fAIR 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.

noé 21
économie, énergie et société

www.noe21.org

CBALANCE
carbon ▸ cost ▸ community ▸ climate

www.cbalance.in


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

Table of Contents

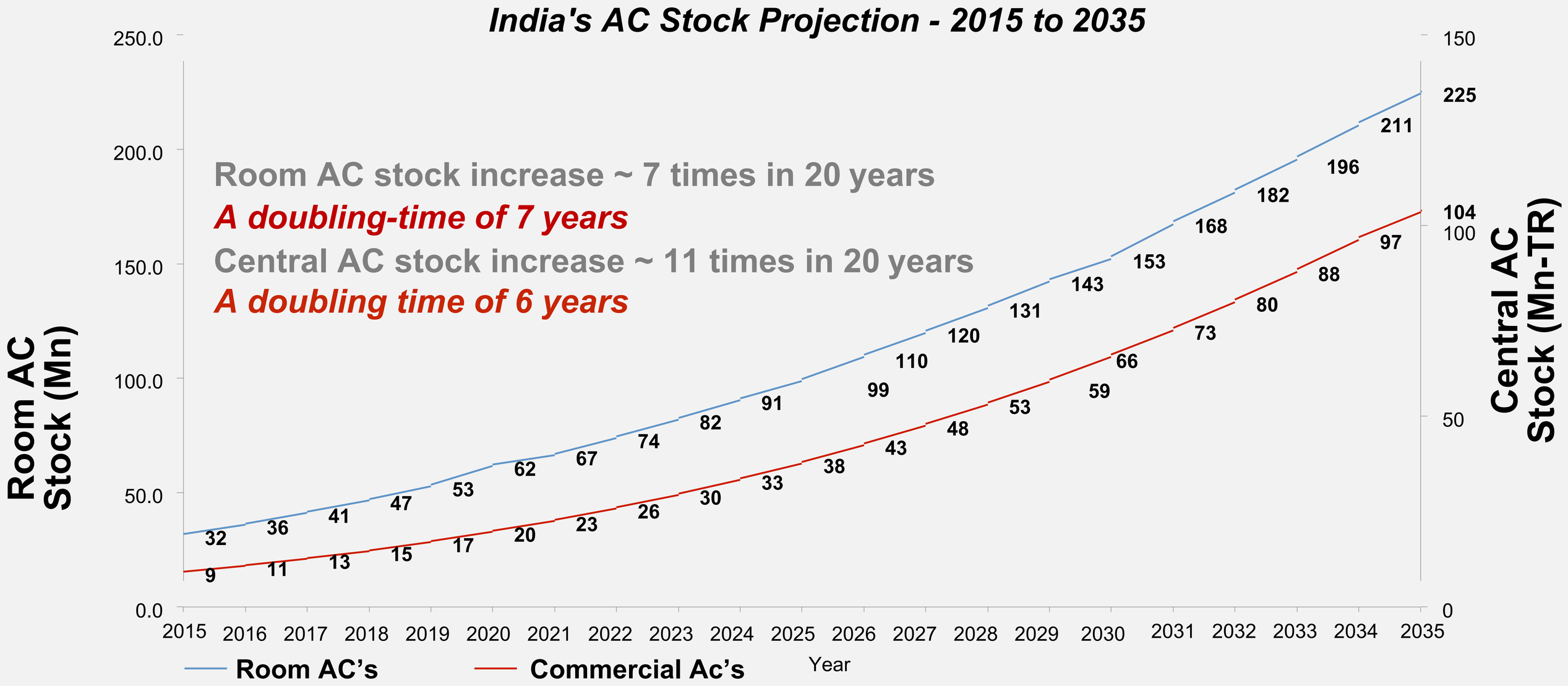
the **Head**

the **Heart**

the **Hands**

the Head – *Environment, Economy, Education*

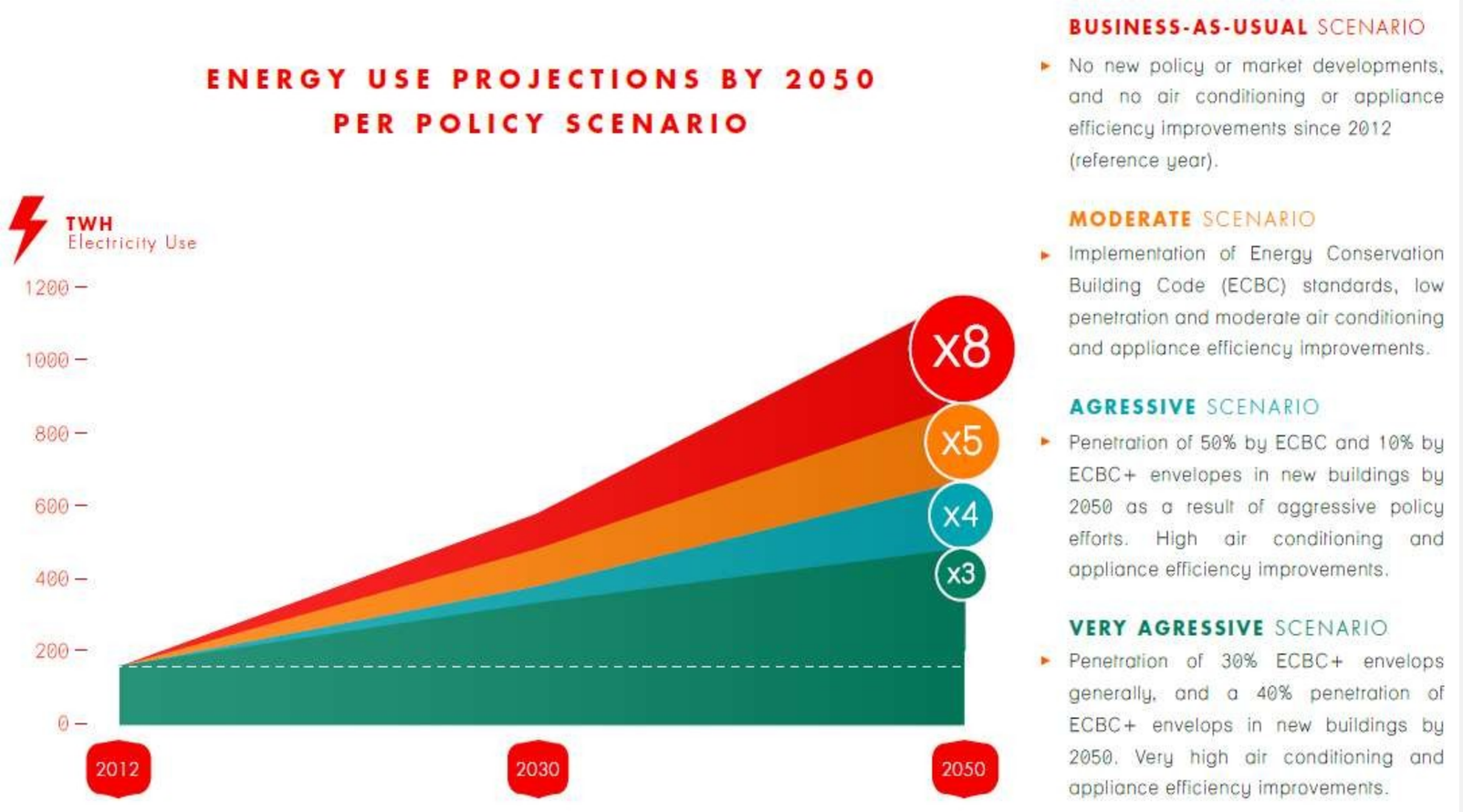
the Head - Economy



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

the Head - Economy

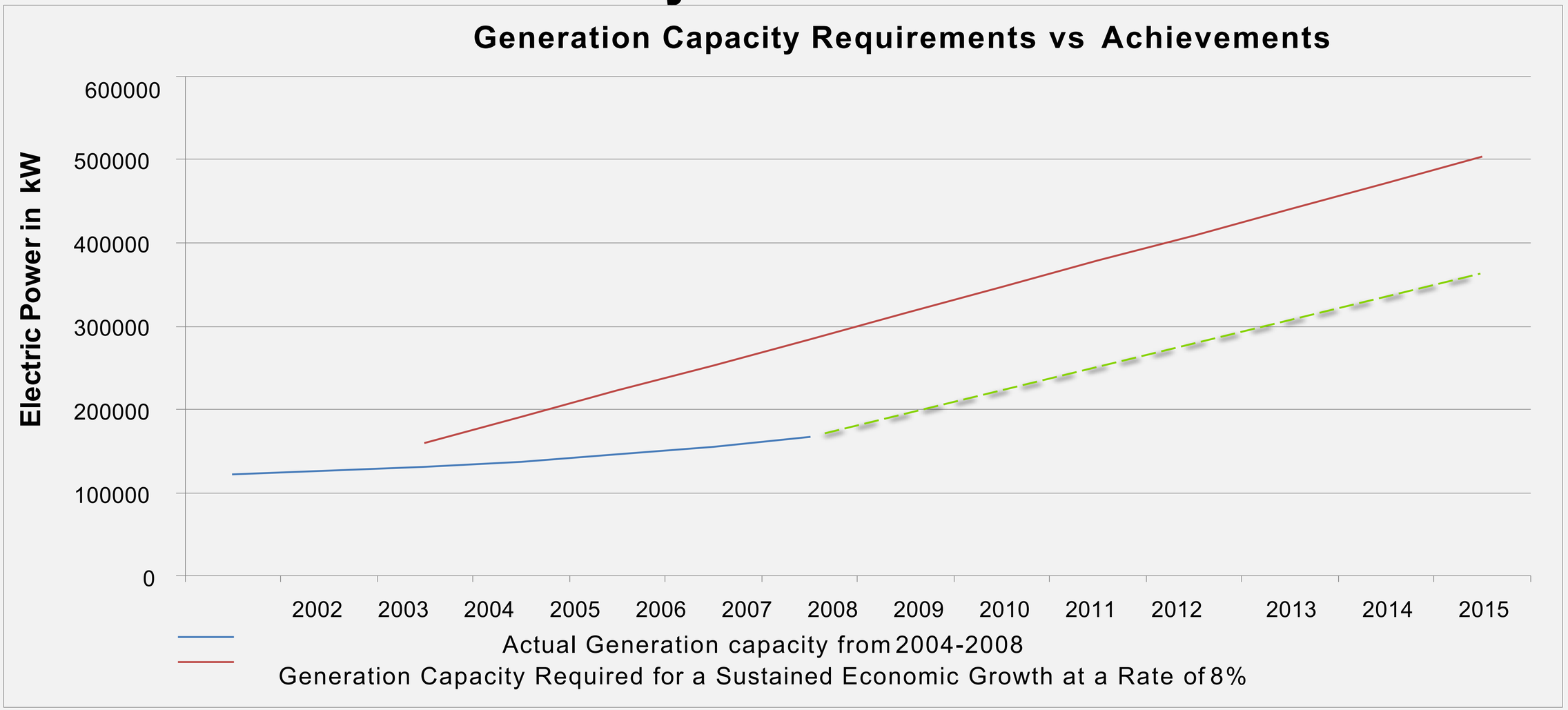
- In a Business-As-Usual Scenario, energy use from Indian buildings ~ 5 fold increase between 2012 and 2030
- Residential building energy consumption ~ 8 fold increase



