change Workshops

- Creating and delivering 'mindset change' workshops encompassing Architects, HVAC consultants and Builders/Developers to compliment technical training workshops; will be designed and delivered in collaboration with dialog-facilitation and collective-intelligence 'coaches'
- Mainstreaming the idea that the Architects and HVAC Consultants must stop co-operating in the perpetuation of the status-quo of energy-inefficient building and HVAC design practices

# SCT Policy Support

## External Policy Support

- Sustainable Cooling Policy integration into ULB policies in India's C40 Network + Smart Cities through direct engagement with designated government agencies
- Capacity building in Administrative Professional Institutes for IAS Officers to institutionalize training related to sustainable cooling technologies and their implications for reducing energy demand and manifesting their advantages by formal inclusion in regional development plans (DPs).

## Internal Policy Support

### *Sustainable Cooling Policy*

- Decision-support for formally integrating sustainable cooling as a core element in corporate real estate procurement/design decisions
- Drafting and operationalizing (embedding capacity, standard operating procedures) a sustainable cooling policy and making it a non-negotiable value in the group sustainability/low-carbon policy

### *Dress-Code Policy*

- A campaign to establish AC thermostat and associated workplace dress code policies to enable corporate offices in India to operate at 28°C without concomitant comfort issues. The campaign also encourages men to forgo ties in favour of casual outfits so they can feel comfortable at the office, as well as in public and commercial facilities
- Provides support to partners through sensitization workshops, thermal comfort vs. building cooling energy scenario modelling studies, and communication support for collaterals useful for operating a motivation-building campaign to enhance uptake of the idea amongst team members

# — Track Record: Jan 2015 +

Current beneficiaries of our support

- **Banking:** ICICI
- **Real-Estate:** Swastik Realty, Satguru Builders, Aavishkar Realty, Kanchan Developers, Oriocon Developers, Orange County Foundation, Great Value India
- **Hotels:** CGH Earth Hotels
- **Commercial Buildings:** GITS Food Products, WIPRO, NIIT, Sai Life, School of Planning & Architecture

# Advisors & Partners

## Advisory Board

- **Roshni Udyavar Yehuda**, Head of Department, Rachana Sansad's Institute of Environmental Architecture, Mumbai, India
- **Dr. Vishal Garg**, Associate Professor & Head at Center for IT in Building Science, International Institute of Information Technology Hyderabad (IIITH), Hyderabad, India
- **Suresh Vaidyarajan**, Architect - Vernacular Architecture, Delhi, India
- **Surendra Shah**, Engineer, Inventor. Founder & Owner, Panasia Engineers Pvt. Ltd., Mumbai, India
- **Dr. Satish Kumar**, President at Synurja and Senior Advisor to Lawrence Berkeley National Laboratory and Schneider Electric, India
- **Fionnuala Walvarens**, Campaign Manager, Environmental Investigation Agency, London
- **Rajendra Shende**, Independent Expert on Refrigerants, Former UNEP Ozone Unit Head, TERRE Policy Centre, Pune, India
- **Dr. Jyotimay Mathur**, Head of Centre for Energy and Environment and Professor in Mechanical Engineering Department at Malaviya National Institute of Technology (MNIT), Jaipur, P.G. in energy studies from the Indian Institute of Technology (IIT), New Delhi
- **Janos Mate**, Ozone Policy Consultant at Greenpeace International, Vancouver, Canada
- **Nina Masson**, Head of Market Research & Projects, Shecco, Brussels, Belgium
- **Dr. Ardeshir Mahdavi**, Professor and Director of Department of Building Physics and Building Ecology, Vienna University of Technology, Austria
- **Dr. Ratnadip Joshi**, Associate Professor, Maharashtra Institute of Technology (MIT), Pune, India
- **Brent Hoare**, Independent Expert on Refrigerants, Green Cooling Association INC., Katoomba, Australia
- **Aalok Deshmukh**, General Manager - Energy-Efficiency, Schneider Electric, Mumbai, India
- **Nicholas Coxx**, Independent Expert on Refrigerants, Earthcare Products Limited, Ware, UK

## Partners

- Centre for Science and Environment
- Smart & Sustainable Space Cooling Coalition
- ISHRAE
- Alliance for an Energy Efficient Economy
- Council of Architecture
- All India Council for Technical Education
- GRIHA Council



# Management Team

## India

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MSc in Environmental Engineering, University of Massachusetts  
Bureau of Energy Efficiency Certified Energy Auditor  
Co-founder of GreenSignal Ecolabel and The NO2CO2 Project  
Founder of the Informed Voter Project

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Integration Project  
MSc in Sustainability, University of Leeds  
Masters in Computer Application, Amity University.

**Ruchie Kothari**, Project Manager for the Professional Ecosystem  
Support Project  
Bachelor of Architecture from Academy of Architecture  
MSc in Sustainable Design from Carnegie Mellon University  
Global Shaper for the World Economic Forum

**Dhruvit Parikh**, Technology Manager for Sustainable Cooling  
Adoption Network  
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MSc in Solar and Alternative Energy, Amity University  
Bureau of Energy Efficiency Certified Energy Manager  
ISO 14001 LEAD Auditor

## Geneva

**Philippe de Rougemont**, Programme Manager  
Fairconditioning Executive Board member  
Political science, University of Geneva. Held several positions in local  
and national environmental NGOs. Freelance journalist. Co-founder  
of Noé21 and DATAS press agency, Noé21 Coordinator.

**Chaim Nissim**, Executive Board Chairman, Engineer, Noé21  
Founder  
Fairconditioning Executive Board member  
Diploma in Information Technology and Electronics. CERN and  
expertise in several nuclear magnetic resonance machines. Four  
term MP in the Geneva Canton parliament. Author of several laws  
on energy. Noé21 Secretary General.

**Dr. Felix Dalang**, Scientific Adviser, Noé21  
Fairconditioning Executive Board member  
PhD in environmental chemistry, Swiss Federal Institute of  
Technology, and Swiss Federal Institute of Aquatic Science and  
Technology. Specialisation in indoor air quality control and energy  
policy.

Visit [fairconditioning.org/team](https://fairconditioning.org/team) to view all team member profiles.

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# SUPPORTERS

