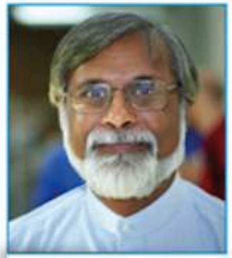
COOL COALITION

WEBINAR SERIES

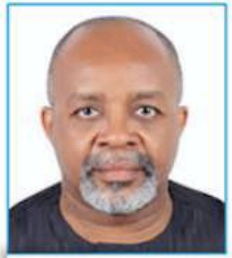
Brian Dean,
Lead, Energy Efficiency and Cooling at Sustainable Energy for All (SEforALL)

Andreas Gruner,
Advisor, Programme for Energy Efficiency in Buildings (PEEB)

Dan Hamza-Goodacre,
Cool Coalition, Non-Executive Director of the Kigali Cooling Efficiency Program (K-CEP), COP26 Champion



Ashok B. Lall,
Principal of Ashok B Lall Architects, India



Emeka Nwandu,
President, Green Building Council in Nigeria

Martina Otto,
GlobalABC, Head of Cities Unit, UNEP

Lily Riahi,
Coordinator Cool Coalition, UNEP

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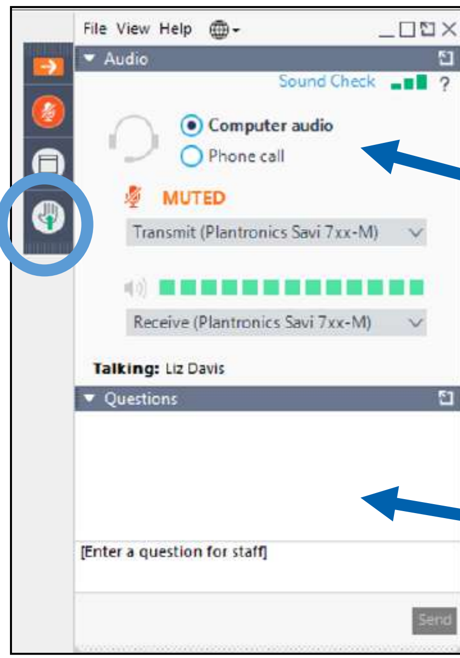
Welcome to the webinar

Please find below some important instructions for your active engagement

1 All participants will be muted by the administrator. Please use the "raise hand" icon to notify us if you would like to speak during the Q&A. We will then enable your microphone.



2 If joining with a computer/mobile select "Computer Audio" If joining by dial-up please choose "Phone call"

3 Questions and comments for the Q&A should be written in this box

Connected via telephone

5 *4 – Hear a menu of keypad commands available to you.
*6 – Mute or unmute your audio.

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Cool Buildings: Greening Real-Estate Investments To Curb The Rise In Cooling Demand

WELCOME AND KEY CHALLENGES *(3.00 pm - 3.05 pm)*
Dan Hamza-Goodacre, Non-Executive Director, K-CEP, COP26 Champions Team

BIOCLIMATIC ARCHITECTURE WITHOUT AIR-CONDITIONING *(3.05 pm - 3.15 pm)*
Ashok B. Lall, Architect, India

REPORT LAUNCH: BETTER DESIGN FOR COOL BUILDINGS *(3.15 pm – 3.30 pm)*
Andreas Gruner, Advisor, Programme for Energy Efficiency in Buildings (PEEB)

PANEL DISCUSSION: POLICY ACTION FOR COOL AND LOW CARBON BUILDINGS *(3.30 pm - 4.00 pm)*
Emeka Nwandu, President, Green Building Council in Nigeria
Brian Dean, Lead, Energy Efficiency and Cooling at Sustainable Energy for All (SEforALL)
Ashok B. Lall, Architect, India
Andreas Gruner, Advisor, Programme for Energy Efficiency in Buildings (PEEB)

Q&A WITH AUDIENCE *(4.00 pm - 4.20 pm)*

CALL TO ACTION AND CLOSING *(4.20 pm - 4.30 pm)*
Martina Otto, Coordinator, Global Alliance for Buildings and Construction (GlobalABC)

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WELCOME REMARKS

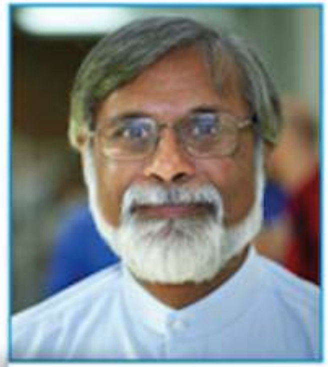
5 minutes

Dan Hamza-Goodacre,

Cool Coalition, Non-Executive Director of the Kigali Cooling Efficiency Program (K-CEP), COP26 Champion

BIOCLIMATIC ARCHITECTURE WITHOUT AIR-CONDITIONING

10 minutes



Ashok B. Lall,

Principal of Ashok B Lall Architects, India

COOL BUILDINGS

To curb the rise in cooling demand

COOL COALITION WEBINAR

1ST July 2020

Ashok lall New Delhi

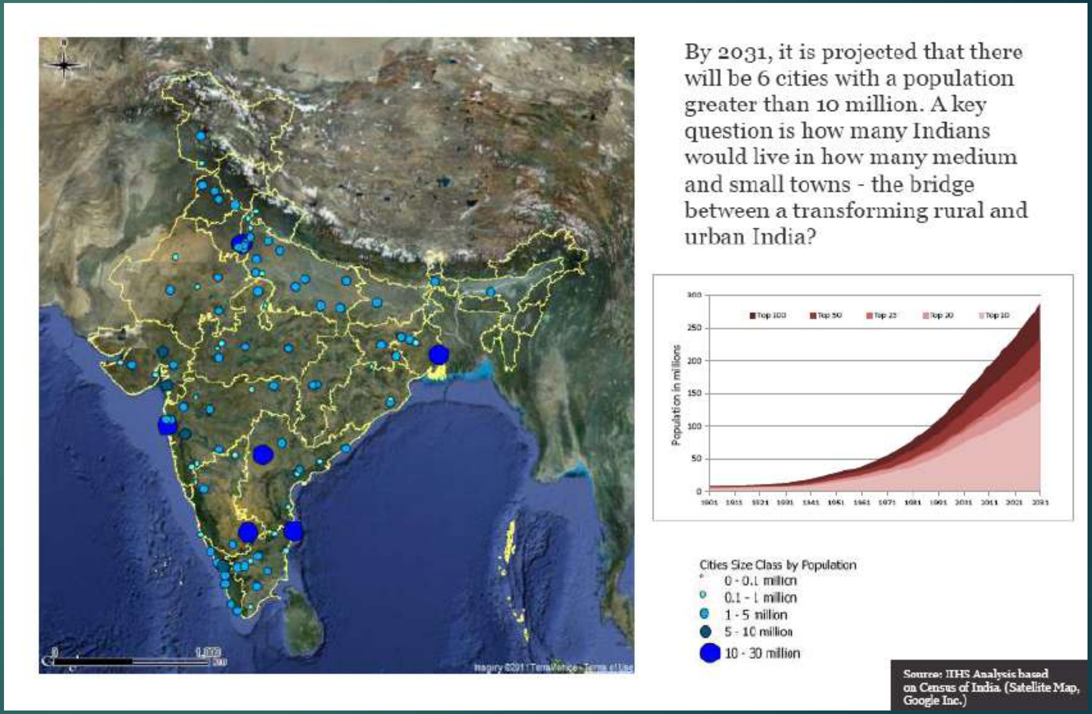
INDIA :   A developmental perspective

Buildings account for **30%** of energy consumption in today

In **2012 Residential buildings** energy consumption was **2.3** times that of commercial buildings.

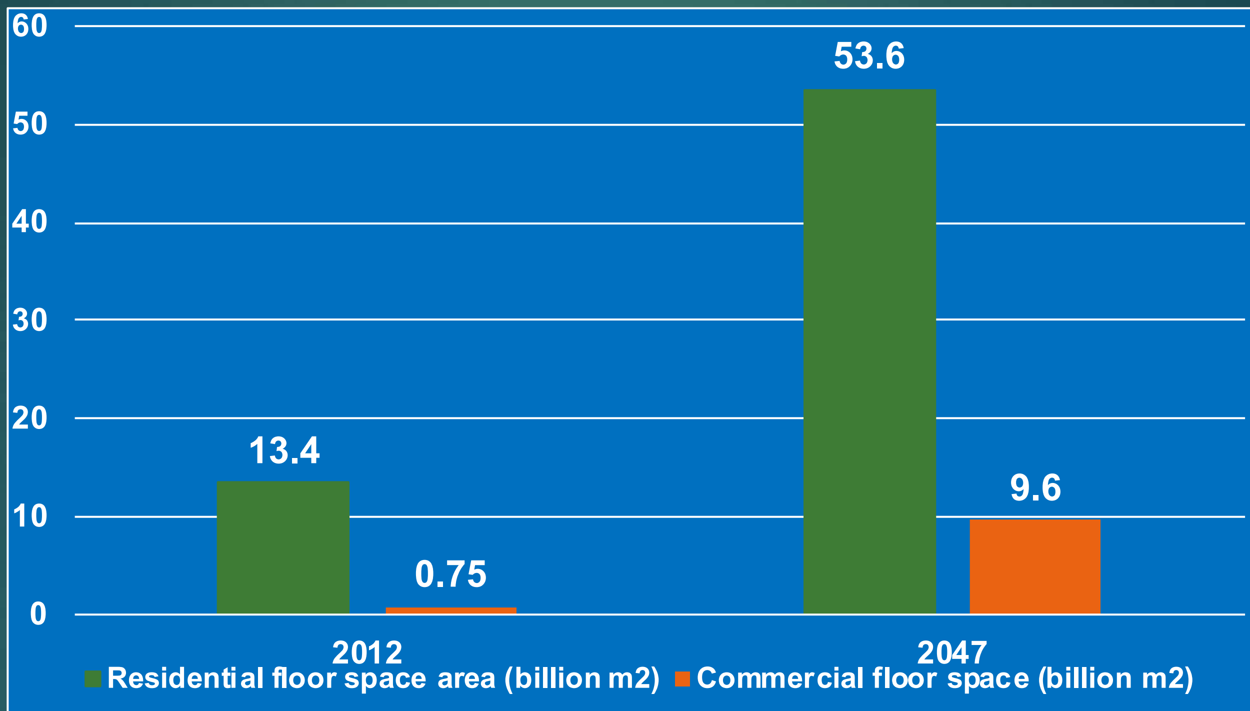
With **rapid urbanisation** and construction **new homes** – to meet the current shortfall and to cope with additional requirement, and rising **standards of living** –

By **2032** this is expected to increase to **7 times** the demand for energy in commercial buildings.



Source: IIHS Analysis based on Census of India. (Satellite Map, Google Inc.)