Source: Mitigation Potential From India's Buildings & Residential Buildings In India: Energy Use Projections And Savings Potentials, India, Global Buildings Performance Network

the Head - Economy

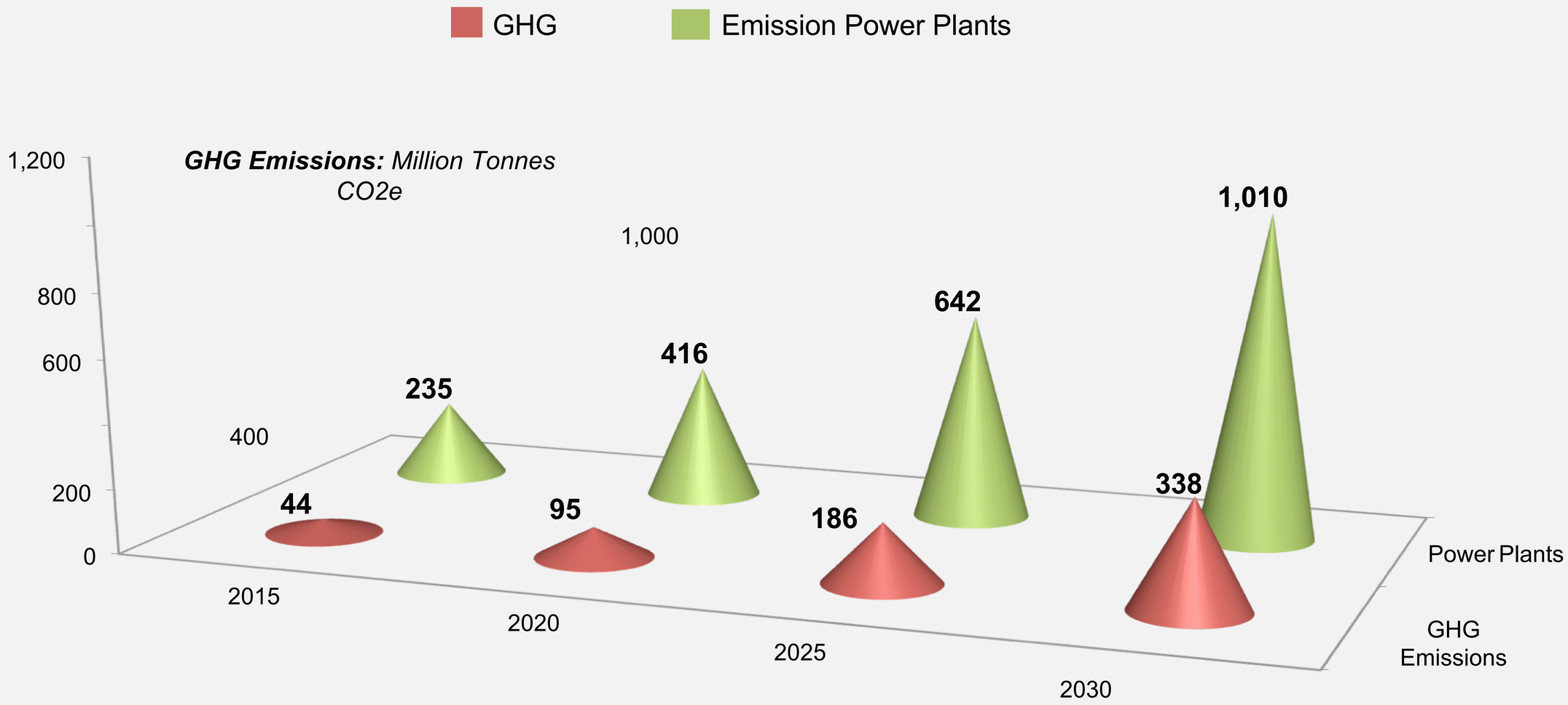
Electricity Scenario in India



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

the Head - Environment & Economy

Power Plants & GHG Emissions from ACs - 2015 to 2030



Source: Fairconditioning

the Head - Education

'Climate Literacy' is quasi-absent from Architecture education in India

Currently, Architecture education in India[1]:

➢ ***Heart***

- does not engender empathy amongst students to relate to climate change as a social issue
- addresses response to climate change in a largely inorganic, abstracted, uncontextualized, mechanistic manner
- Does not adequately promote critical thinking to challenge the conventional narrative of limitless growth which is recognized as one of the bases of runaway climate change

➢ ***Head***

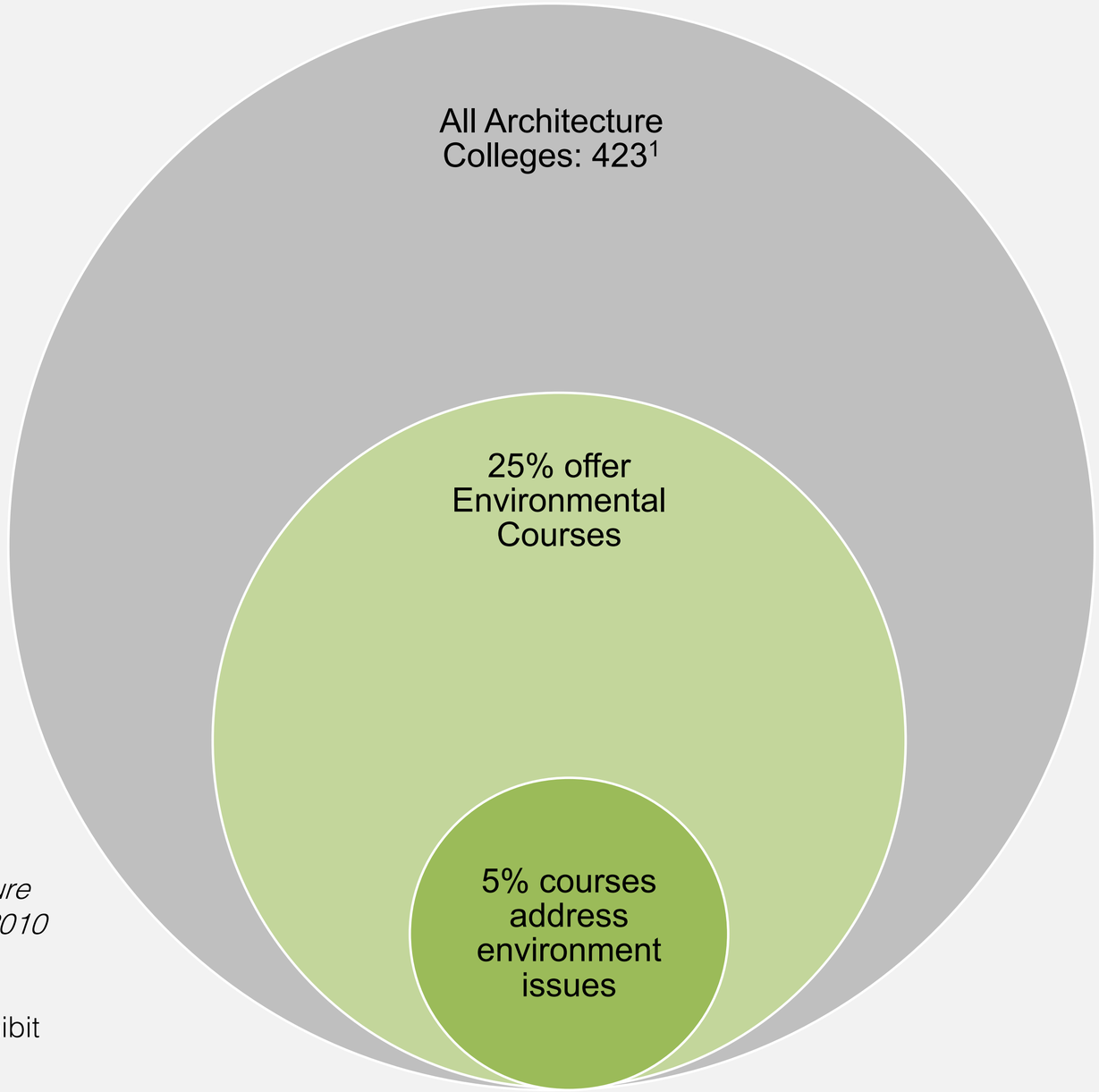
- does not connect building science with sustainable design techniques
- 'teaching-centric (as opposed to learning-centric) pedagogy techniques do not foster intuitive understanding of sustainable design principles
- continues to perpetuate amongst students the dominant view that conventional air conditioning is imperative for thermal comfort of occupants

➢ ***Hands***

- does not impart skills related to sustainable HVAC systems in building services
- graduates students without the knowledge of ECBC
- does not have the budget for teaching-skill upgrades in colleges or budgets for energy/sustainability modelling software

[1] Learnings from Fairconditioning workshops with 117 Architects at 80 firms, and 90 Architecture Professors at 23 colleges in Mumbai, Delhi, Bangalore, Chennai and Pune.

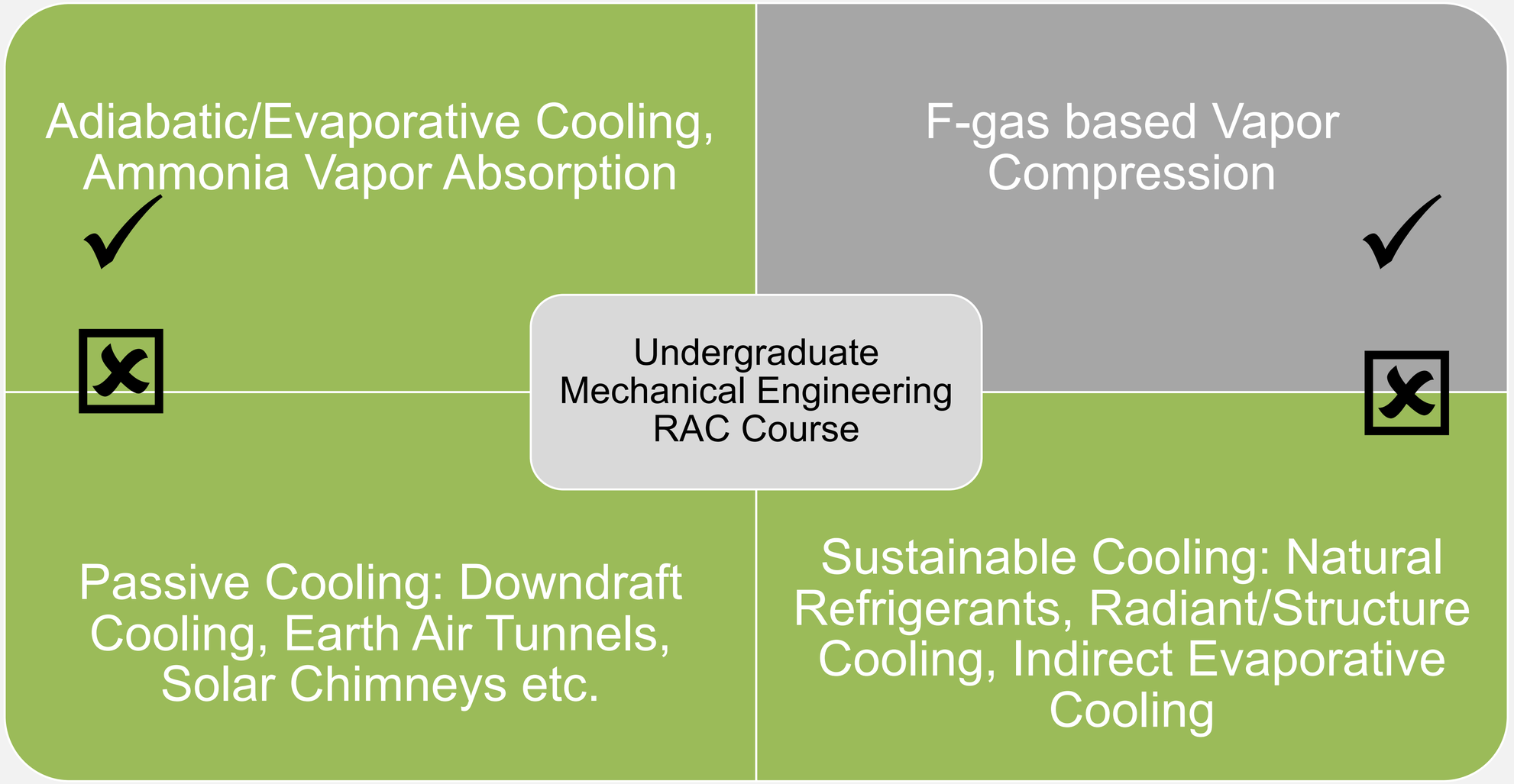
the Head - Education



The growth rate of architecture colleges is formidable; a*rchitecture colleges increased from 174 in 2010 to 416 in 2015*

Source: State of Architecture Exhibit & Book, Mumbai 2016

the Head - Education



the Head - Education

In 2017

India’s 423 Architecture Colleges graduate **17,000 students with deficient skills** in designing environmentally responsible buildings

