Webinar on Housing people not diseases in the face of COVID-19

Beyond the Four Walls of Pradhan Mantri Awas Yojna

Resource efficiency, thermal comfort and livability in the affordable housing sector

Anumita Roychowdhury
Rajneesh Sareen
Mitashi Singh
Sugeet Grover
Scoping paper: Resource Efficiency, Climate Responsiveness, Resilience and Human Comfort

- Locational characteristics
- Environmental Services
- Solar Energy Potential
- Building Envelope
- Material Choice

Optimizing the Third Skin

- Thermal comfort
- Energy performance
- Orientation
- Shading Devices
- Daylighting
- Building Geometry
- Material Choices: An assessment of alternative walling technologies from the BMTPC compendium.

Beyond the Four Walls of PMAY

- State-wise housing demand and supply
- Vertical-wise progress
- Master plans and urban planning
- Decentralized environmental services for sustainability
- Rental housing
Housing demand, sanctioned and completed under PMAY

Need clarity on housing demand in each state

Progress as of 10 February 2020, MoHUA
Definitions need to be checked to incorporate health criteria for housing demand

Social Distancing in Dharavi:
8.4 Lakh people stuck in 2.4 sq. km.

Congestion / overcrowding: Units of built-up area under 300 sq ft, wherein a married couple does not have a separate room.

Source: Technical Group on Urban Housing Shortage 2012
Magnitude of houseless immigrants visible during COVID-19

Government of Delhi and Government of Odisha have urged land owners to waive off the rentals during lockdown

- Rental housing emerges as the fifth important vertical
- Draft National Urban Rental Housing Policy yet to be notified

Static planning systems enforced in kinetic demands

Rental housing models:
- Rent-to-own scheme in Chandigarh, Andhra Pradesh
- Rental housing for migrant construction workers in Odisha using Labor Cess funds
- MMRDA model: 2.5 lakh units in 7 ULBs
Demand-supply and vertical-wise progress

- Rental housing as the fifth vertical
- PPP setups to be attuned to develop performing housing stock
- Fiscal arrangements and possible strategies

Decentralized environmental services for sustainability

- Rainwater harvesting
- On-site water and waste treatment
- Solar rooftop
- Efficient area utilisation

Master plans and urban planning

- Location characteristics and access to services

Thermal comfort, energy efficiency and liveability

- Orientation
- Passive strategies
- Shade-insulate-ventilate
- Envelope efficiency

- Alternative materials and construction technologies
- Embodied Energy
- Thermal performance

CSE research scope

- Alternative materials and construction technologies
- Embodied Energy
- Thermal performance
- Orientation
- Passive strategies
- Shade-insulate-ventilate
- Envelope efficiency

- Rainwater harvesting
- On-site water and waste treatment
- Solar rooftop
- Efficient area utilisation

- Location characteristics and access to services
Demand-supply and vertical-wise progress

- Rental housing needs to be focus
- Definitions for housing shortage need to incorporate health as criteria

Master Planning

- Self sufficiency in terms of access to basic supplies, schools, health centers

Decentralized environmental services for sustainability and health

- Decentralized services to curb the spread of virus or other diseases
- Transmission risk via sewage and solid waste

Research avenues opening up for housing in COVID times

- Healthy housing: 
  - Temperature
  - Humidity
  - Ventilation

Thermal comfort, energy efficiency and liveability

Next steps: Mass-value-carbon in housing sector

- Housing stock projections
- Climate-wise housing typologies
- Material penetration in local markets
- Embodied and operational energy analysis
- Fiscal strategies to facilitate energy transition
Thermal comfort and health in a Post coronavirus world

Coronavirus can be airborne up to a certain distance and remain suspended in air for some time.

According to ISHRAE, dry air makes the mucous layer in our lungs to become dryer hence lowering the body's defence against the virus.

Ventilation
Ventilation becomes an important factor as high level of air changes is recommended and recirculation of air is to be discouraged. Hence natural systems have to be given preference.

Humidity
Studies indicate that 80% relative humidity and above tend to neutralize the COVID-19 virus. ISHRAE recommends a humidity range from 40-70%.

Temperature
Virus survives for less duration on surfaces as the temperature increases.
The study of the transmission of COVID-19 virus in 100 cities of China indicates that high temperature and high humidity significantly reduce the transmission of influenza.

**OPPORTUNITY**

Thermal comfort standards for overall well being

Night purge can be used to achieve thermal comfort, this would also help in energy savings

Let this public health crisis inform designing and use of safe built spaces and spur change for energy and health security
Base Case checking of adherence of ECO-NIWAS SAMHITA 2018 (ECBC-R) and other analysis

- Visual Light Transmittance
- Window opening to Floor area Ratio
- Residential Envelope Transmission value
- Daylit area
- Annual Thermal Comfort

As per ECBC – Residential 2018
As per National Building Code of India 2016
Using whole building energy & thermal simulation. Comfort standard as per NBC 2016

Link subsidies and incentives with performance of the housing stock

Performance Criteria for resource efficiency, thermal comfort and sustainability

Guide and bring private sector to construct housing that performs

The extra cost should be taken up by the government
North-South facing buildings performed better in terms of Residential Envelope Transmittance Value by 3W/sq.m.