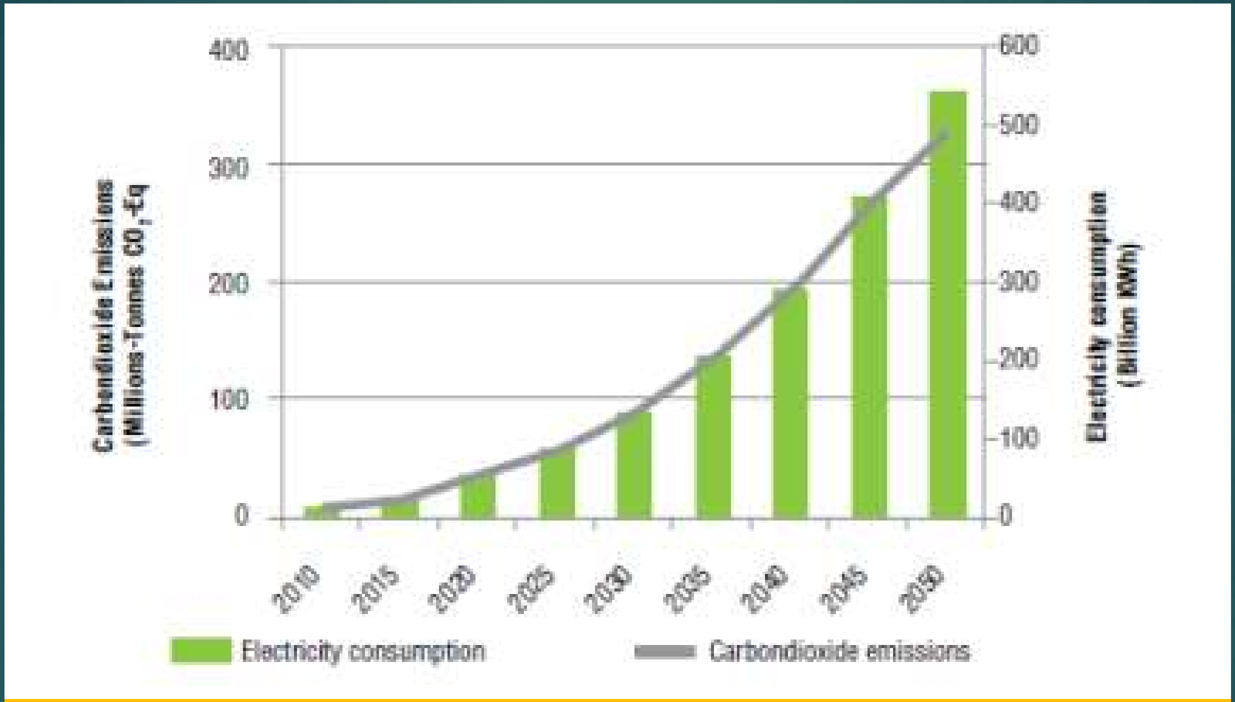
INCREASE IN BUILT UP AREA



Source: India Energy Security Scenarios, NITI Aayog' (2015) estimates based for 7.4% of Compound Annual Growth Rate (CAGR) in GDP

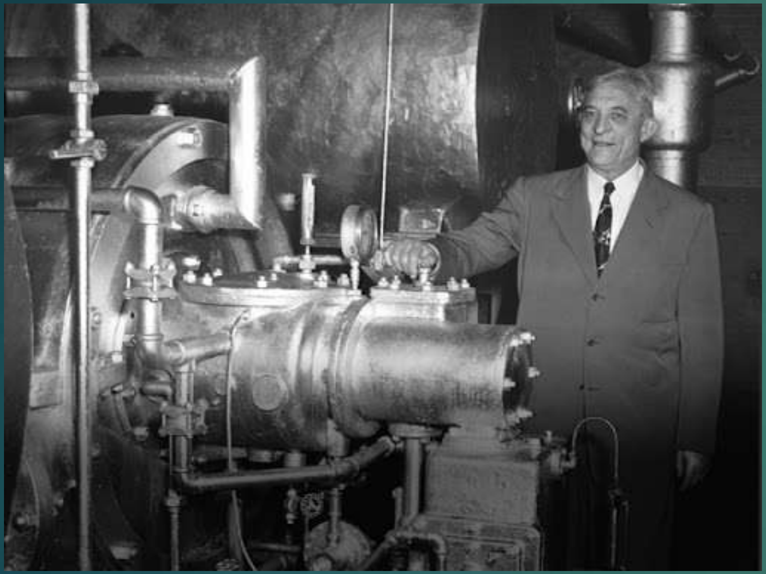
2-4 x increase in built-up area of buildings in next 30 years

IMPACT OF INCREASE IN ROOM AIRCONDITIONERS



Under BAU scenario, increased penetration of room air conditioners (RAC) will add to **additional 150 GW** electricity generation capacity and put a huge strain on the electricity distribution system in the cities.

1902



Carrier invented the first electrical air conditioning unit in 1902.

1952

The need for cooling the body

when one is feeling uncomfortably warm is self evident

First Priciple : cool the body

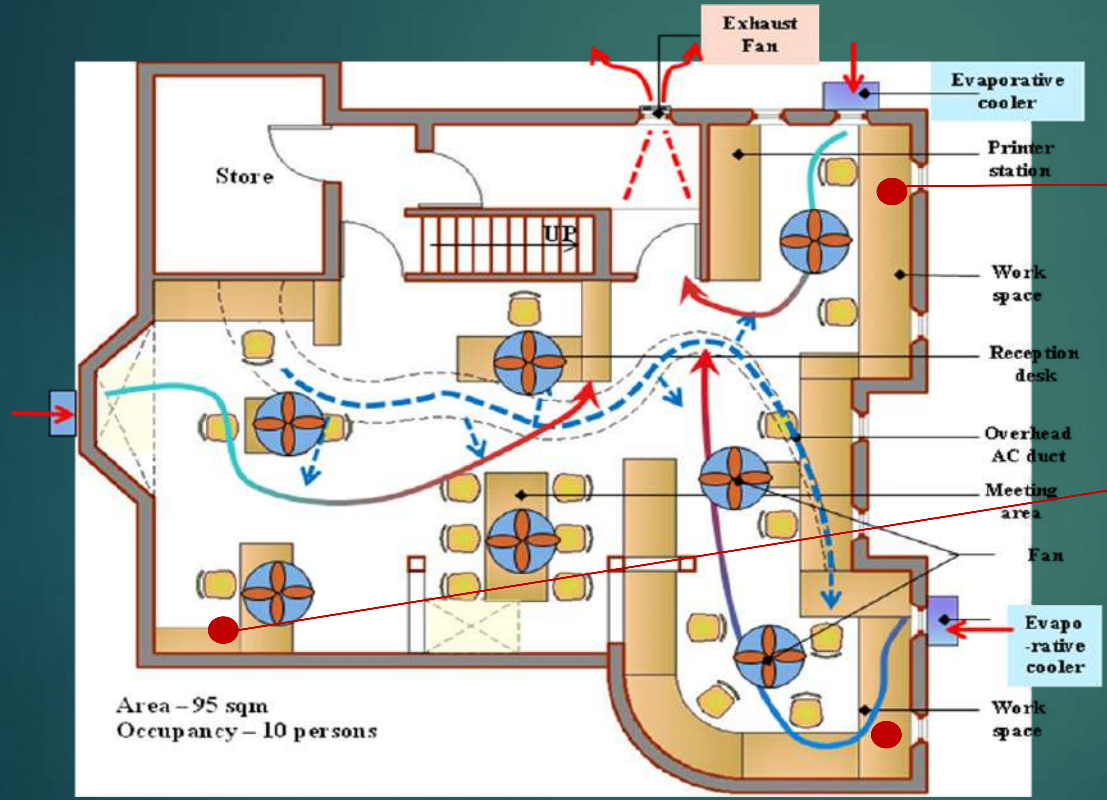
1882

In 1882, Philip Diehl developed the world's first electric ceiling fan.

COMBINATION OF COOLING SYSTEMS :

Protected thermal mass, natural ventilation, ceiling fans

Assisted ventilation, evaporative cooling, de-humidification

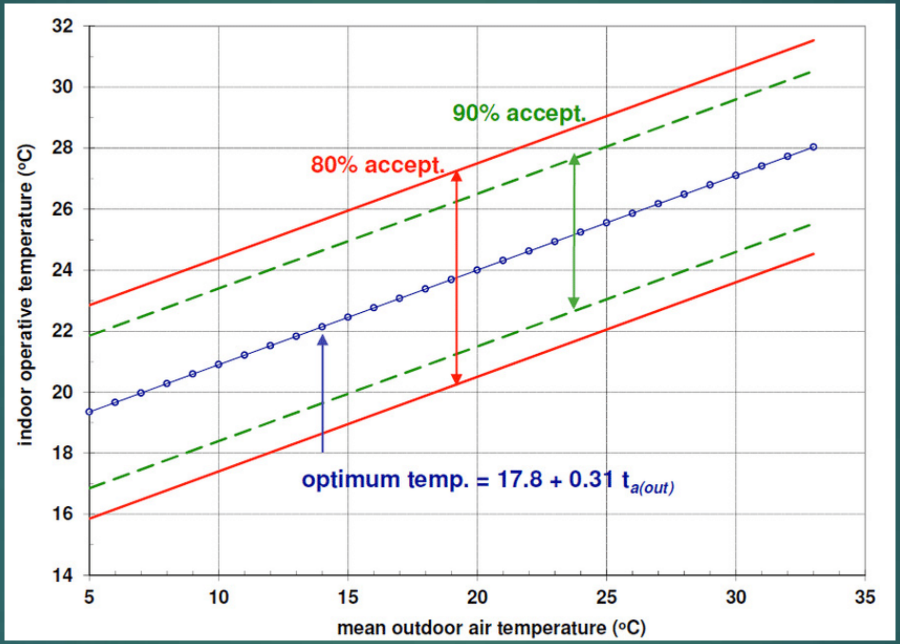


DRY BULB TEMPERATURE – 29 ° Celsius

WET BULB TEMPERATURE – 24 ° Celsius

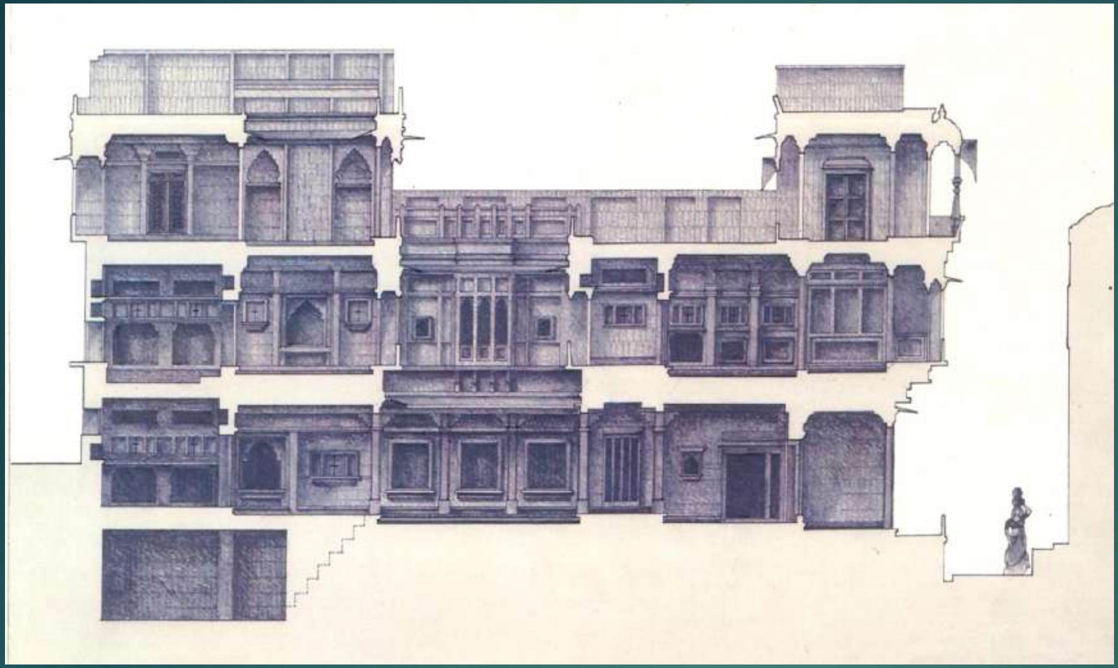
COMFORT STANDARD !!!