In 2030

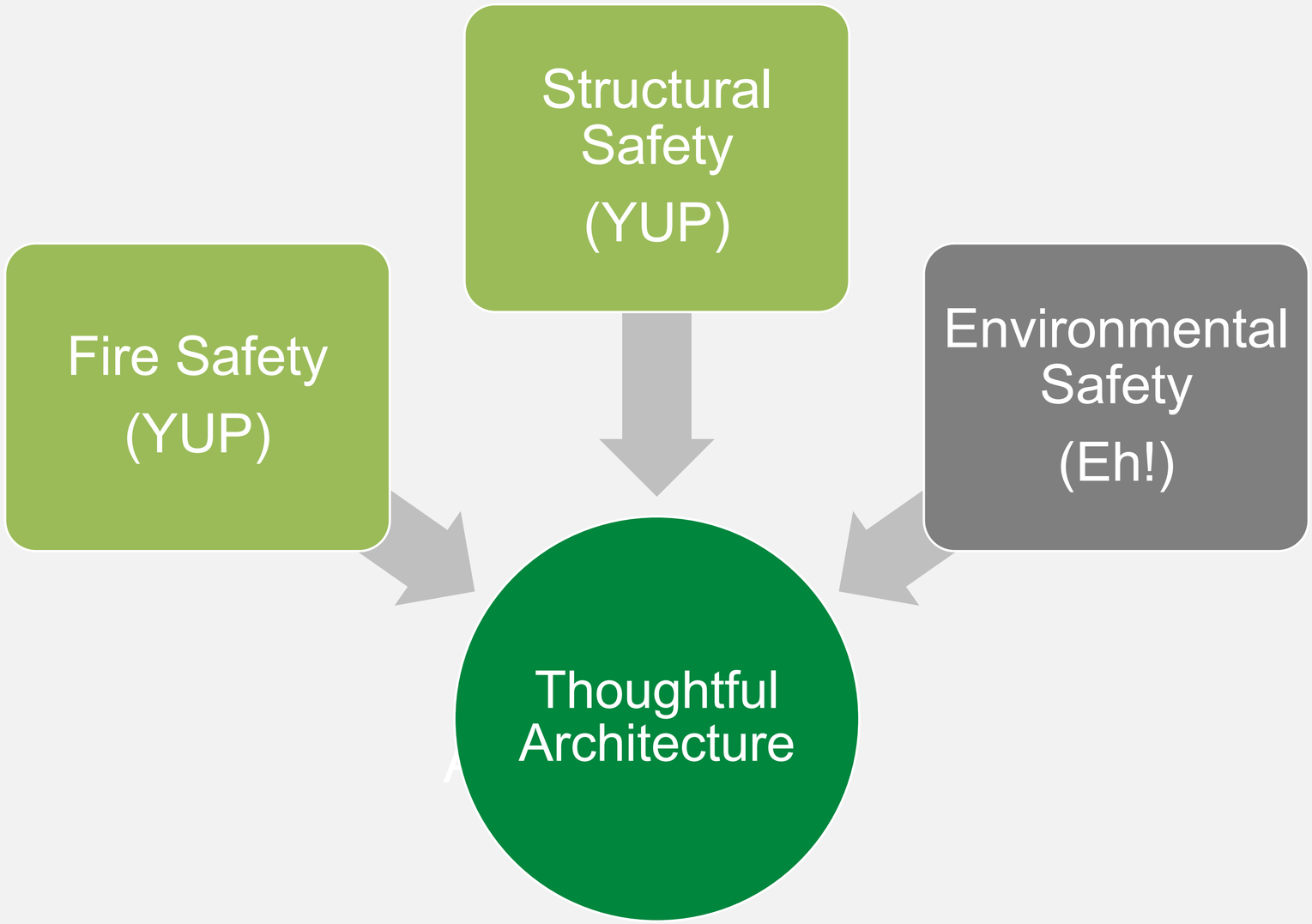
AC GHG Emissions from India ~ 338 Million Tonnes CO2e per year

~ 1.35 Billion Trees required per year[1]

1. Fairconditioning analysis

the Heart – *Responsibility, Justice, and Ethics*

the Heart - Responsibility



the Heart - Ethics

A typical Split-Unit AC in India ~ 24 ceiling fans[1]

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 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 C02e 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 - Targets

- In September 2017, the Indian Bureau of Energy Efficiency (BEE) and Council-of-Architecture (COA*) signed a Memorandum of Understanding (MoU) that seeks to integrate aspects of building physics and energy efficiency in some technical courses

- The Maharashtra State Energy Conservation Policy, 2017, requires “Inclusion of Course Material on Energy Conservation in curriculum of ITI, Diploma Engg. & Degree Engg. This will include the Energy Management, Energy Audit & New & Renewable Energy subjects.Higher & technical education department will take necessary action regarding this activity & MEDA will give all necessary support for it”

- These are encouraging signs. However, these pure-top-down approaches that ‘will’ such significant alterations in trajectory into existence, emerging from a executive order devoid of a dialectic process with stakeholders of higher education are expected to yield only marginal benefits according to many policy advocacy professionals in India. A rooted and contextual approach that is co-created with (and not ‘for’) educational institutions, using the existing intellectual apparatus, is still a meritorious and relevant approach.

- Required overhauls in pedadogy techniques, teaching aids, vertical and horizontal integration as well as bridging the HVAC engineering-architecture practice divide are clear lacunae that persist

* COA is the primary government statutory body that governs architecture education in India and who, along with the All-India-Council-of-Technical-Education), defines curricula requirements in academic institutions,

the Hands - Solutions

Note: 'bold' elements are focus of Fairconditioning Program. Source: Based on the Lean-Mean-Green concept by Bordass et al, 2001

the Hands - Solutions

Potential

Average office building

- 250 kWh/m^2.year
- 14 Rs/ft^2.month
- 1400 Rs/employee/month

Best-in-class office building

- 60 kWh/m^2.year
- 3.25 Rs/ft^2.month
- 325 Rs/employee/month

Even just 25% of the Energy Efficiency opportunity is worth:

✓ 2.5 Rs/ft^2.month
✓ 250 Rs/employee/month

the Hands - Solutions

Potential

Infosys Pocharam SDB 1 and 2:

- Orientation, shading
- Daylighting, high performance glazing, high efficiency lighting
- Radiant Cooling
- 1 conventionally air-conditioned wing, 1 radiant cooled wing
- Radiant cooled wing operating at 80 kWh/m^2/year (business as usual – 250-300 kWh/m^2/year)
- No added construction cost

the Hands - *Program*

fAIR CONDITIONING

An initiative supported by

SHAKTI SUSTAINABLE ENERGY FOUNDATION

REPUBLIC AND STATE OF GENEVA

POST TENEBRAS LUX

OAK FOUNDATION

Frankfurt School of Finance & Management Bankakademie | HfB

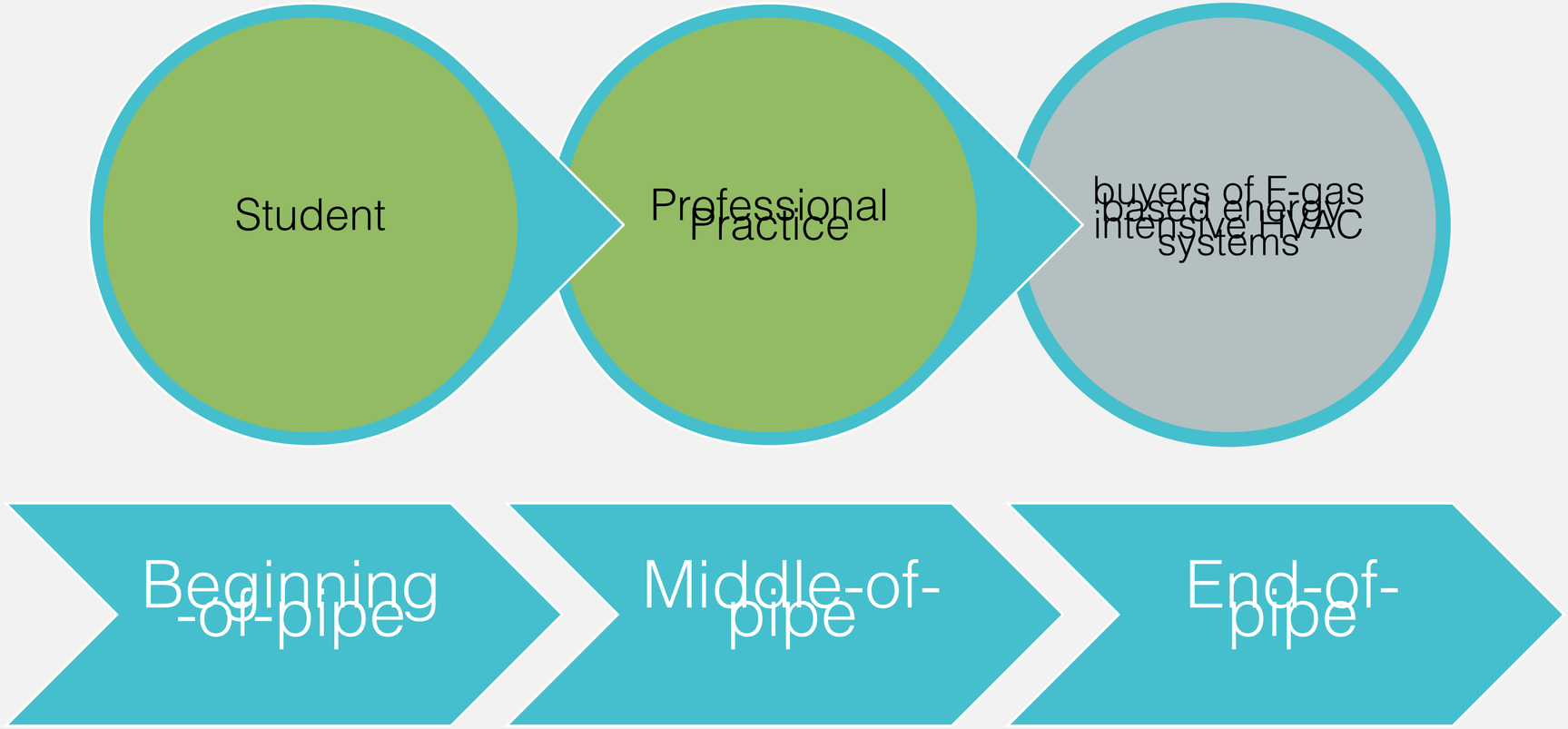
USAID FROM THE AMERICAN PEOPLE

- 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.

Simplified Ecosystem Diagram



The program is organized into four (4) projects that focus on:

- **Academia** (Academic Curricula Integration Project)
- **Professionals** (Professional Ecosystem Support Project)
- **Commerce** (Sustainable Cooling Adoption Network)

Fairconditioning seeks to achieve these clearly defined long-term eco-system changes:

A. For the beginning-of-the-pipe (academia)

- Integrating sustainable cooling into undergraduate academic curricula of Indian engineering and architecture universities through educational policy change promulgated by Ministry of Human Resource Development

- Integrating sustainable cooling pedagogy skill development amongst architecture and engineering professors through formal integration in professional development requirements determined by All India Council of Technical Education (AICTE) and Council of Architecture (COA)

B. For the middle-of-the-pipe (professionals)

- Embedding sustainable cooling related skills into professional licensing requirements for Indian Architects (COA) and HVAC Engineers (Indian Society of Heating Refrigeration and Air Conditioning Engineers)

- Amalgamating sustainable cooling related skills into formal training of green building consultants aligned with major certification systems (LEED, IGBC, GRIHA)

C. For the end-of-the-pipe (commerce)

- Embedding sustainable cooling design into design DNA of family owned and corporate real-estate firms through direct engagement and institutional engagements with industry bodies (CREDAI)

