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

3:00 pm to 4:30 pm (Paris Time)
6:30 pm to 8:00 pm (Delhi Time)
9:00 am to 10:30 am (New York Time)

- 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 Nwandum, President, Green Building Council in Nigeria
- Martina Otto, GlobalABC, Head of Cities Unit, UNEP
- Lily Riahi, Coordinator Cool Coalition, UNEP

COOL COALITION
WEBINAR SERIES

PEEB
PROGRAMME FOR ENERGY EFFICIENCY IN BUILDINGS

Cool Coalition

Global Alliance for Buildings and Construction

SUSTAINABLE ENERGY FOR ALL
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.

4. *4 – Hear a menu of keypad commands available to you.

5. *6 – Mute or unmute your audio.

Connected via telephone.
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)
WELCOME REMARKS

5 minutes
BIOCLIMATIC ARCHITECTURE WITHOUT AIR-CONDITIONING

10 minutes
COOL BUILDINGS

To curb the rise in cooling demand

COOL COALITION WEBINAR

1ST July 2020

Ashok lall New Delhi
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.

By 2031, it is projected that there will be 6 cities with a population greater than 10 million. A key question is how many Indians would live in how many medium and small towns - the bridge between a transforming rural and urban India?
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
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.
Carrier invented the first electrical air conditioning unit in 1902.
The need for cooling the body when one is feeling uncomfortably warm is self-evident.
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

\[ \text{optimum temp.} = 17.8 + 0.31 \times T_{\text{out}} \]
PROTECTED THERMAL MASS, COMPACT PLAN

NATURAL VENTILATION

SHADING

TRADITIONAL BUILDING
NEGATIVE DESIGN
Watch out for the effect of split units hanging out of all the flats in hundreds of thousands of middle class homes!

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
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/CUSTOMER 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
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
Buildings: the sleeping giant for climate change

Buildings construction & operation:

- Nearly 40% of global CO₂ 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
Energy demand for cooling will triple...

Nearly 70% of increase in residential buildings

Energy needs for space cooling are predicted to triple between 2016 and 2050.

Source: IEA. The Future of Cooling. 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**

At the design phase, extra effort is minimal

• Energetic retrofits later on are much more expensive.

Three steps towards cool buildings

<table>
<thead>
<tr>
<th>AVOID</th>
<th>Building design adapted to the local climate to avoid high cooling demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHIFT</td>
<td>Renewable energy* to replace carbon-intensive energy supply</td>
</tr>
<tr>
<td>IMPROVE</td>
<td>Efficient systems and appliances to reduce cooling demand</td>
</tr>
</tbody>
</table>

* whenever possible in the respective local socio-economic context
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)
Better building designs in hot climates

- **Hot & humid climate**
  - Open design *without* AC
  - Closed design *with* AC may incl. natural ventilation

- **Hot & dry climate**
  - Open design *without* AC
  - Closed design *with* AC
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**: Building design
- **Cool buildings**: Efficient appliances
- **Shift**: Renewable energy
- **Improve**: A+ efficient appliances
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
Working Paper:
BETTER DESIGN FOR COOL BUILDINGS

BETTER DESIGN FOR COOL BUILDINGS
HOW IMPROVED BUILDING DESIGN CAN REDUCE THE MASSIVE NEED FOR SPACE COOLING IN HOT CLIMATES
PEEB Working Paper
June 2020

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PANEL DISCUSSION: POLICY ACTION FOR COOL AND LOW CARBON BUILDINGS

30 minutes

Ashok B. Lall, Principal of Ashok B Lall Architects, India
Emeka Nwandum, President, Green Building Council in Nigeria
Brian Dean, Lead, Energy Efficiency and Cooling at Sustainable Energy for All (SEforALL)
Andreas Gruner, Advisor, Programme for Energy Efficiency in Buildings (PEEB)
Q&A

20 minutes
CALL TO ACTION AND CLOSING REMARKS

10 minutes
SAVE THE DATE

Friday, July 3, 2020

12:00 pm
Paris Time

11:00 am
London Time

6:00 am
New York Time

5:00 pm
Bangkok Time

FROM RECOVERY TO COP26:
The Contribution of Sustainable Cooling

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