Richard de Dear



The ASHRAE 2004 (2010) adaptive comfort standard

Gail Brager



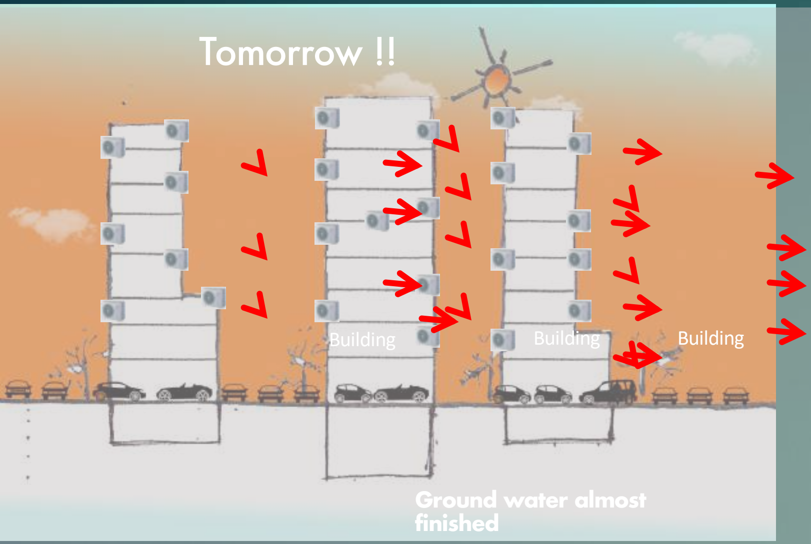
TRADITIONAL BUILDING

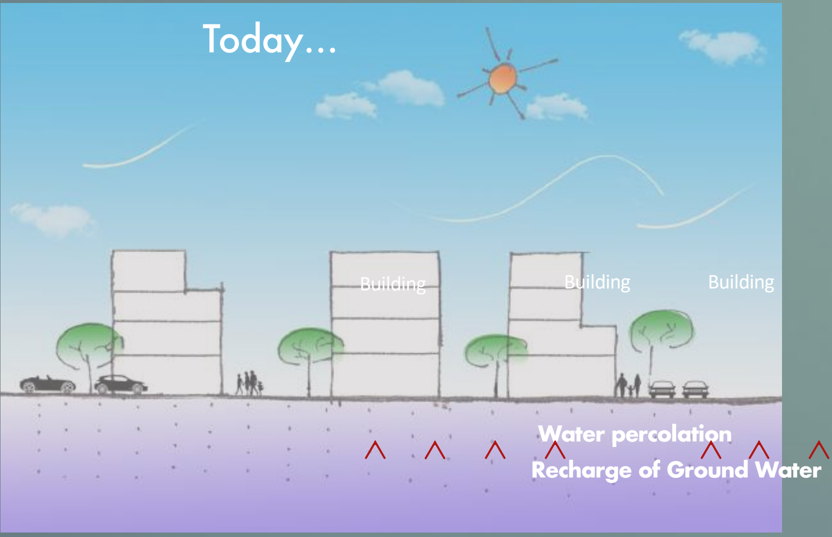
PROTECTED THERMAL MASS, COMPACT PLAN

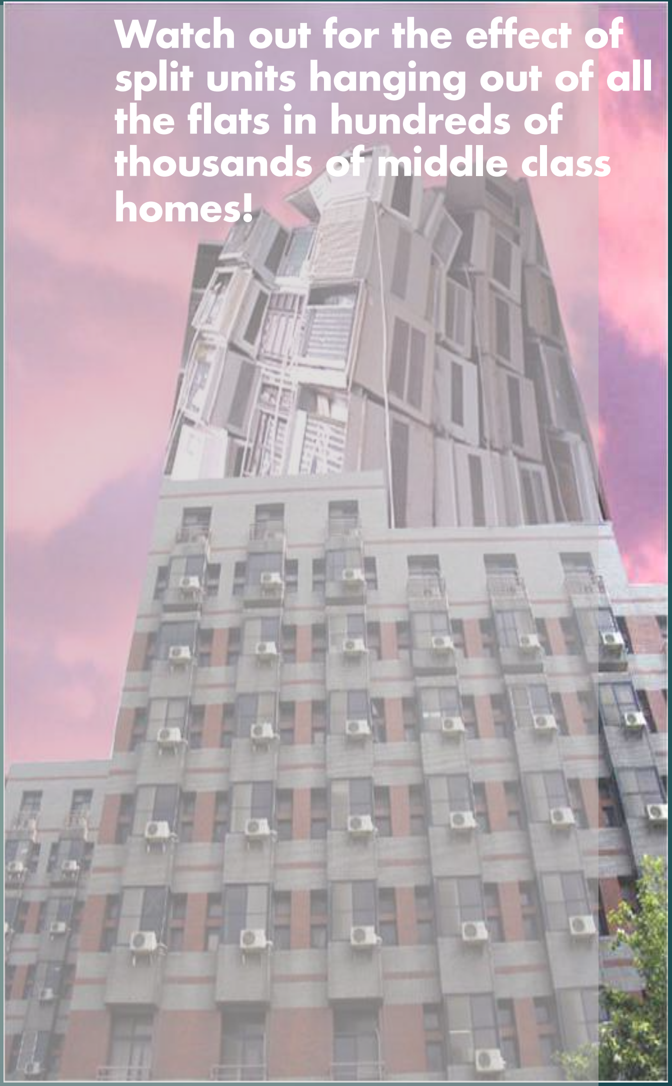
NATURAL VENTILATION

SHADING

NEGATIVE DESIGN





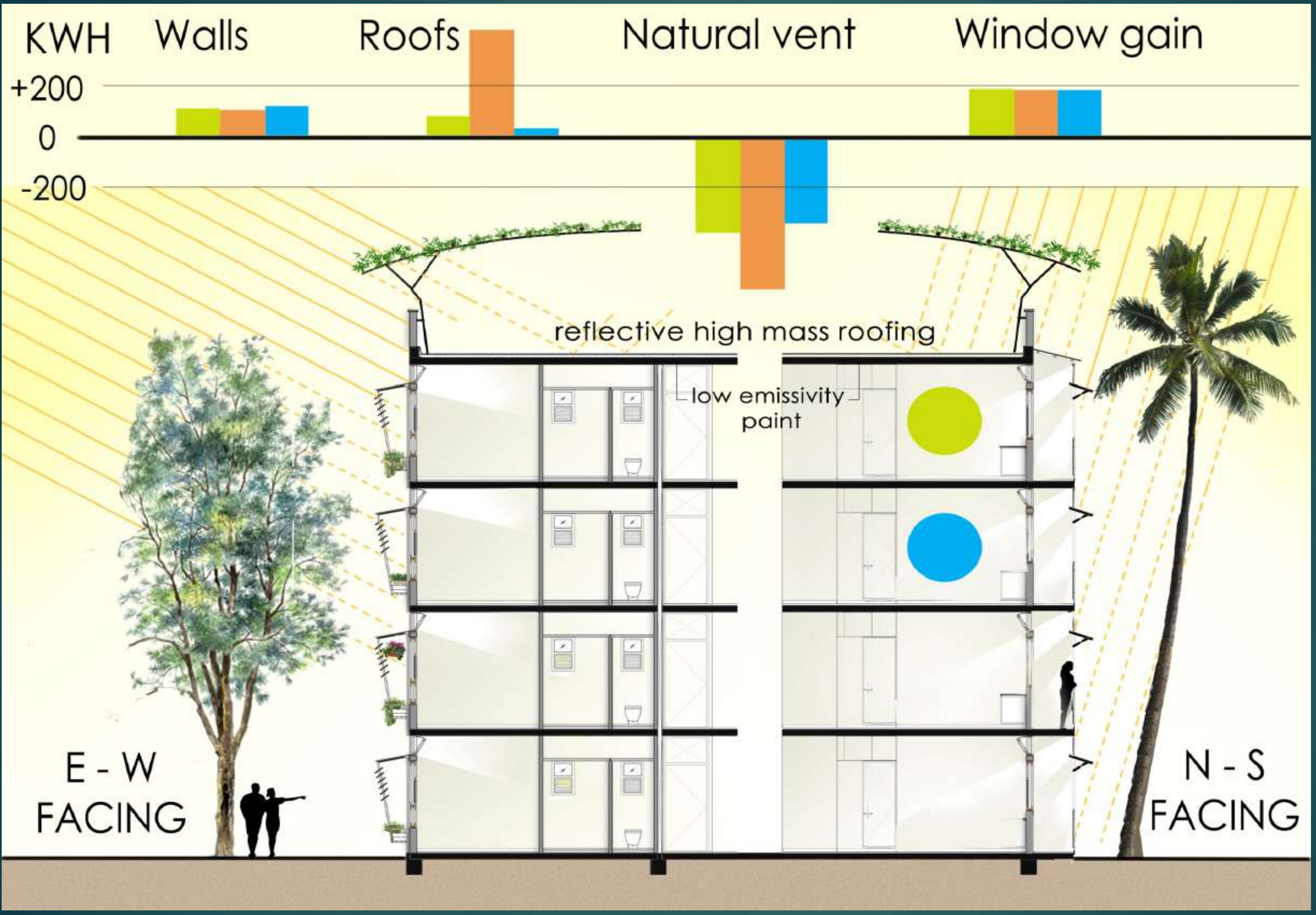


VISCIOUS CYCLE

OF

AIRCONDITIONED

DISCOMFORT

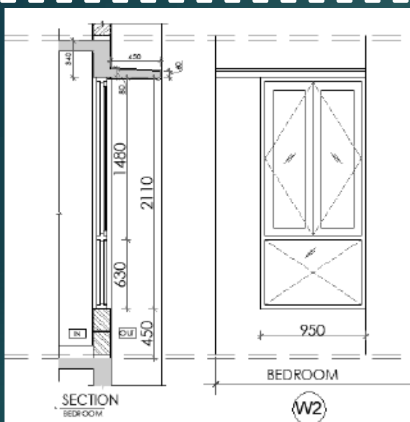


SHADE

VENTILATE

INSULATE

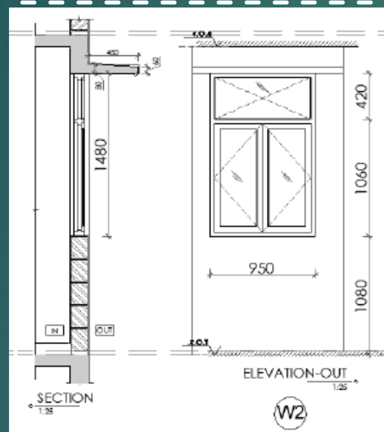
Window and shading design alternatives for comparison