- Including sustainable cooling in corporate environmental, social responsibility, human resource policies, and real estate design and procurement practices of large banking chains, hotel chains, and IT companies through direct engagement and institutional engagements with industry bodies (FICCI, FHRAI, NASSCOM)

fAIR CONDITIONING

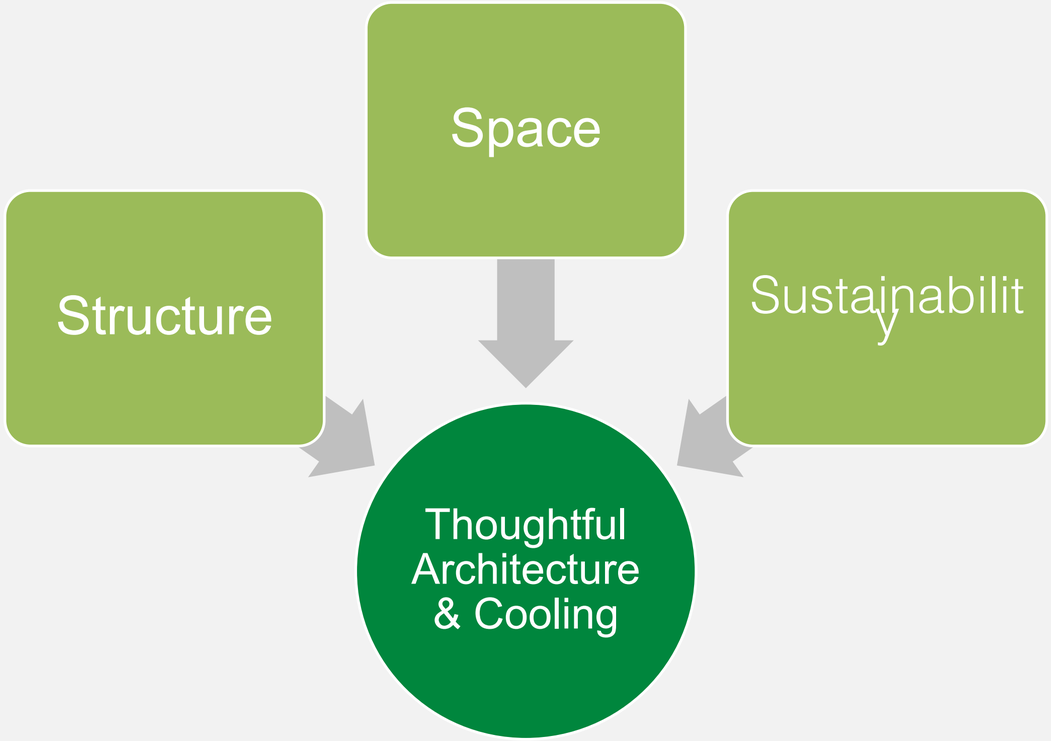
Theory-of-Change

PROJECT	ACTIVITES	OUTPUTS	OUTCOMES	IMPACT	LEGACY
Academic Curricula Integration Project (ACIP)	Tool Building and Training Material Creation, Curricula-Integration Workshops, Handholding/Trouble shooting Sessions, Co-Creation and Course Correction Roundtables	Non-IPR Protected Tools and Training Materials added to Knowledge Commons, 24 colleges sign Curricula Integration MoUs, 450 Architecture Professors, Heads of Departments/Principals (Decision Makers), at 24 colleges are trained in building physics, passive design and sustainable cooling design pedagogy	24 Architecture Colleges integrate sustainability within their existing-curricula across all courses in the Undergraduate Program	Evidence base for Curricula-Integration of sustainable cooling into Architecture and Engineering University Curricula created and appropriate designated authorities are influenced through reputed advocacy groups	Integrated Sustainable Cooling Ecosystem synthesized, New buildings in India use principles of sustainability & sustainable cooling to reduce HVAC-system energy use by up-to 50%; achieving certifications like the Energy Conservation Building Code (ECBC)
	Tool Building and Training Material Creation, Engineering Student Certification Workshops, Handholding/Trouble shooting Sessions, Co-Creation and Course Correction Roundtables	Non-IPR Protected Tools and Training Materials added to Knowledge Commons, 1,440 HVAC Engineering Students at 24 colleges are certified in heat-load calculation and sustainable HVAC-system modeling techniques, 24 colleges sign Curricula Integration MoUs	24 Engineering Colleges integrate sustainable cooling technology education in the Refrigeration and Air Conditioning Course of the Undergraduate Program		

ACADEMIC CURRICULA INTEGRATION PROJECT

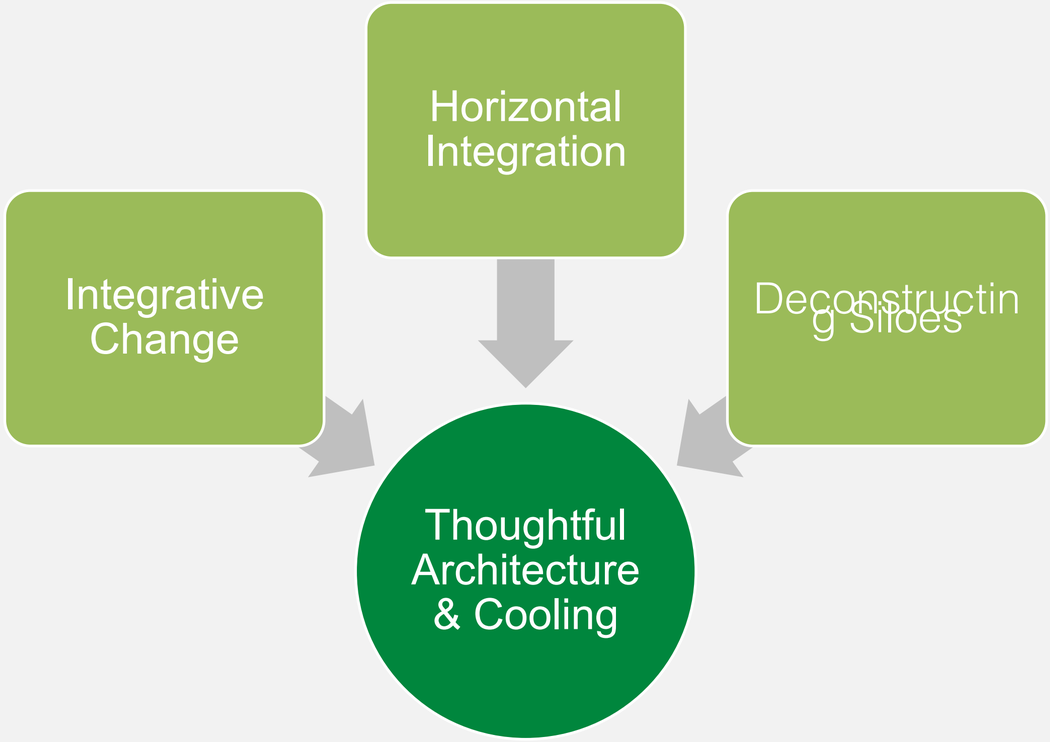
The ACIP project deeply embeds skills related to working with sustainable cooling technologies (for engineering academia) and efficient building design centered around building physics and relevant sustainable design principles (for architecture academia) through workshops designed to enhance sustainable design pedagogy skills amongst Architecture professors, facilitate activity-based learning process amongst students, as well as accomplish seamless syllabus integration of sustainability and efficiency into official University-defined curricula.

Goal



The program envisages a pedagogy in architecture and engineering where sustainability considerations are at par with space and structural considerations in design thinking and execution.

Principles



The program is guided by the principles of invisible and ‘integrative’ curricula change as opposed to ‘additive’ curricula change (i.e. not adding a new course on environmentally responsible architecture etc.), achieving horizontal integration of sustainable cooling related knowledge (so that knowledge gained from ‘taught’ subjects manifest in design studios), and diminshing siloes between HVAC engineering and architecture students.

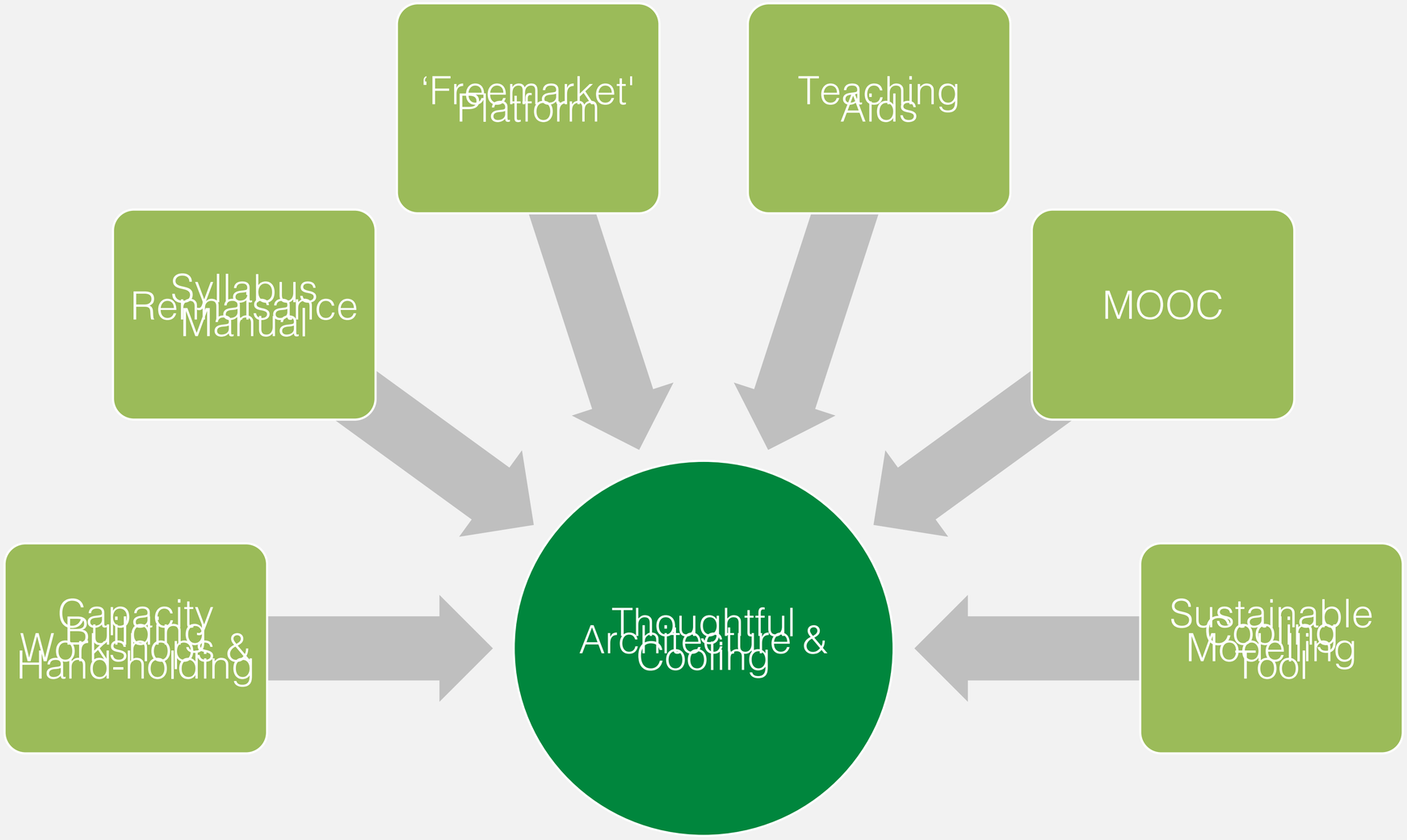
Understanding ‘Invisible’ or ‘Subtle’ Change

*If one ask’s a bachelor’s degree graduate from an Architecture College**: “which specific ‘courses’ shaped your views about space and structure”** , it is very likely that the respondent wouldn’t be able to ‘pinpoint’ it.*

*Contrastingly, if the question was: **“which specific ‘courses’ shaped your views about sustainability”** , the response is very likely to contain the name of a specific course and concomitantly the name of the professor.*

