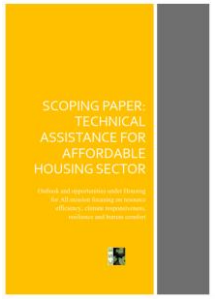
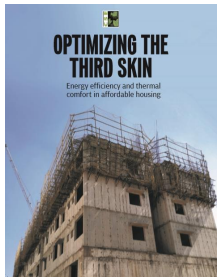
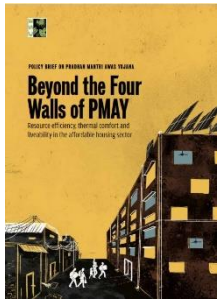
Beyond the Four Walls of Pradhan Mantri Awas Yojna

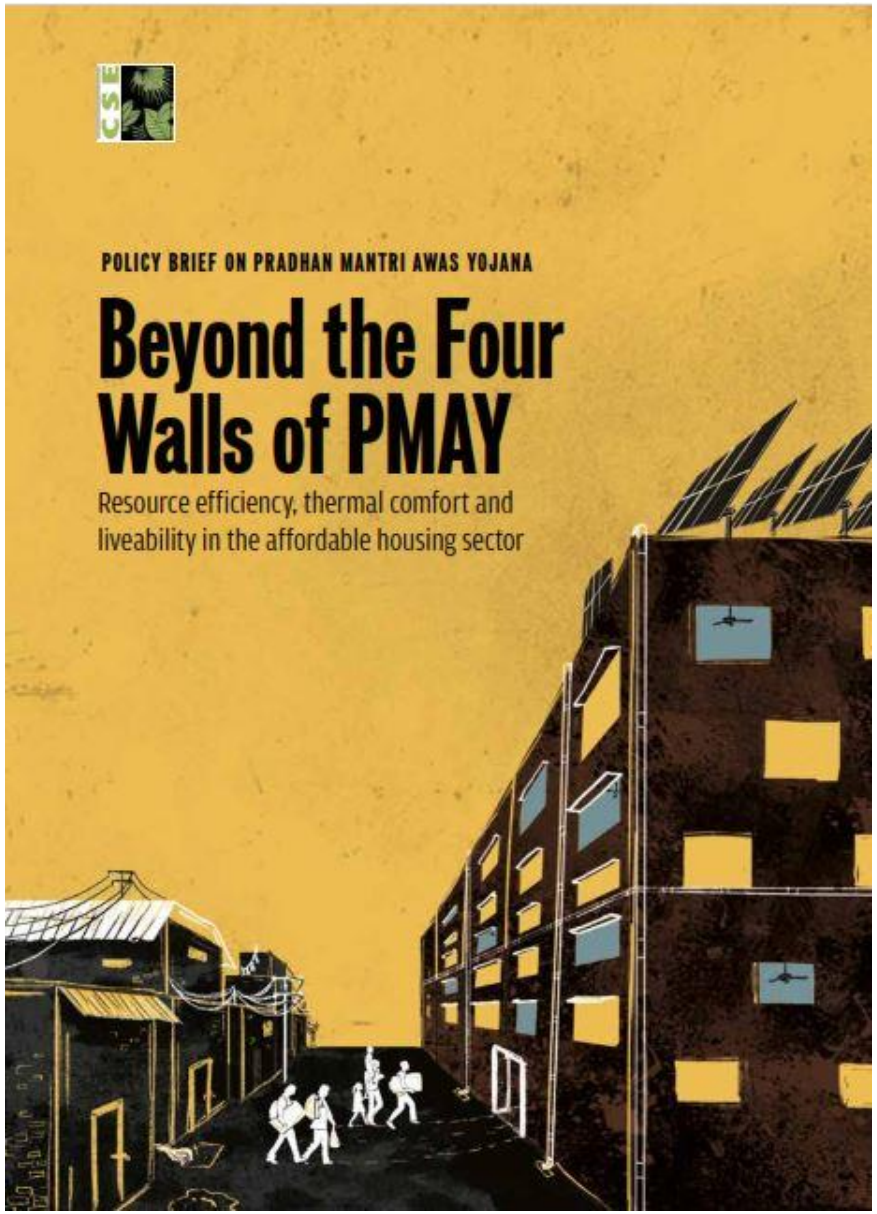
Resource efficiency, thermal comfort and livability in the affordable housing sector