Case 1:

Window size: As per current design

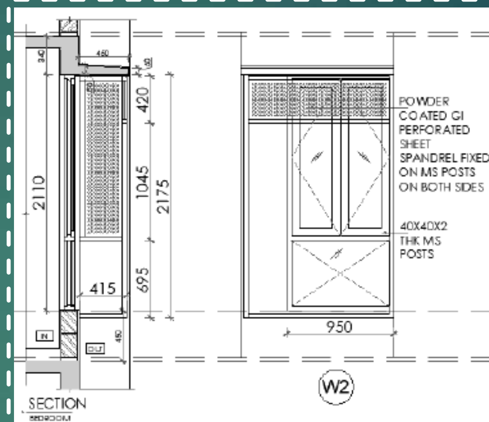
Shade: As per current design



Case 2:

Window size: As per Part 1 design (Fixed part of Glass at bottom is removed)

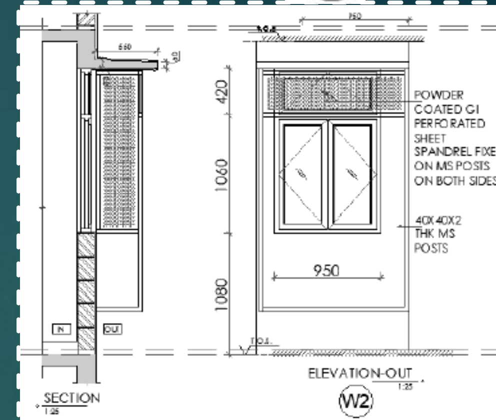
Shade: As per current design



Case 3:

Window size: As per current design

Shade: As proposed (side fins – up to 1.48 m from top, front screen – up to 0.42 from top of window)



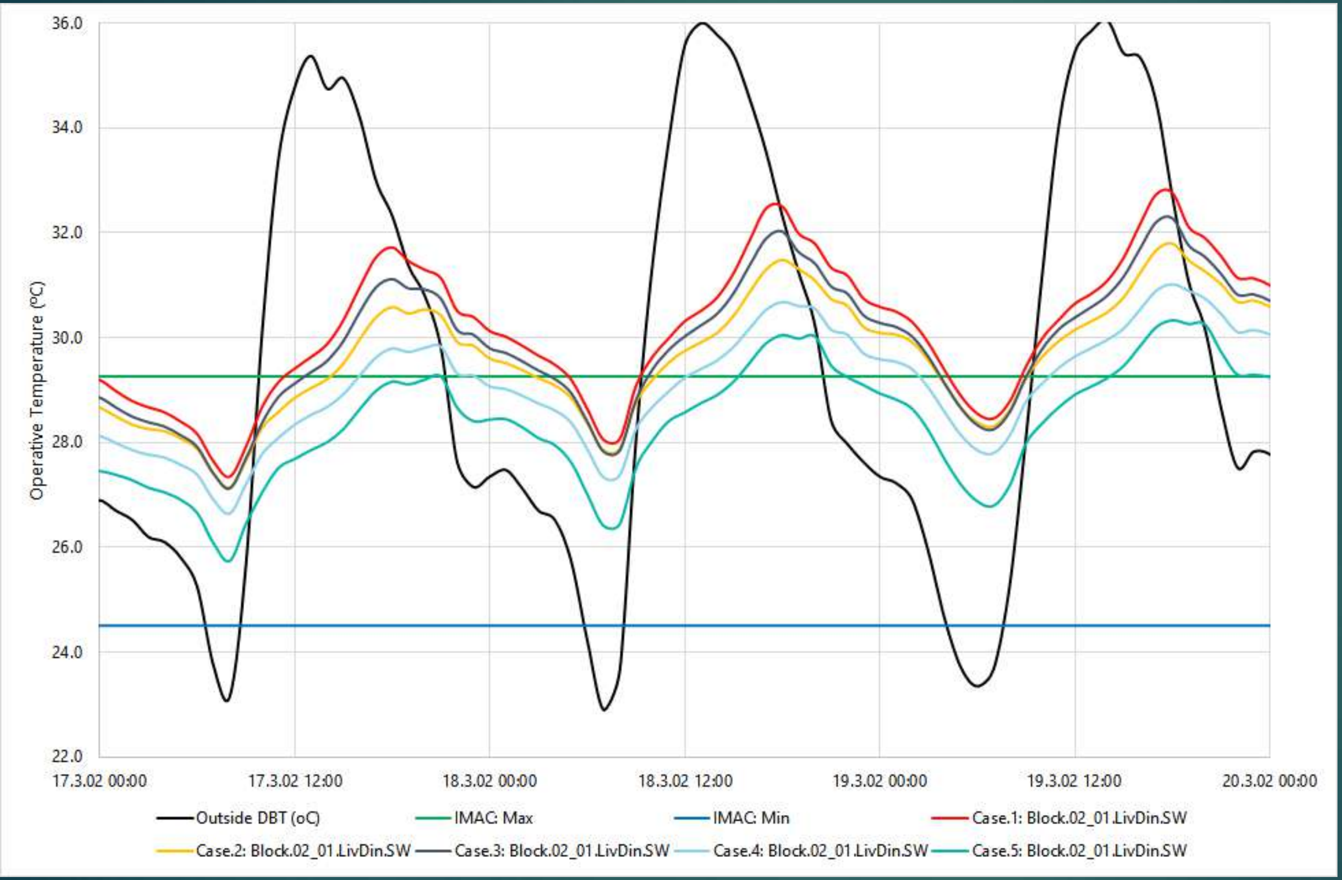
Case 4:

Window size: As per Part 1 design (Fixed part of Glass at bottom is removed, while top part of the window in Bedroom and Living room is also openable)

Shade: As proposed (side fins – up to 1.48 m from top, front screen – up to 0.42 from top of window)

Case 5: Assisted ventilation is added in Case.4

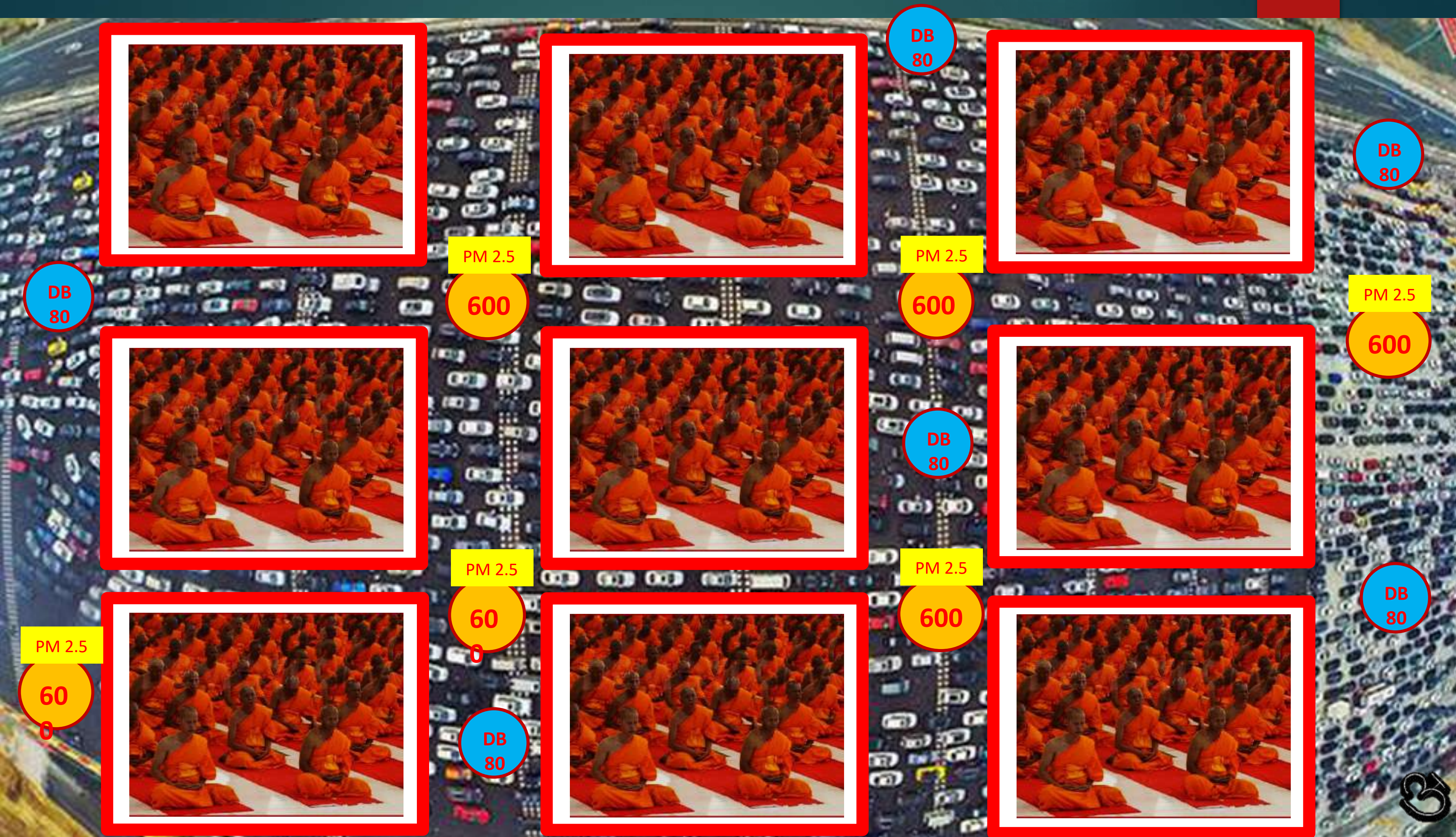
Indoor operative temperature (March: Living Room)



- ~2.5°C when assisted ventilation is added with improved design (Case.5 vs Case.1); **Most of hours come within IMAC band**
- ~2°C reduction in peak inside operative temperature with reduced glass area and shading (Case.4 vs Case.1)
- ~0.5 and ~1°C reduction in peak inside operative temperature by adding window shading (Case.3 vs Case.1) and with reduced glass area (Case.2 vs Case.1), respectively.