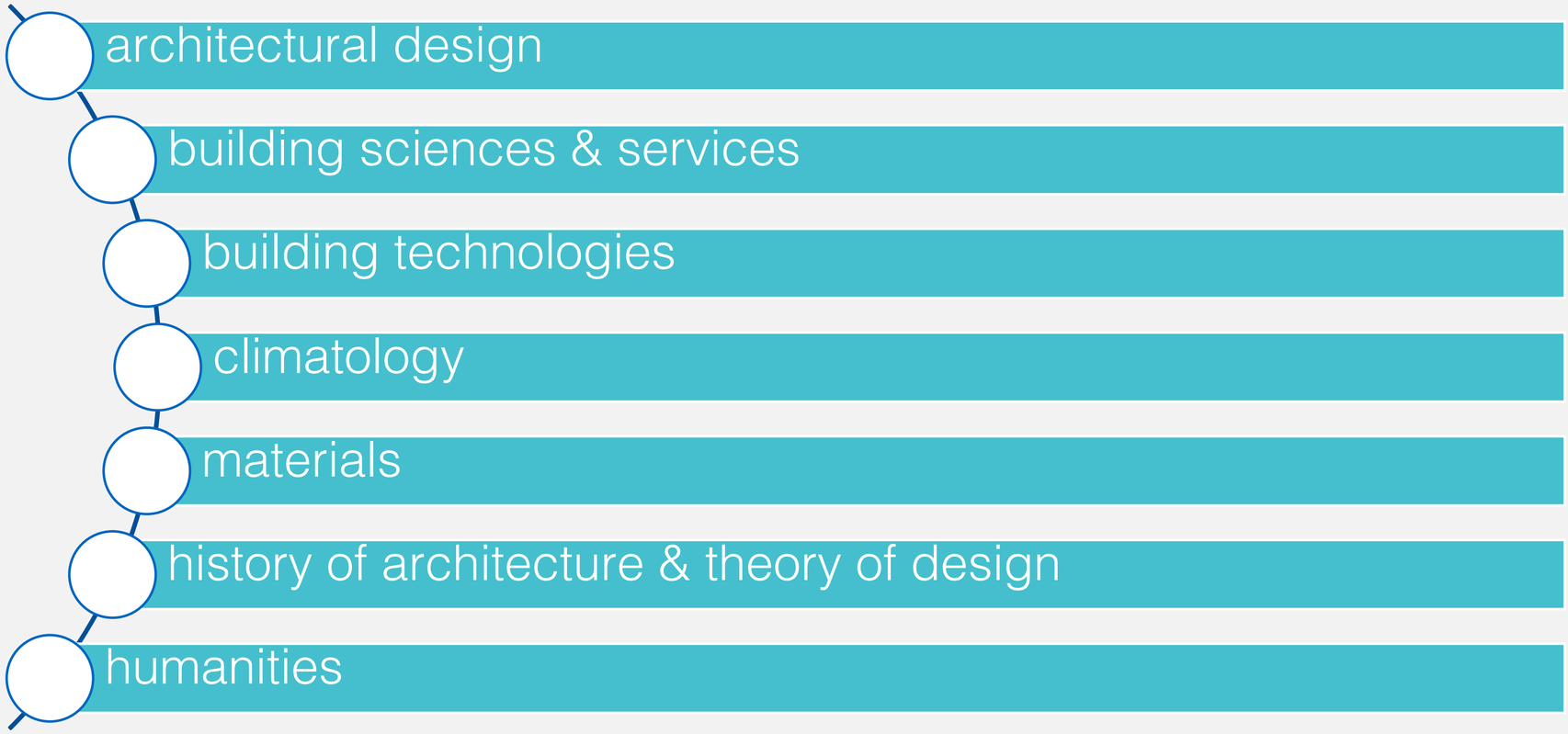
*This indicates that ‘**sustainability’ or ‘efficiency’ is ‘compartmentalized’** in the student’s mind. Not integrated into the ‘whole’ body of knowledge and therefor future praxis.*

Benefits


'Freemarket' Platform
Teaching Aids
Syllabus Renaissance Manual
MOOC
Capacity Building Workshops & Hand-holding
Thoughtful Architecture & Cooling
Sustainable Cooling Modelling Tool

Capacity Building Workshops: Architecture Professor Training

Integrating sustainable-cooling knowledge & pedagogy into following courses



Capacity Building Workshops: Architecture Professor Training

Workshop Agenda Elements

1

Building Physics & Thermal Comfort, Psychrometry, Climate Analysis & Passive Design

Solar Geometry and Shadow Masking

Active Cooling Principles

Sustainable Cooling Technologies

Capacity Building Workshops: Architecture Professor Training

Workshop Agenda Elements

2

Rethinking Pedagogy

Syllabus Renaissance – redefining lesson plans for Technical, Design and Humanities courses

Developing plan of action to effect workshop learnings in college courses

Capacity Building Workshops: Architecture Professor Training

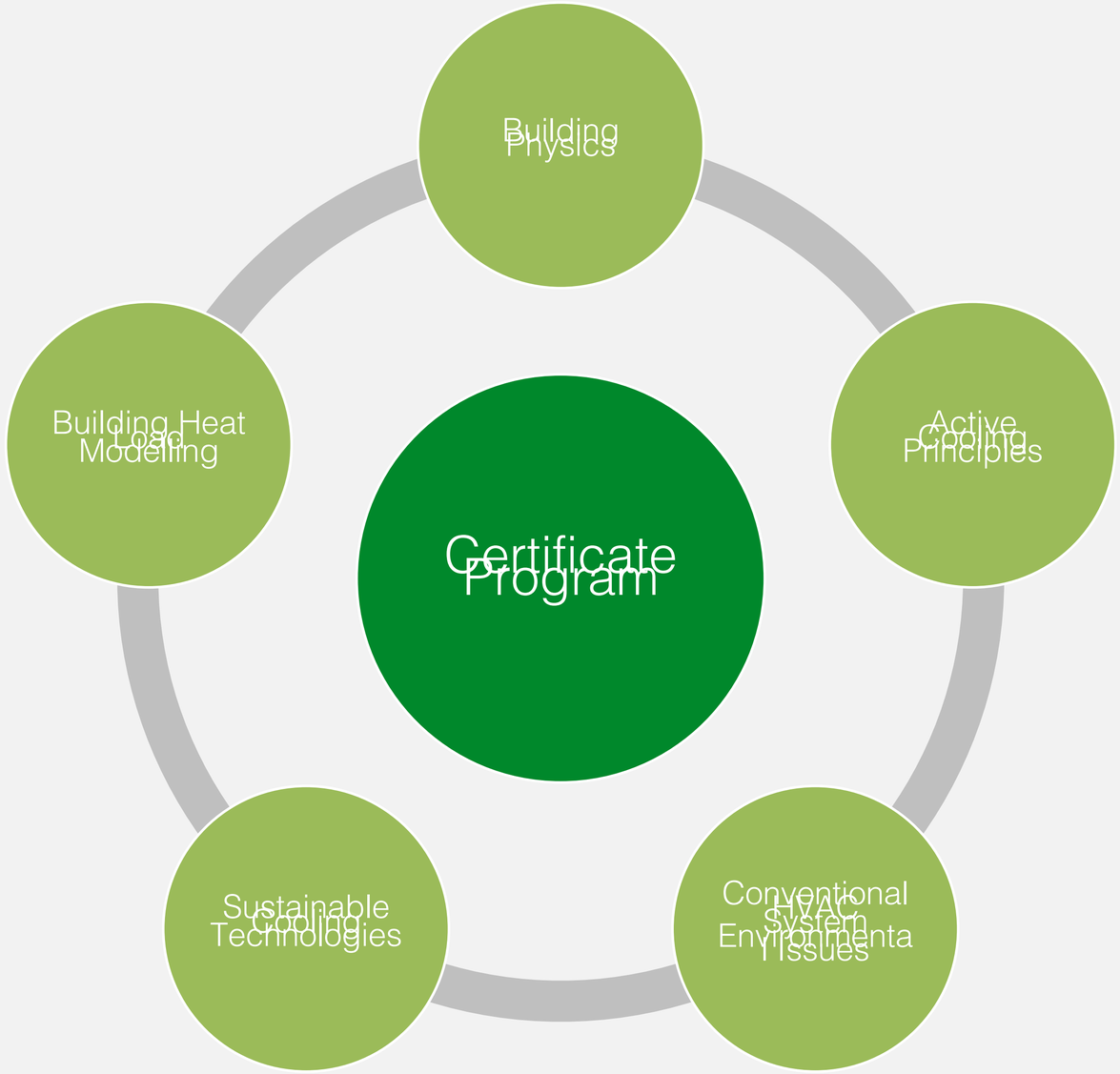
Capacity Building Workshops: Engineering Student Certification

Training Content Certified by:

Alliance for an Energy Efficient Economy

ISHRAE — Indian Society of Heating Refrigerating & Air Conditioning Engineers

Workshop Training Content



Capacity Building Workshops: Engineering Student Certification

Curricula Integration Manual

Heat transfer in buildings and thermal comfort

Expected outcome
Students understand the basic concepts of how heat transfer takes place through - Conduction, Convection and Radiation. Introduction to u-value (thermal conductivity), R-value (resistance). The concept of thermal comfort – relative humidity, absolute humidity, how does the body cope with changes in the temperature.

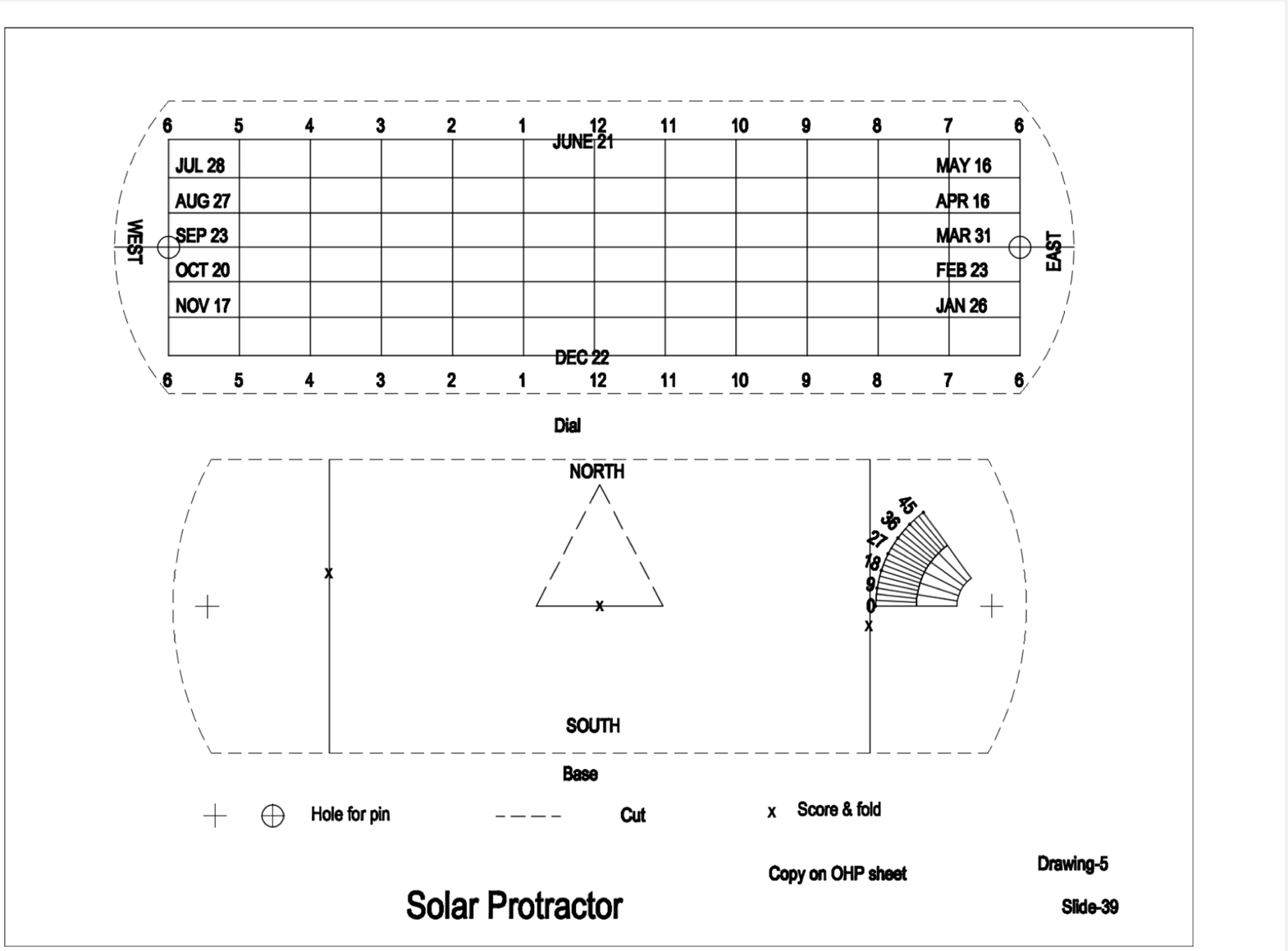
Delivery type
Virtual aids; Physical aids / Experiential learning

Virtual Aid:
www.climateconsultants.com
Refer to annexure A for DIY kit, Use software to try out different designs to achieve a less energy consuming design