Insulation based building materials such as Autoclaved Aerated Concrete and Extruded Polystyrene based sandwich panels performed well in RETV values.

Eco-Niwas Samhita based performance

E-W Facing buildings  3 W/sq.m. N-S facing buildings

17% reduction in heat gain
North-South facing buildings performed better in terms of thermal comfort, similar to Eco Niwas Samhita compliance.

High insulation materials performed well for thermal comfort.

Materials with high thermal mass and appropriate thickness also performed well. Hence something other than the U-Value was also playing a part.

Materials with low thermal mass or insulation performed poorly.

In spite of the north facing blocks having an Eco Niwas Samhita compliance, they were only able to achieve thermal comfort during 82% time of the year.

Logic used for natural ventilation, windows are open when:

- Outside temperature is between 18°C - 36°C
- Indoor Temperature is higher than outdoor temperature
- Night Time During Summers
- Maximum Air Changes of 10 per Hour

### Table: Material Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate file</td>
<td>Hyderabad</td>
</tr>
<tr>
<td>Exterior &amp; Interior Walls</td>
<td>150mm Flyash Bricks</td>
</tr>
<tr>
<td>Glazing</td>
<td>6mm Clear Glass</td>
</tr>
<tr>
<td>Window Shades &amp; Size</td>
<td>As per design</td>
</tr>
<tr>
<td>Interior Lighting Load</td>
<td>5W/sqm</td>
</tr>
<tr>
<td>Interior Equipment Load</td>
<td>10W/sqm</td>
</tr>
<tr>
<td>No. of Occupants per DU</td>
<td>4 Nos</td>
</tr>
<tr>
<td>Thermal Comfort System</td>
<td>Natural Ventilation with Ceiling Fans Only</td>
</tr>
<tr>
<td>Thermal Comfort Range</td>
<td>18 Deg C - 32 Deg C (As per NBC 2016)</td>
</tr>
</tbody>
</table>
Circulation Efficiency: Circulation Area / Plinth area

- Circulation Efficiency: 11%
- Circulation Area: 21%

Envelope Efficiency: Envelope Area (not roof) / Carpet Area of DU

- Envelope Area of Dwelling units: Walls towards corridor, shafts or common walls are excluded.
- Carpet Area of Dwelling units: Partition walls are included.

A lower value denotes a more efficient envelope design, this has an impact on heat gained or lost through envelope.
Decentralized environmental services for sustainability

• States are yet to exploit solar rooftop potential in affordable housing, even when solar power is subsidized
• Bring convergence from a number of national or state-level initiatives into affordable housing – Jal shakti Abhiyan, Swachh Bharat Abhiyan, National Solar mission, ECBC, etc.

Optimize land utilization

- Residential (Proposed Block) 16%
- Parks and Playground 11%
- Green and Open areas 18%
- Amenities 22%
- Open Parking 2%
- Roads 26%
- Public building area 5%
Planning for affordable housing missing from PMAY-U

• Perspective planning needs to be done
Need analysis and criteria to ensure self-sufficiency of neighbourhoods

Geo-spatial tools help in decision-making
Decentralized services help in curbing the spread of diseases

- Decentralized Waste Water treatment
- Rainwater Harvesting
- Waste management

Self-sufficient neighbourhoods

COVID-19: Novel coronavirus may be present in water cycle; poor, marginalised at risk
Virus may be present in the water cycle, says editorial in scientific journal

COVID-19: Disposing biomedical waste Bengal’s challenge at hand
The state is yet to follow CPCB guidelines on collection of biomedical waste of quarantined people

What is COVID-19 signaling about building design for healthy living?
The possibility that our air-conditioned and cooled living spaces may make coronavirus comfortable and spread needs to be well understood to spur bigger changes

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases. According to the World Health Organization (WHO), while persistence in drinking-water is possible, there is no current evidence that coronaviruses are present in surface or groundwater sources or transmitted through contaminated drinking-water.

However, the spread of the virus is closely related to water and sanitation. Cleaning hands can reduce the transmission and help people stay healthy but today billions of people lack safe water, sanitation and handwashing and funding is inadequate.
Taking the agenda forward

- Standardise criteria for estimating housing shortage and include health criteria to define congestion
- Need more comprehensive guidelines and mandates on material and architectural design to improve thermal comfort of the buildings and reduce air conditioned hours for energy savings and healthy living.
- Need guidelines for mass housing in terms of fixing orientation to improve solar access, adopting compact urban form with adequate green spaces and also for ventilation and mutual shading.
- Earmark locations in Master Plans to improve locational advantages of affordable housing to reduce economic and social costs of living. Plan the building and its habitat together
- Implement decentralized services related to water access, rain water harvesting, sanitation, and segregated waste management to improve health and wellbeing
- Build accessible technical knowledge support and professional help for beneficiary led self construction to enable them to build well ventilated and well lit healthy spaces with thermal comfort. Ensure appropriate skill building to cater to this requirement.