HIGH DENSITY INTENSIVE DEVELOPMENT + FOSSIL FUEL BASED TRANSPORTATION =

POLLUTION AND URBAN HEAT ISLAND EFFECT WITH RISING TEMPERATURES


DB 80
DB 80
PM 2.5
600
PM 2.5
600
DB 80
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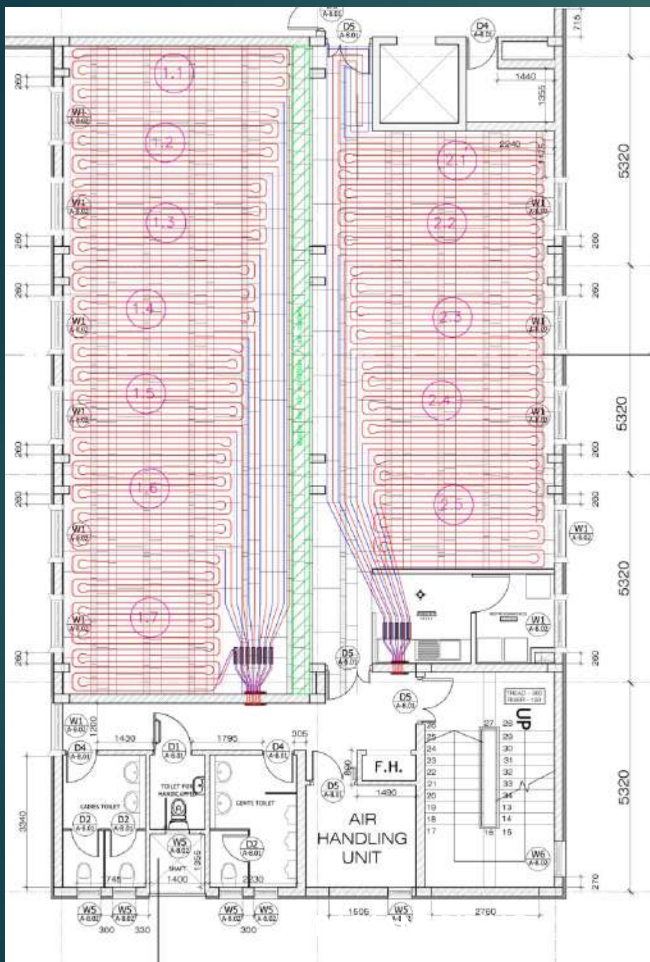
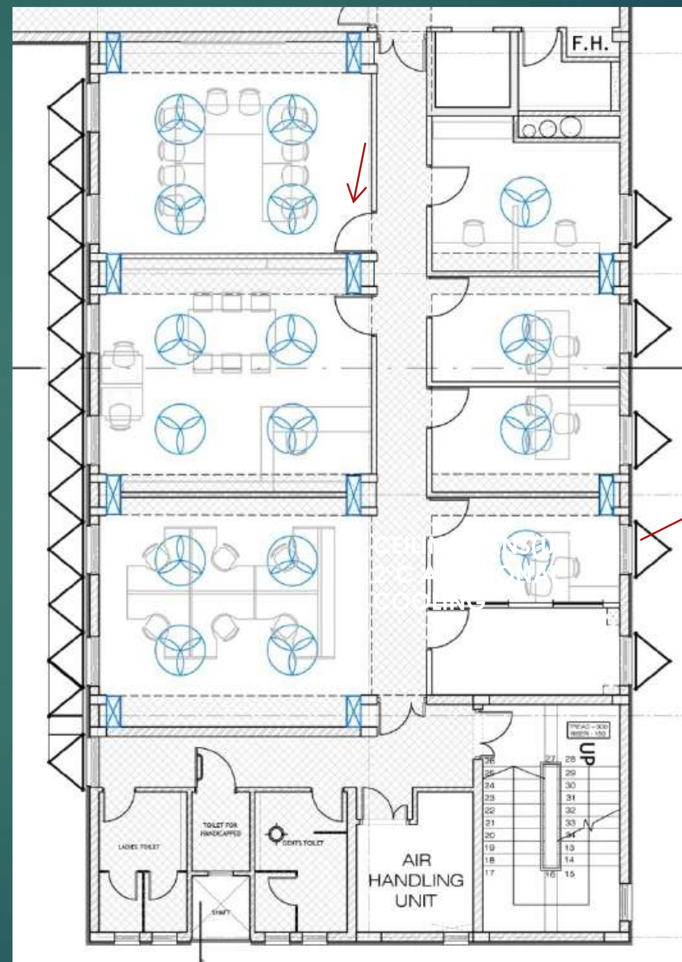
COMBINATION OF COOLING SYSTEMS – MIXED MODE

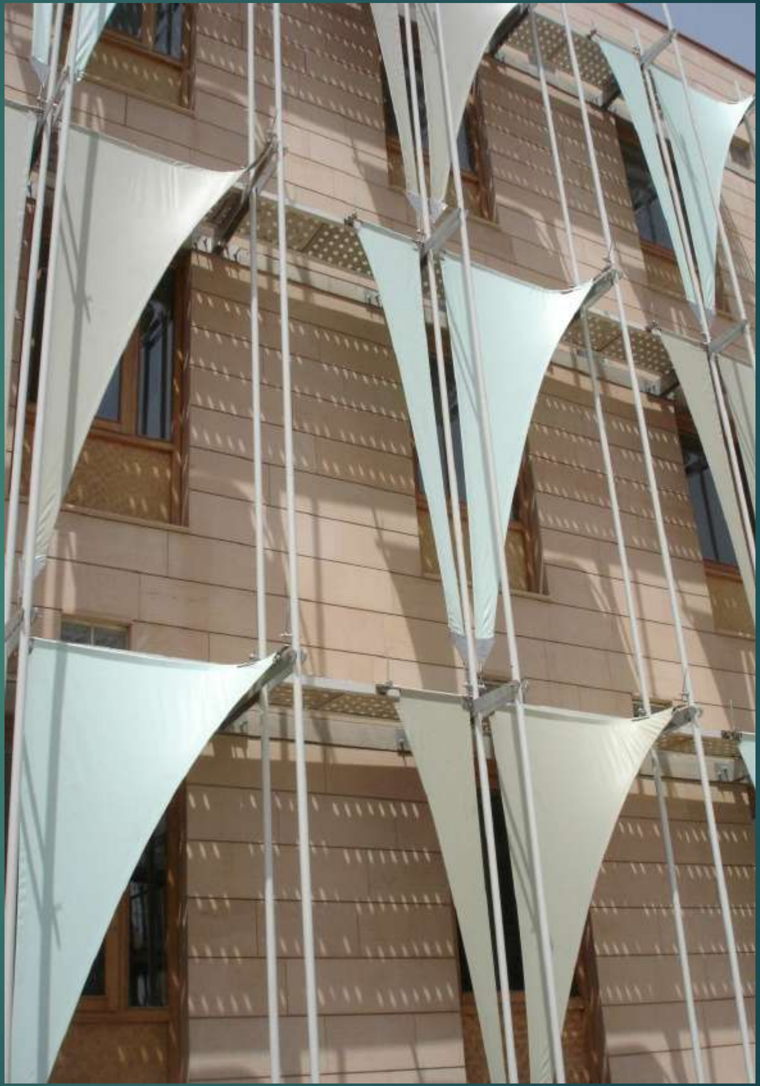




COOLED FRESH AIR
19°C – 22°C

SLAB TEMPERATURE :
26°C(SUMMER) TO
20°C(WINTER)

CEILING FANS
& COOLED FRESH AIR



USER/BUYER/CUTOMER MUST KNOW AND MUST DEMAND

POSITIVE DESIGN FOR COMFORT AT AFFORDABLE PRICES

SHADE

VENTILATE

INSULATE

ASSIST AIR MOVEMENT

ASSIST VENTILATION

AVOID AIR CONDITIONING !

REPORT LAUNCH: BETTER DESIGN FOR COOL BUILDINGS

15 minutes

Andreas Gruner,

Advisor, Programme for Energy Efficiency in Buildings (PEEB)

Better design for cool buildings

Reducing the massive need for space cooling in hot climates

Andreas Gruner

1 July 2020, Cool Coalition webinar on Cool Buildings

Star Garment Innovation Centre, Sri Lanka

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PROGRAMME FOR ENERGY EFFICIENCY IN BUILDINGS

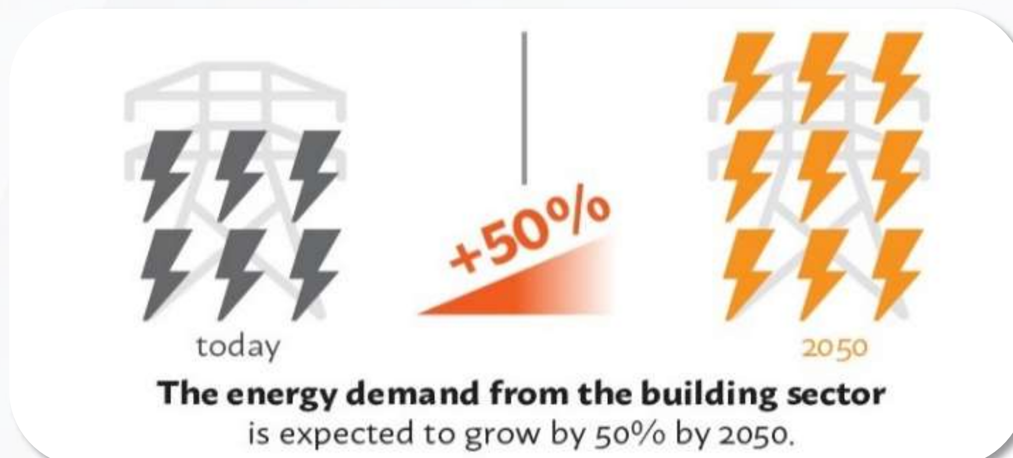
Buildings: the sleeping giant for climate change

Buildings construction & operation:

- Nearly **40%** of global CO_2 emissions
- **Lock-in GHG emissions** for +50 years