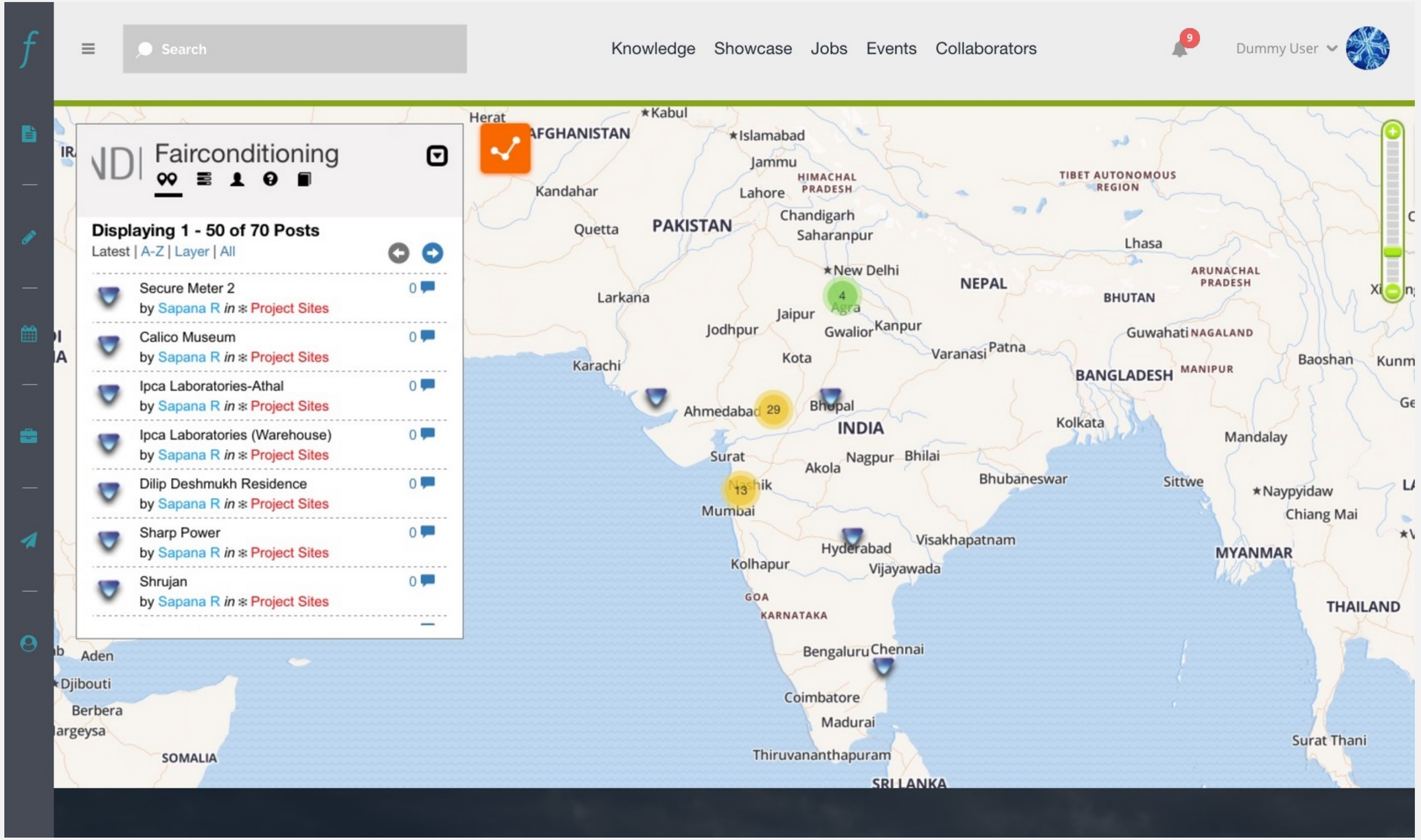
Physical Aids:
Radiation from hot plate blocked by a paper screen, the purpose is to keep away the heat from having a direct impact on the user.

Experiential Learning:
The fundamental behind the idea of having high and false ceiling, insulation (either in building or in person). Another example is having separate layers on for protection against the cold, it follows the same principle.

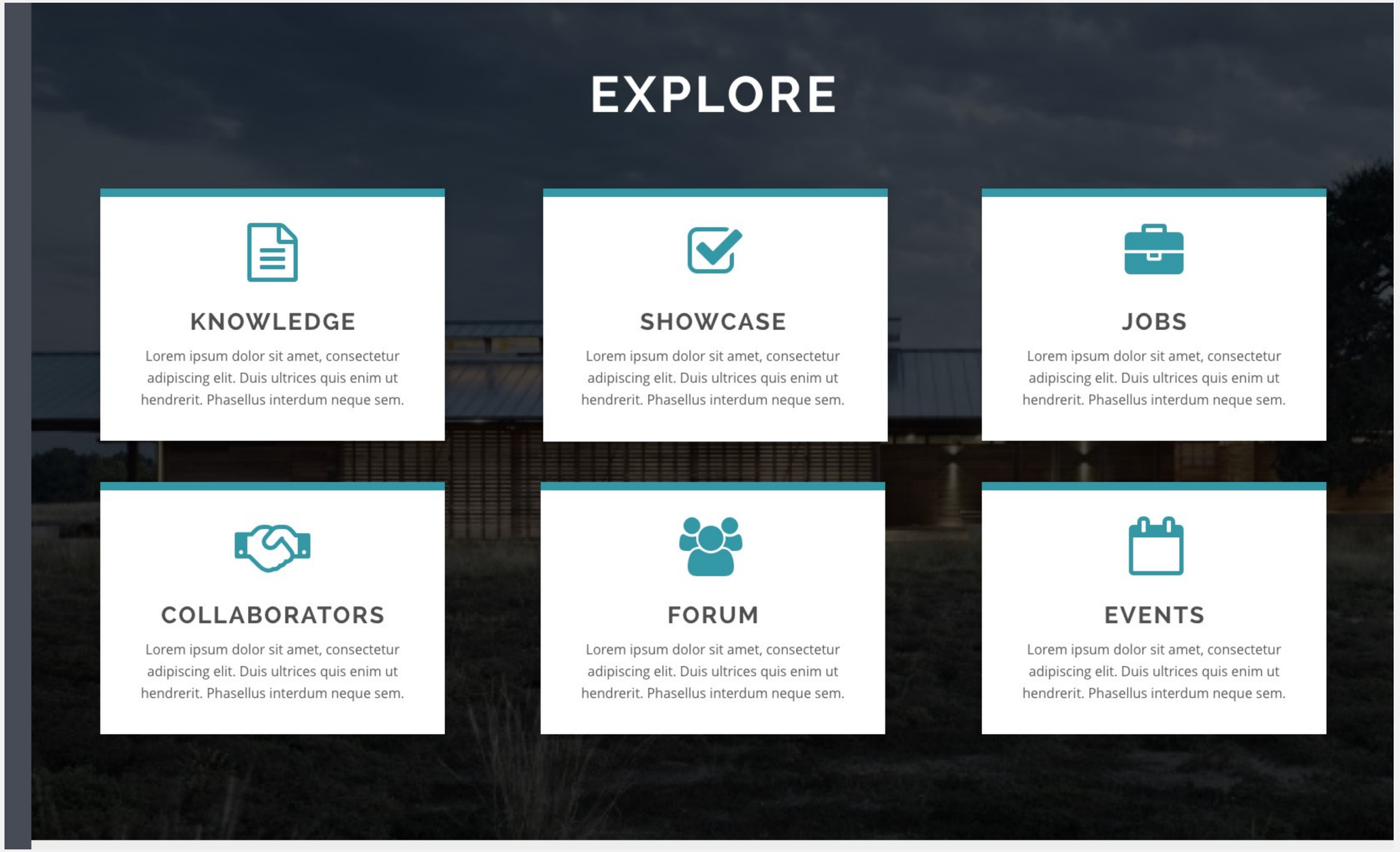
Curricula Integration Manual



Freemarket Platform



Freemarket Platform



Freemarket Platform

SEARCH KNOWLEDGE SHOWCASE JOBS EVENTS 9 Nikhil Pasricha

KNOWLEDGE CENTER / SUSTAINABLE COOLING / STRUCTURE COOLING

STRUCTURE COOLING

WHY | WORKING PRINCIPLE | VS. CONVENTIONAL COOLING | CASE STUDIES | RESOURCES | MANUFACTURERS

THREE QUESTIONS

1. What is the merit of cooling a place using **AIR**, a good insulating medium, with low thermal capacity?
2. If you want to empty a tank, do you **pump** it out or would you rather **drain it**?
3. Which heat transfer process would you choose: A or B?
   A: linearly proportional to temperature difference (i.e. doubling Δ T = 2 x heat transfer rate)
   B: proportional to **4th power** of temperature difference (i.e. doubling Δ T = 16 x heat transfer rate)

LETS EXPLORE WHY

	Thermal Conductivity	Specific Heat Capacity	Density
	(W/mK)	(W/kg.k)	(kg/m3)
Air	0.03	1.004	1.225
Water	0.6	4.18	1000

Water presents a **significantly higher heat transfer capacity**:

- The multiplier of specific heat capacity and density for water vs. air is ~ 3400 (heat absorption per unit volume)
- The thermal conductivity multiplier for water vs. air is ~ 20 (heat transfer per unit area per unit thickness)

Medium	Cooling Capacity	Flowrate Required	Power Required
Air	100 TR	~ 40,000 cfm	22 kW
Water	100 TR	~32 cfm	3.7 kW

SAMPLE IMAGE

Teaching Aids

Visual depiction and tactile understanding of building physics principles, passive cooling design strategies, and sustainable cooling technologies in the Indian context is deficient and conspicuously absent from architecture and engineering pedagogy at the academic and professional level. This intervention seeks to create prototypes, animations, and DIY-toolkits to enable a rigorous understanding of the scientific phenomenon underlying building physics principles, passive cooling design, and sustainable cooling principles (such as radiant cooling, indirect evaporative cooling) and their implications for designing energy efficient buildings.