NDCs are not actionable

- 136 NDCs mention building sector, but lack concrete actions and targets



Source: GlobalABC. Global Status Report. 2019

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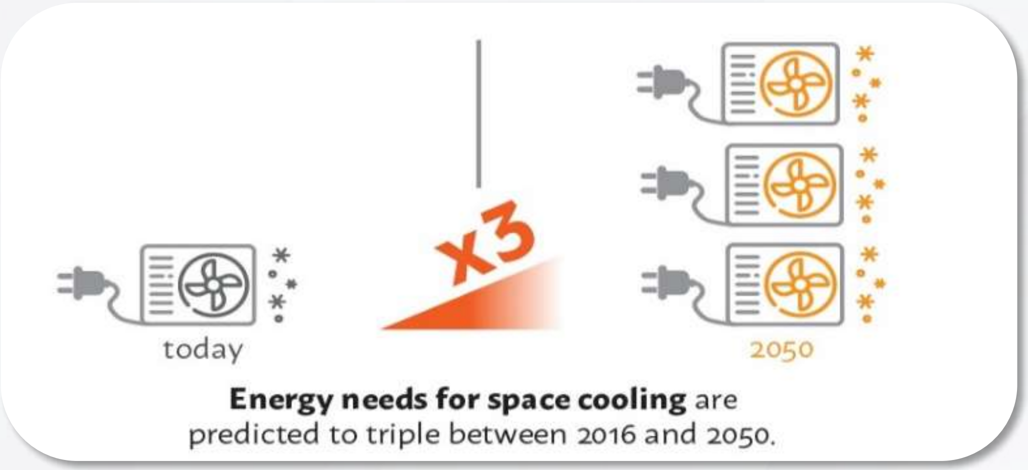
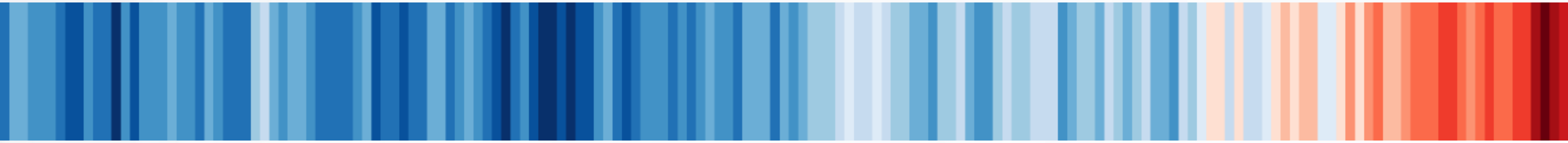
Energy demand for cooling will triple…



Source: IEA. The Future of Cooling. 2018

Nearly **70%** of increase in **residential buildings**

1850 **2018**



Source: Climate Lab Book. 2018

Better building designs reduce cooling needs

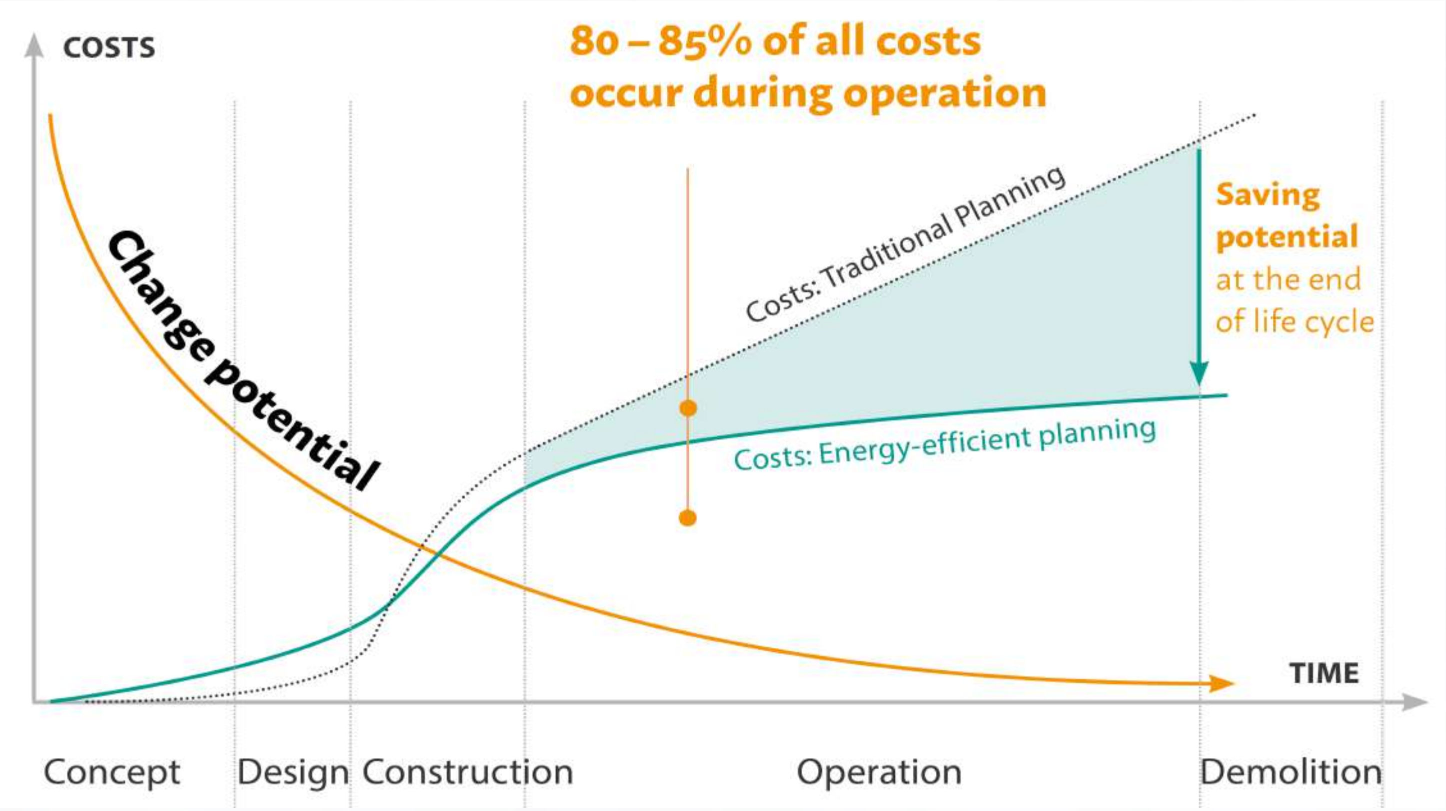
Improved building designs can significantly increase the **thermal comfort** and **reduce or even avoid** the **energy demand** for space cooling.

- **White roofs** reflect **80%** of sun's energy (dark roofs only 5 – 10%)
- **50%** less cooling demand through better **thermal envelope**
- **20%** less cooling demand by using low-emissivity glass **windows**
- **40%** reduced air conditioning hours through **natural ventilation**
- **25%** less cooling energy through **landscape and vegetation**

Sources: IEA. 2018, IEA. 2019, IPCC. 2014 and Fraunhofer Institute for Solar Energy Systems ISE. 2017

At the design phase, extra effort is minimal

- Energetic retrofits later on are much more expensive.



Source: PEEB 2020, based on: https://www.sciencedirect.com/science/article/abs/pii/S0360544215003217

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Three steps towards cool buildings

AVOID	**Building design** adapted to the local climate to avoid high cooling demand
SHIFT	**Renewable energy*** to replace carbon-intensive energy supply
IMPROVE	**Efficient systems and appliances** to reduce cooling demand

** whenever possible in the respective local socio-economic context*

Avoid …

Avoid or reduce any cooling demand through **bioclimatic architecture** and **passive building design.**

Site adaption:

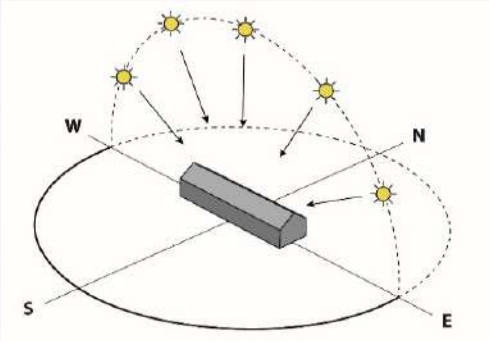
- Location, shade through vegetation and other buildings

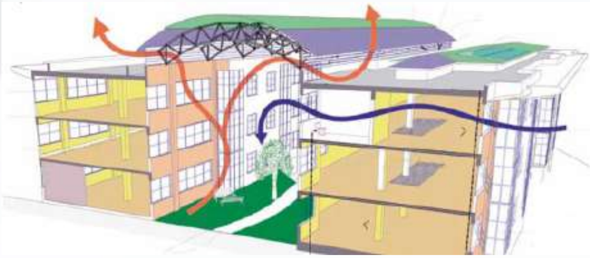
Orientation and shape:

- Sun path, compactness, positioning and size of windows, low window-to-wall-ratio

Building envelope:

- Walls & roofs, external shading, reflective coatings, windows, ventilation





… shift and improve!

Shift to **renewable energy** for operation of systems and appliances to replace carbon-intensive energy supply.

Photovoltaic systems, grid or on site-generation

Solar-powered cold chains and stations in remote or rural locations for delicate goods

Improve: Use **energy efficient systems and appliances** for cooling, lighting and devices for remaining energy needs.

- **Ceiling fans** before using highly-efficient ACs
- **Smart** thermostats and control devices
- **District cooling** if possible
- **No** use of **harmful refrigerants** (CFCs, HCFCs)

A+

Better building designs in hot climates

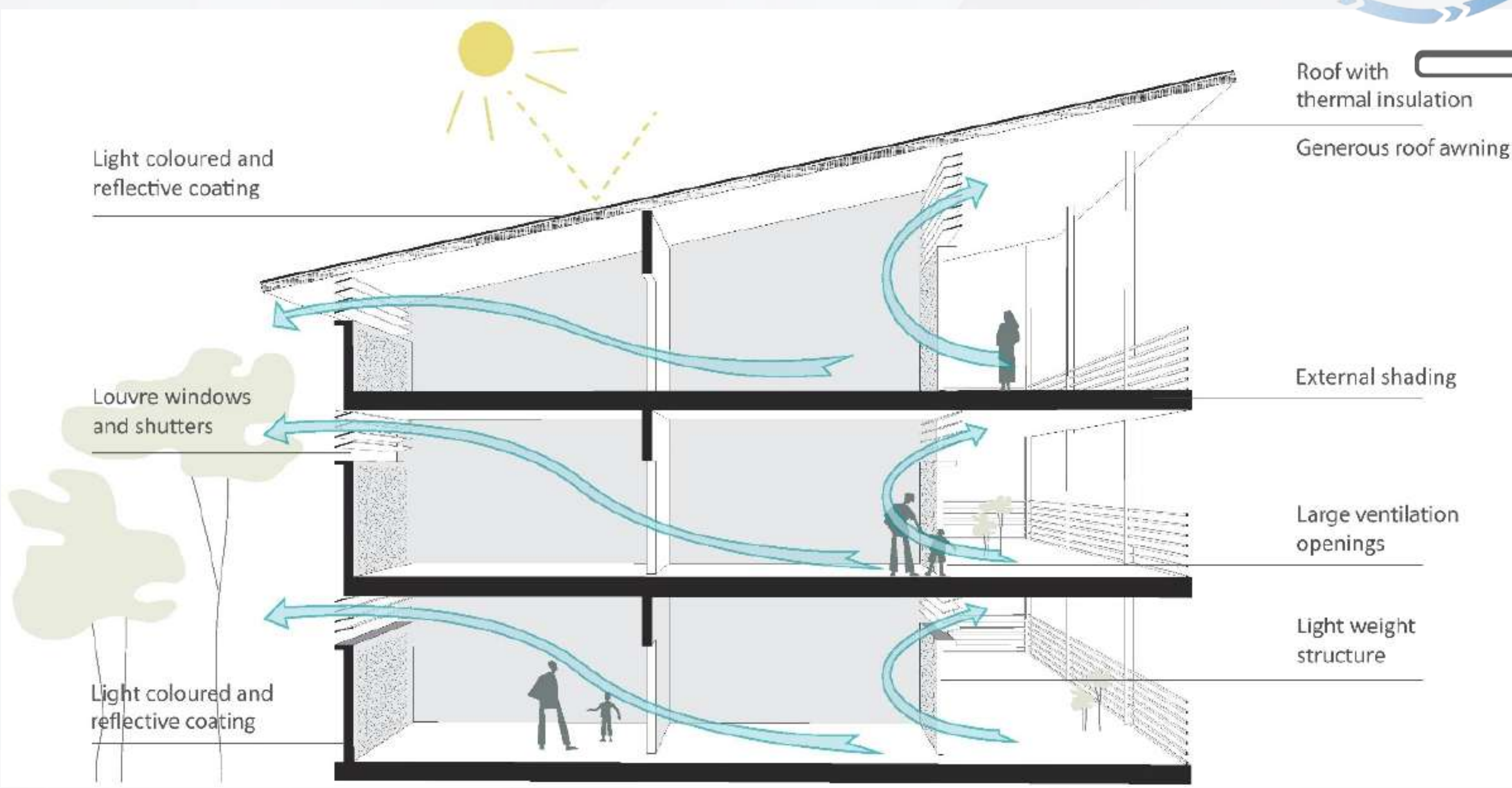
- **Open design *<u>without</u>* AC**

- **Closed design *<u>with</u>* AC** may incl. natural ventilation

Humid climate – Ventilation is essential to stay cool

Open building design *without* air conditioning

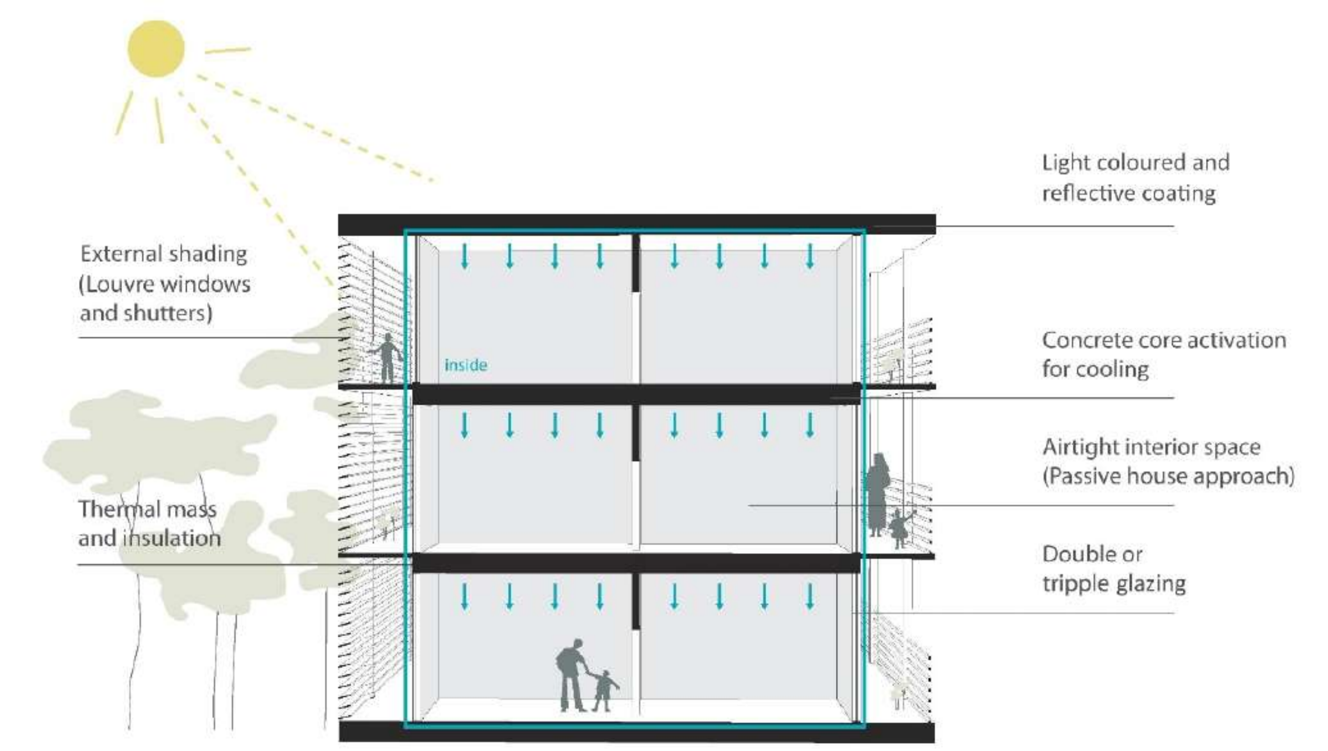
- Lightweight building, encouraging constant air circulation



Humid climate – Efficient cooling and natural ventilation at night

Closed building design *with* air conditioning

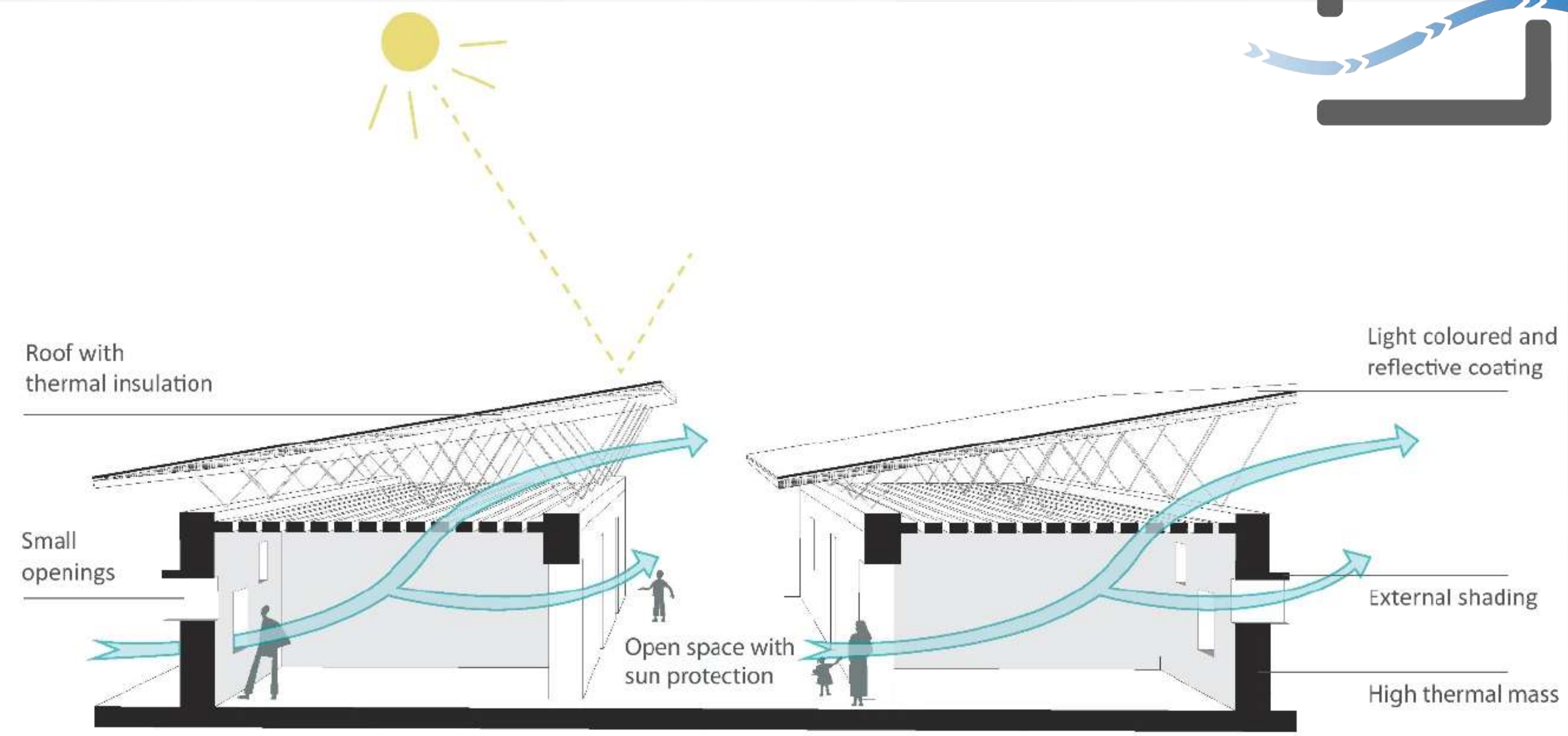
- Mid-weight building with very efficient mechanical cooling
- Can also be combined with natural ventilation for cooling



Dry climate – Slowly absorbing the heat during the day and cooling off at night

Open building design *without* air conditioning

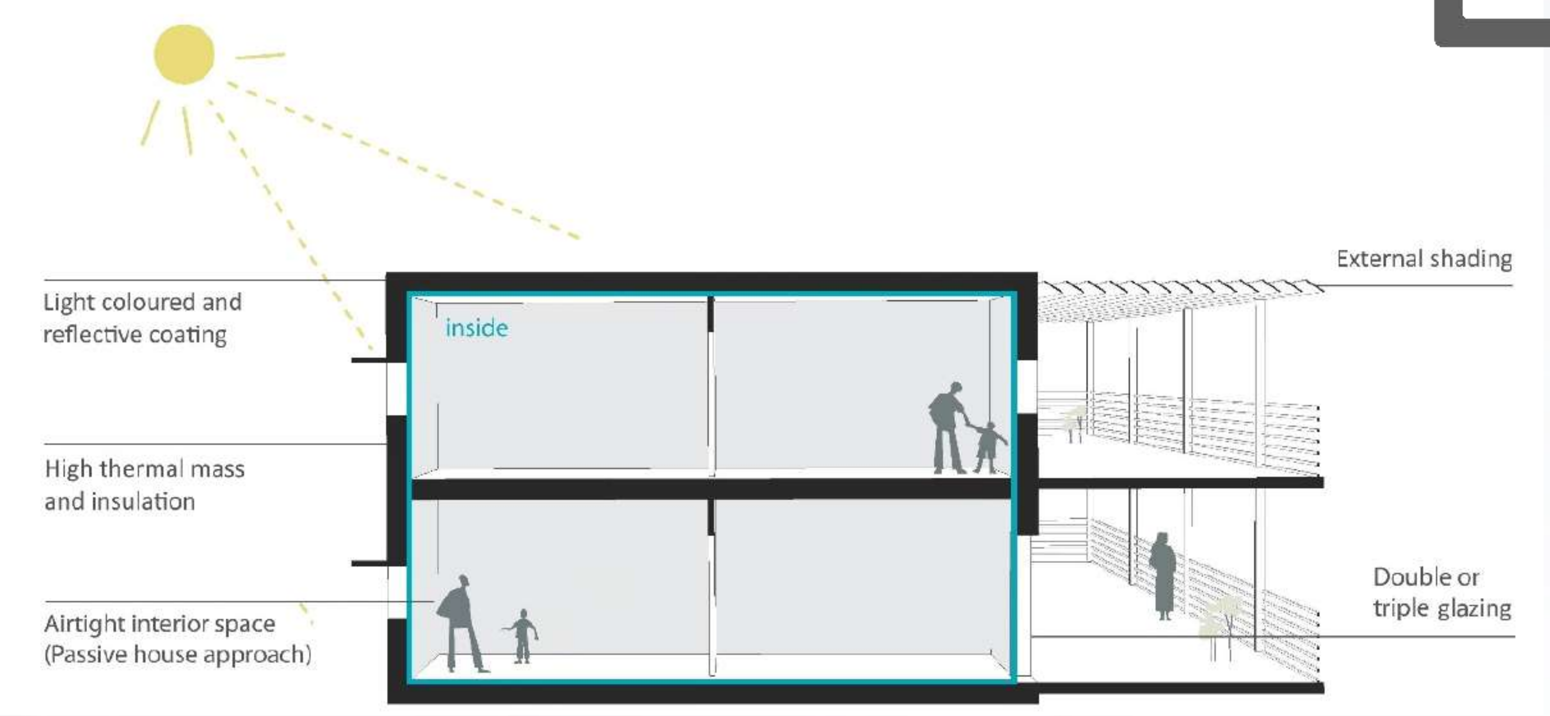
- Massive building, blocking heat, encouraging air circulation