Teaching Aids: Physical

Openings pertaining to air flow in buildings

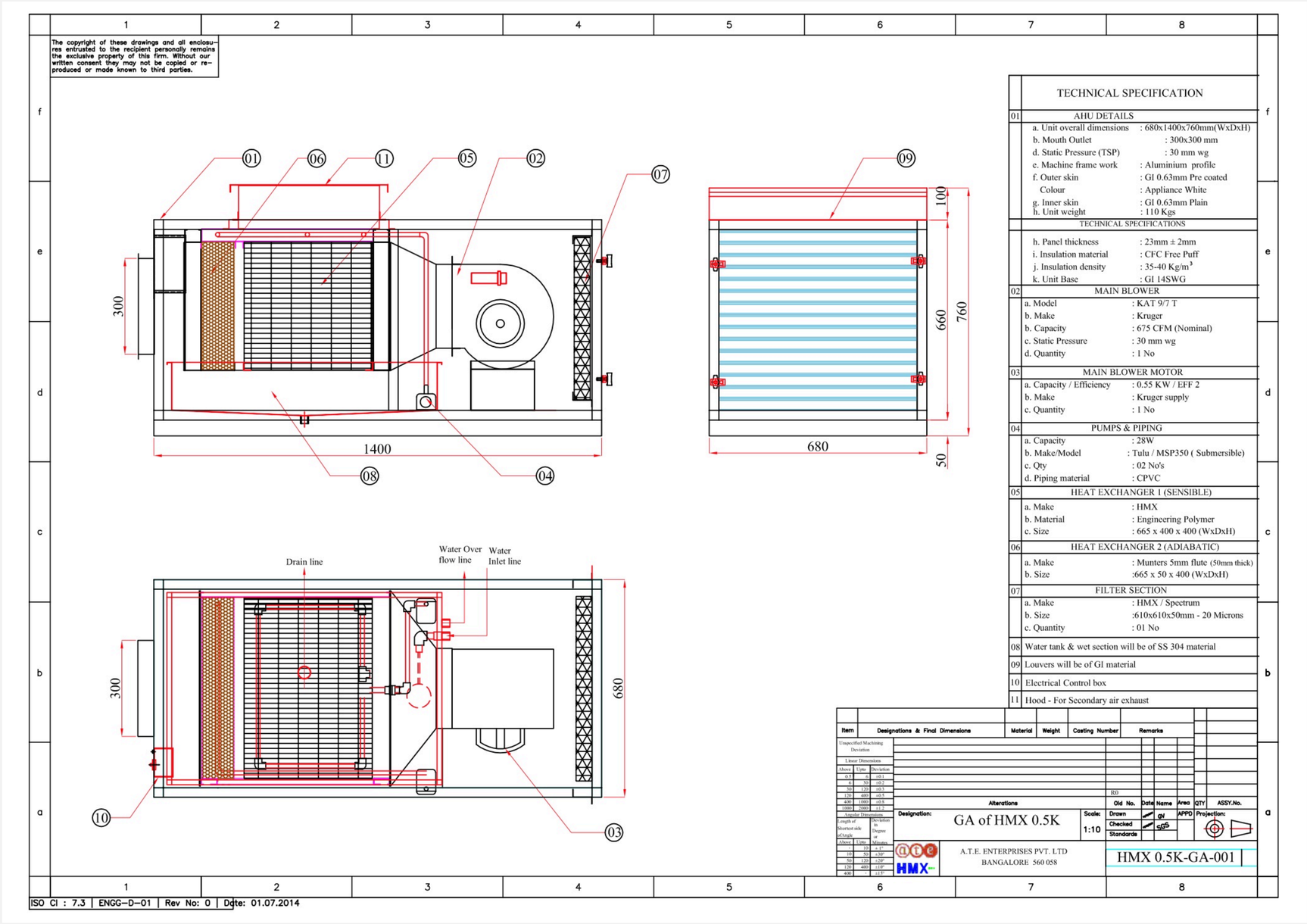
Air speed inside the tube - 0.9 m/sec

Air speed inside the tube - 2m/sec

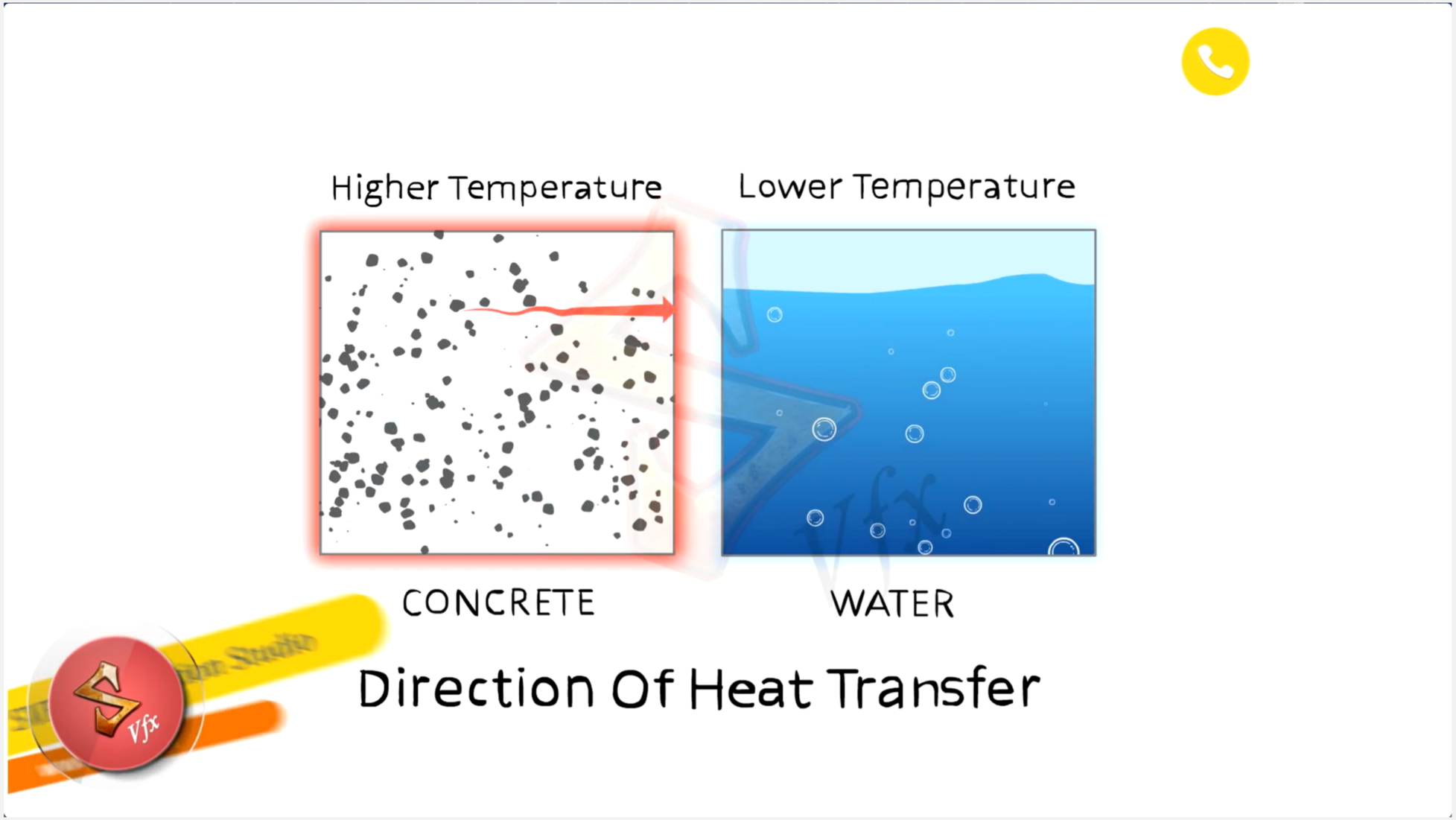
Air speed outside the pipe – 5m/sec

Large openings on the Leeward side ensure much better air flow

Teaching Aids: Physical



Teaching Aids: Virtual



MOOC

Curriculum For This Course

Expand All | 22 Lectures | 08:43:38

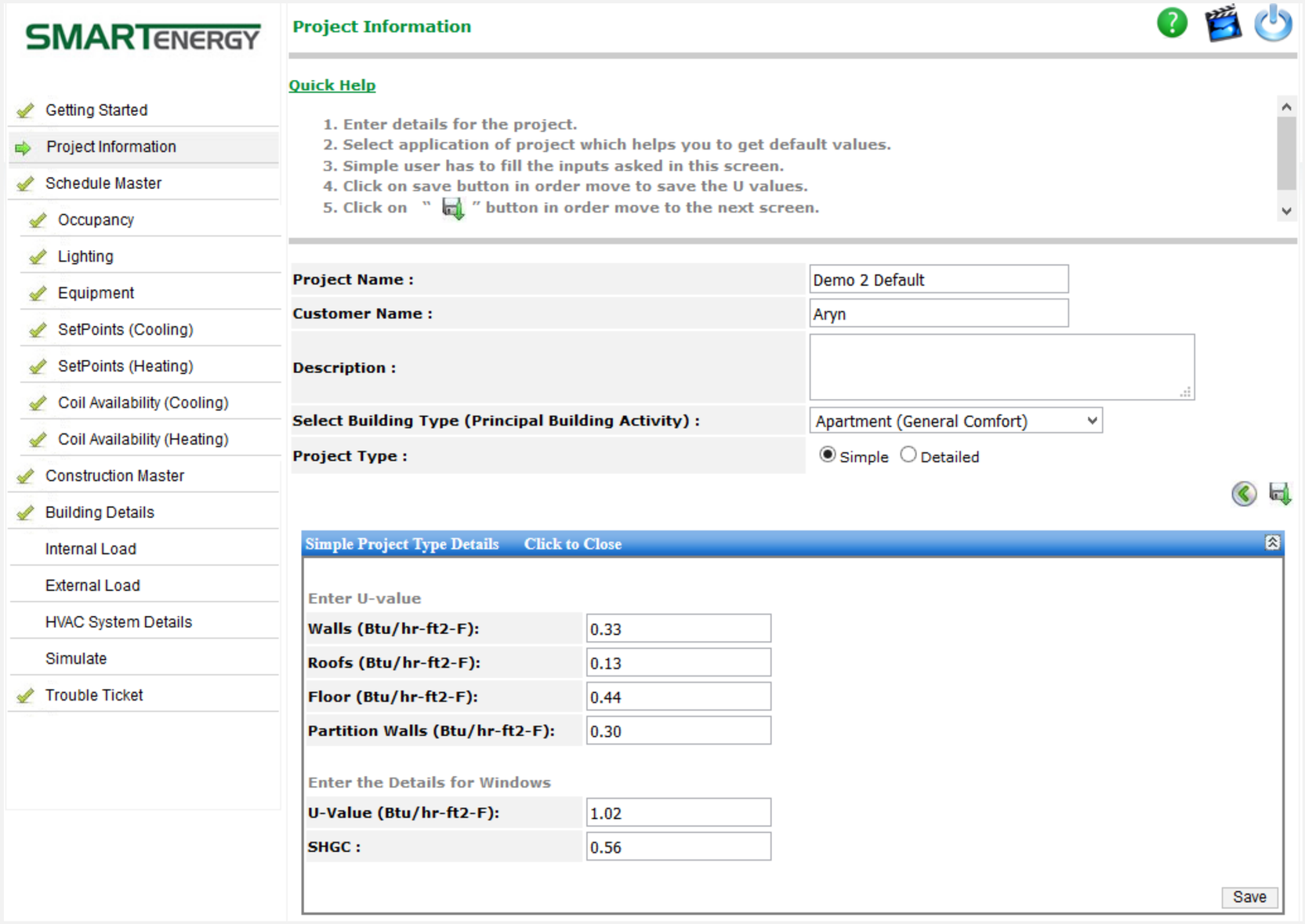
– **Program Introduction**	00:00
– **Heat transfer in buildings**	00:00
Introduction	9 pages
Heat	33 pages
Heat	5 questions
Fundamentals of heat transfer	36 pages
Fundamentals of heat transfer	5 questions
Building heat transfer	45 pages
Building heat transfer	4 questions
Material properties - I	27 pages
Material Properties - I	4 questions
Materials properties - II	23 pages
Material Properties - II	4 questions
Glass	15 pages
Glass	4 questions

Sustainable Cooling Modelling Tool

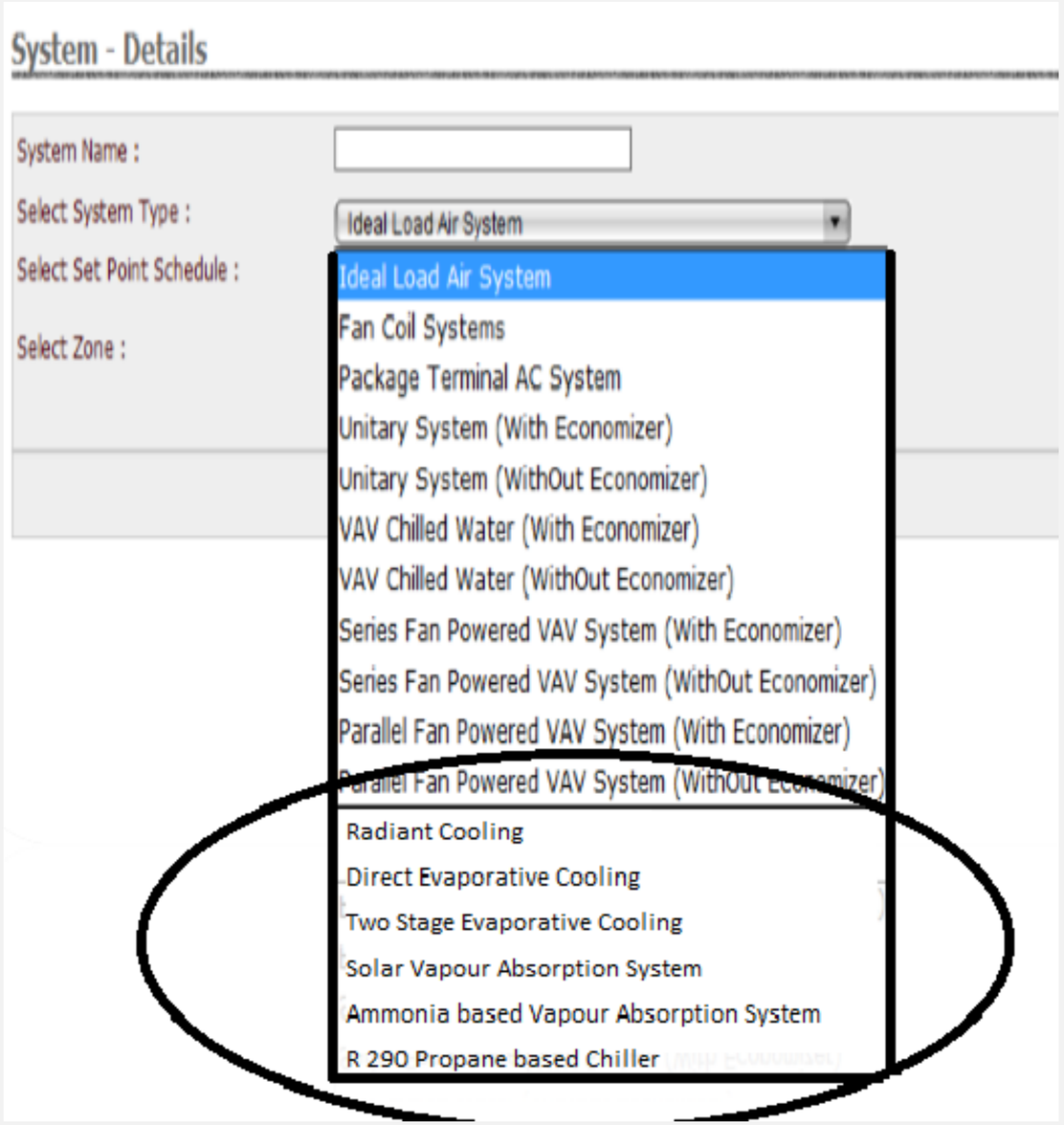
Industry-standard tools widely used by practicing engineers and architects for modelling building heat loads from HVAC systems do not enable modelling of sustainable cooling technologies, and thus hampers the much required mainstreaming if they are to be considered as commercially and technically viable alternatives to conventional HVAC systems.