Dry climate – Efficient cooling with high-performance airtight building envelope

Closed building design *with* air conditioning

- Massive building, blocking heat, cooling down mechanically

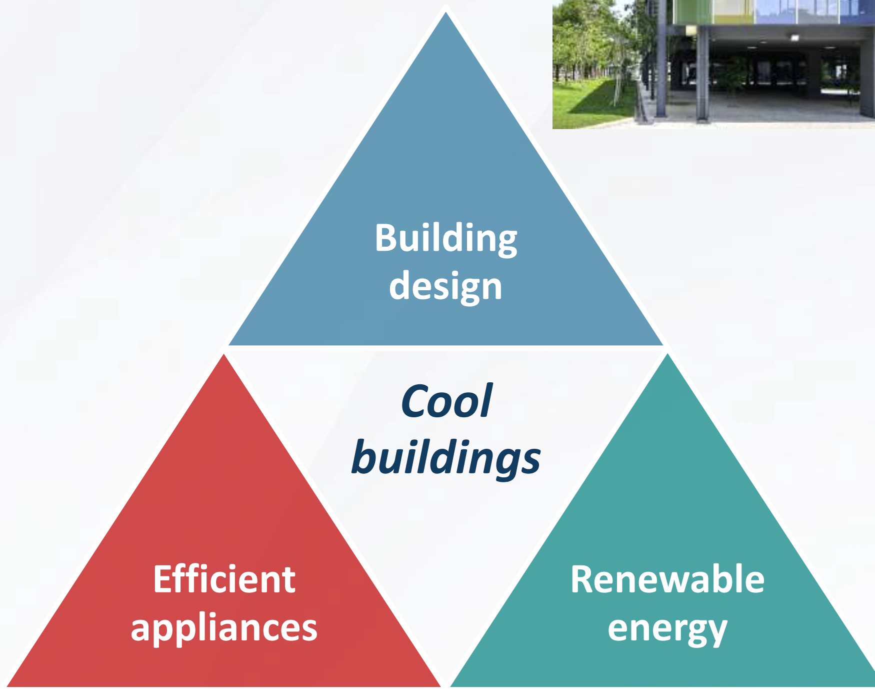


Quick wins for all buildings

- Align building **orientation** from **west to east**
- **Window-to-wall ratio** should not exceed **20%**
- Build **roofs** with **thermal insulation**
- Apply white **coatings** on **roofs and façades**
- Install **external shading** above all openings, windows
- Use **ceiling fans** rather than air conditioners
- Provide **vegetation** for shade and cooling

Better buildings are essential to respond to the cooling challenge

Avoid



Improve

A+

Shift

Policies should address *both* building designs *and* efficient technologies

1. Integrate building design into **cooling strategies & NDC targets**
2. Adopt and enforce **ambitious building energy codes** for new buildings and renovations
3. Use **financial incentives, information campaigns and capacity building** to promote energy-efficient building design
4. Develop minimum energy **performance standards** and labelling **for appliances**
5. Make **low-income housing** energy-efficient to ensure **‘Cooling for all’** and reduce energy poverty

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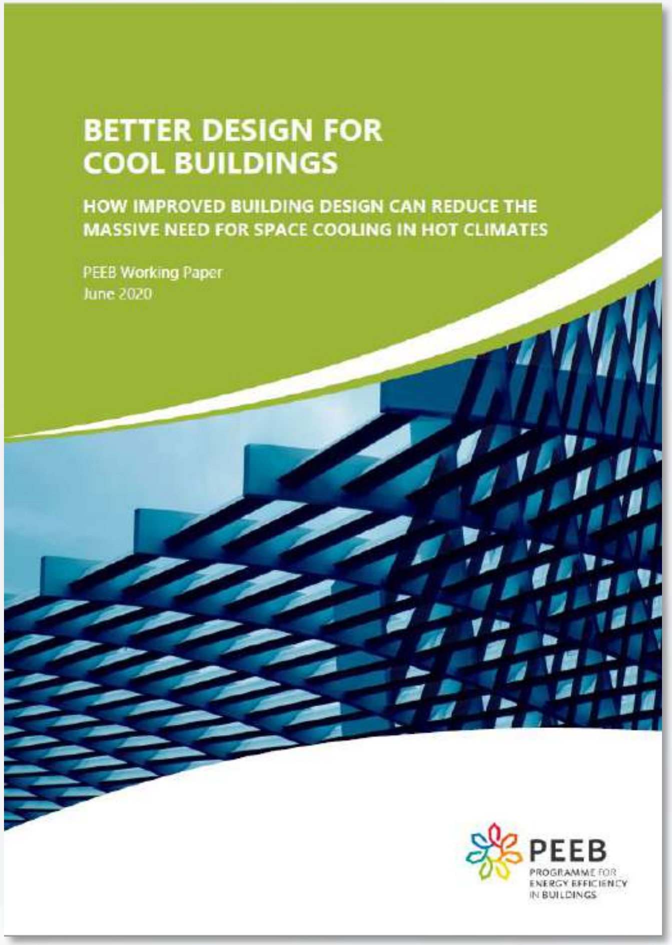
IN BUILDINGS

Working Paper:

BETTER DESIGN FOR COOL BUILDINGS



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PEEB – Programme for Energy Efficiency in Buildings
Andreas Gruner, Advisor

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PANEL DISCUSSION: POLICY ACTION FOR COOL AND LOW CARBON BUILDINGS

30 minutes

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Q&A

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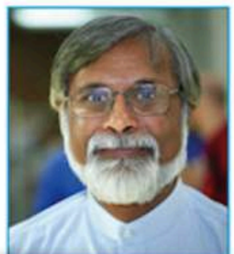

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Lily Riahi,
Coordinator Cool Coalition, UNEP

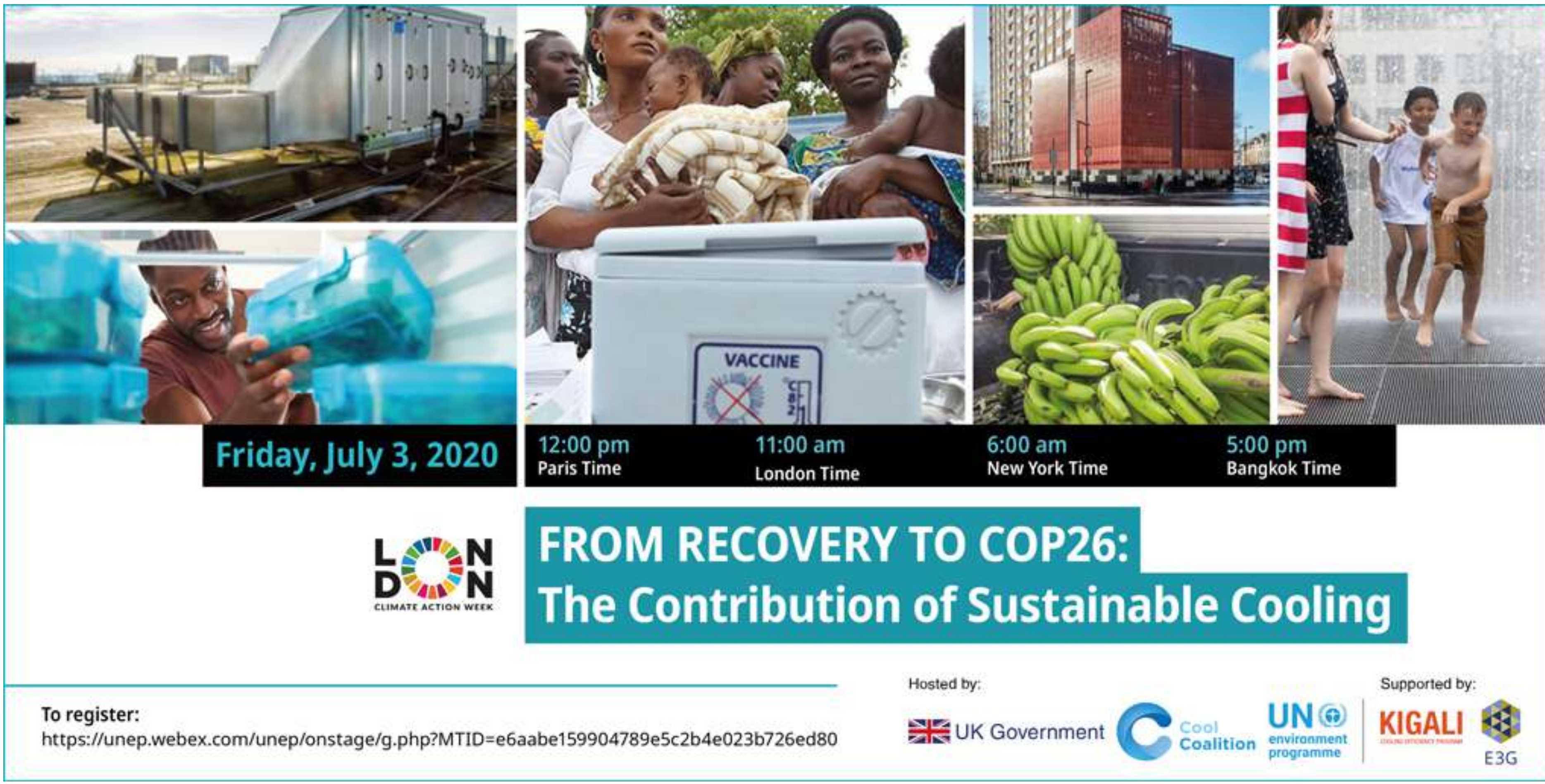
20 minutes

CALL TO ACTION AND CLOSING REMARKS

10 minutes

Martina Otto,
GlobalABC, Head of Cities Unit, UNEP

SAVE THE DATE



THANK YOU




Cool
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