This intervention will upgrade ÍSHRAE's 'Smart Energy' Software to include sustainable cooling technologies to accelerate the uptake of sustainable cooling technologies through enabling a broad spectrum of professionals to design and recommend them to end-users.

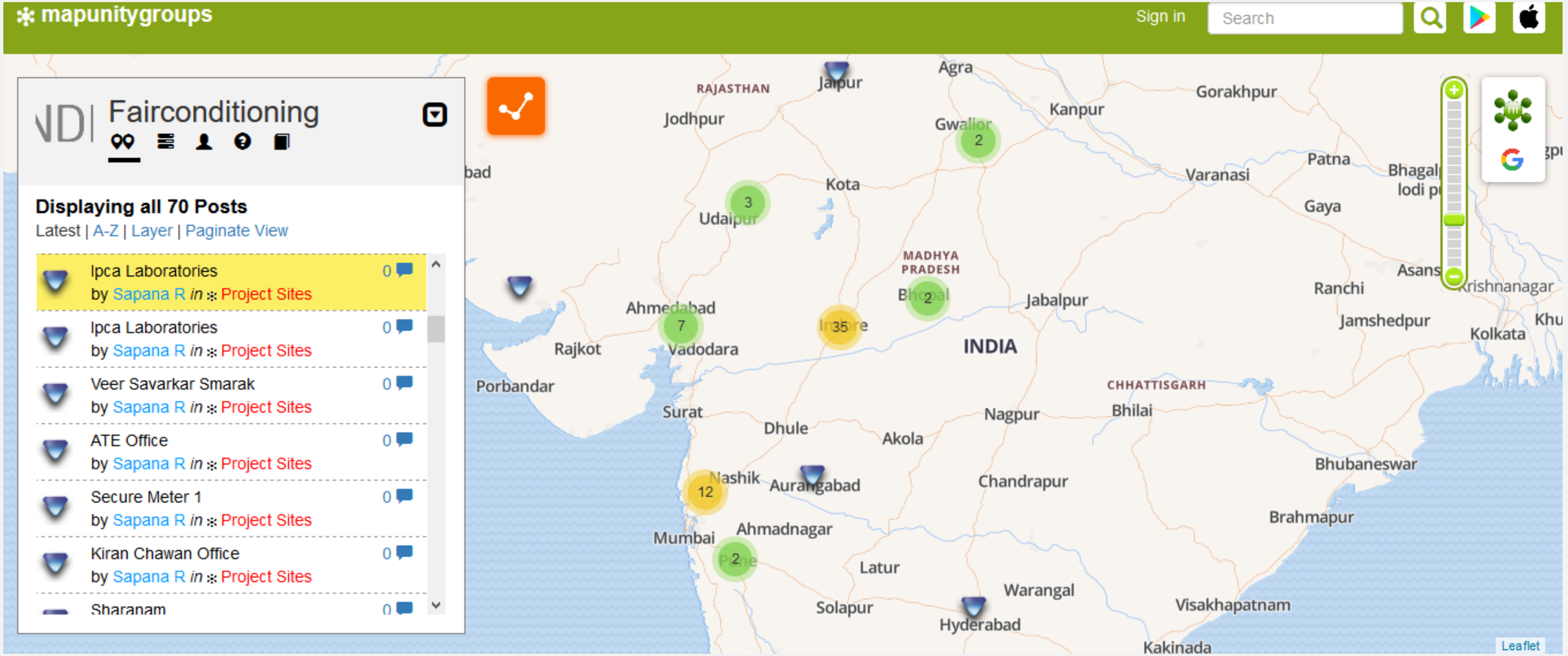
Sustainable Cooling Modelling Tool



Sustainable Cooling Modelling Tool

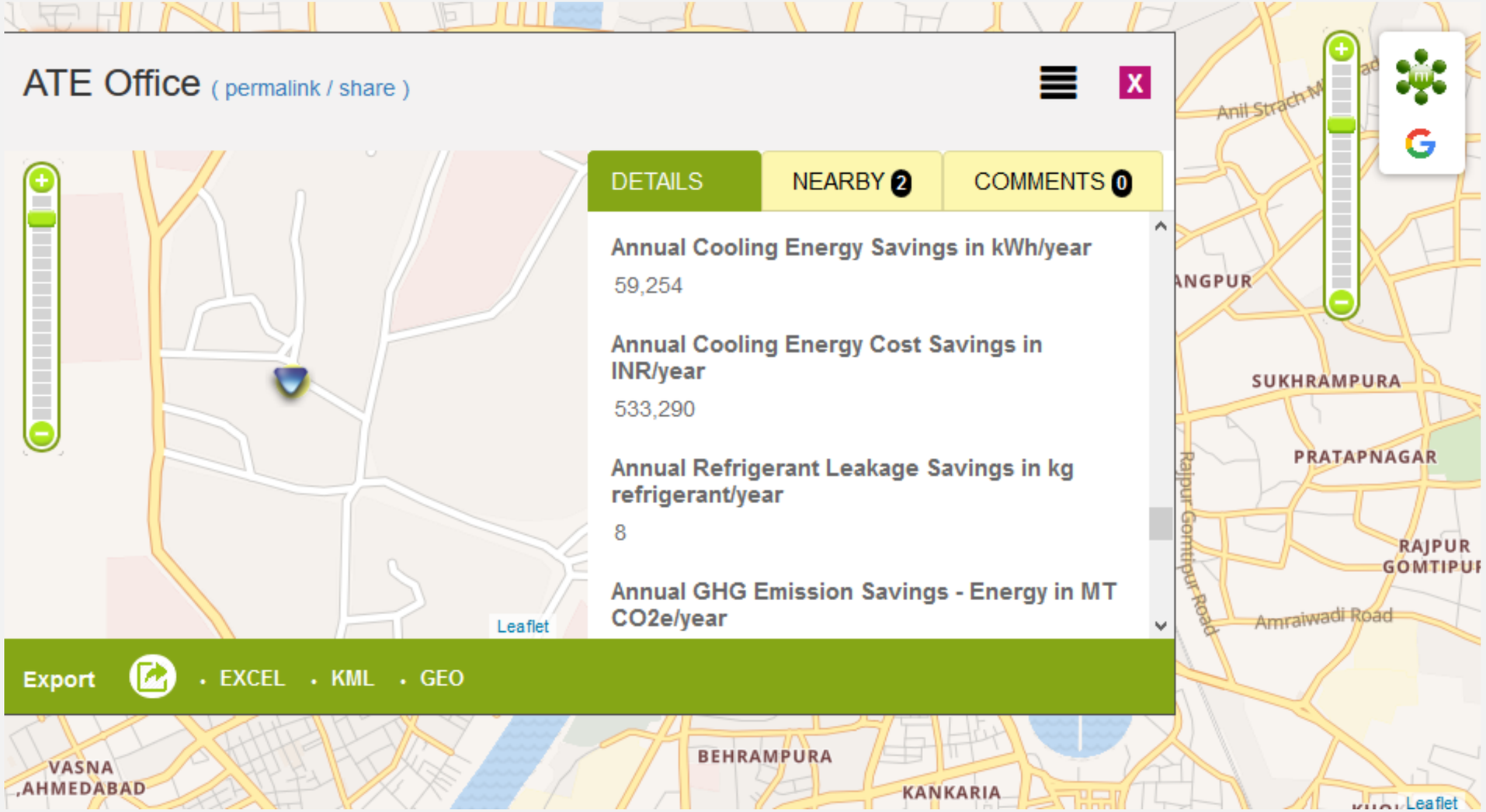


Business & Policy Support



India’s first, open access, web-based sustainable cooling map that broadcasts real-time cooling performance and energy consumption data from various sustainable cooling sites amongst stakeholder sectors in India on the Mapunity platform to allow users to view, interpret, and visualize sustainability efforts quantitatively and qualitatively.

Business & Policy Support



India’s first, open access, web-based sustainable cooling map that broadcasts real-time cooling performance and energy consumption data from various sustainable cooling sites amongst stakeholder sectors in India on the Mapunity platform to allow users to view, interpret, and visualize sustainability efforts quantitatively and qualitatively.

Performance Metrics

The Ministry of Power could spend **INR 5.3 crore to increase capacity by 1 MEGA-watt**

Or

Spend **INR 4,600 to generate 1 NEGA-watt** through transforming Academic Curricula in HVAC Engineering and Architecture Colleges

Current Interventions

BNCA:
- engendering empathy for the subject is the starting point for all courses
- passing-the-parcel game
- site visits used not just for understanding history, but also building physics principles in action
- market survey in light of energy efficiency performance
- physical teaching aids for sustainable cooling technologies

Sushant School of Art and Architecture:
- training session with Physical Aids expert
- coal mining site visit to sensitize students
- new building performance mapping (light, ventilation, hot-spots etc.)
- climate consultant training/use at early stages of studio
- all architectural movements will be studied in context of building performance parameters

Tiwari College of Architecture:
- new games for psychometrics, solar geometry
- prepare physical models for shading strategies for building designs for different climatic zones
- site visit to teach passive design strategies
- linkage with other subjects to create horizontal integration
- buddy-college co-creation studio
- shelter-as-teaching aid

Our Ask

Fairconditioning spends **INR 5.0 lakhs per HVAC Engineering or Architecture College** to embed sustainable cooling into their curricula

Track Record: Jan 2015 +

Current beneficiaries of our support

- **Education:** 32 Architecture and 10 Engineering Colleges
- **Architecture Firms:** 136 firms
- **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

Vivek Gilani, Fairconditioning Programme Manager for India
Fairconditioning Board member
Managing Director, cBalance Solutions Hub
Ashoka Fellow
BSc in Chemical Engineering, Florida Institute of Technology
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

Nitin Pasricha, Project Manager for the Academic Curricula 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

Dhrumit Parikh, Technology Manager for Sustainable Cooling Adoption Network
BSc in Mechanical Engineering, Sardar Patel University
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.

Chaïm 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 to view all team member profiles.

CONTACT

Vivek Gilani
Ashoka Fellow
Managing Director, cBalance Solutions Hub
Programme Director, Fairconditioning (India)
vivek@cBalance.in

Philippe DeRougemont
Co-Founder, noe21
Programme Director, Fairconditioning (Switzerland)
phr2@noe21.org

www.fairconditioning.org

SUPPORTERS

SHAKTI
SUSTAINABLE ENERGY
FOUNDATION

Frankfurt School of
Finance & Management
Bankakademie | HfB

noé 21
economy, energy, society

OAK
FOUNDATION

REPUBLIC
AND STATE
OF GENEVA
POST TENEBRAS LUX

USAID
FROM THE AMERICAN PEOPLE