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

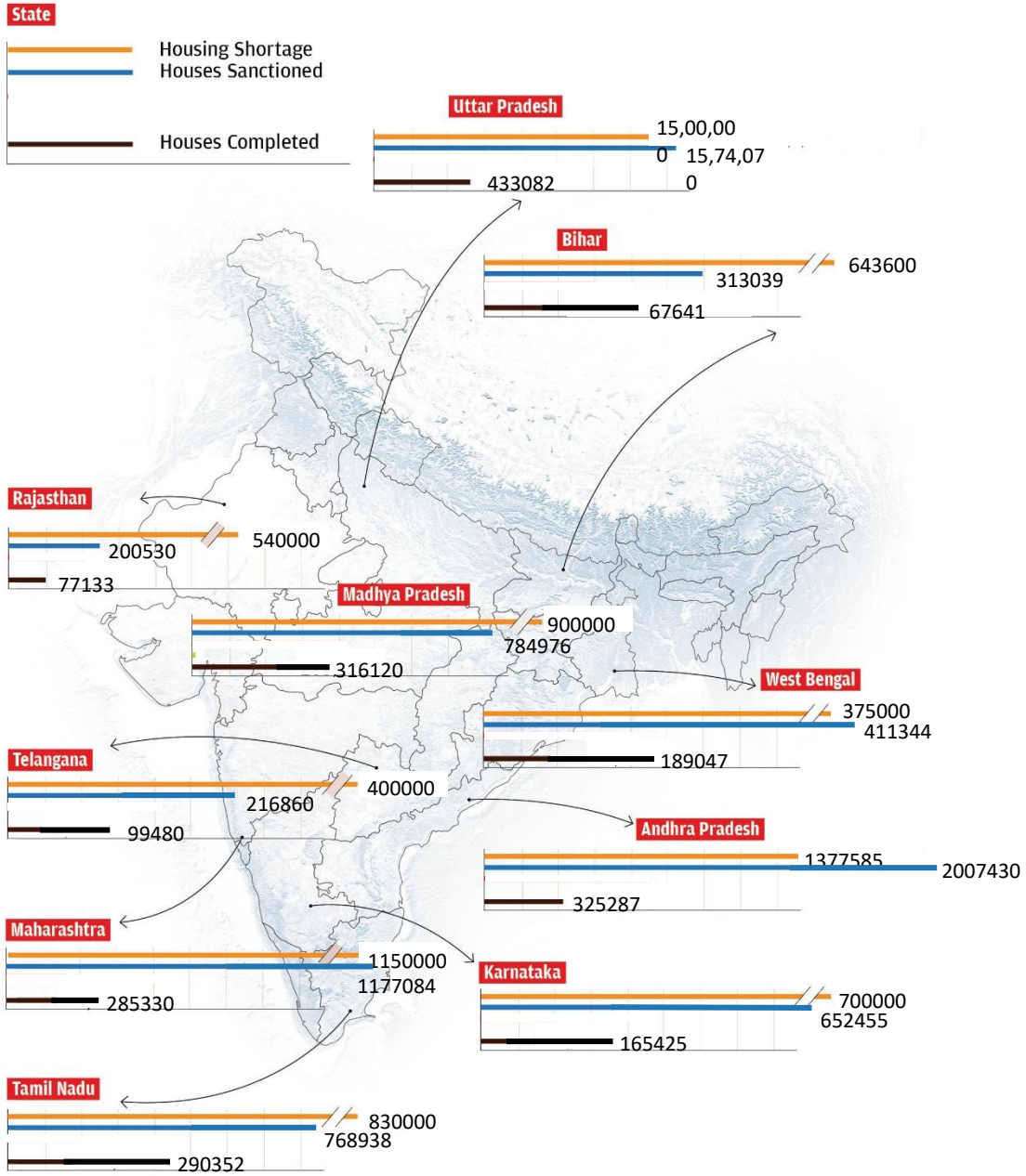
Optimizing the Third Skin

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

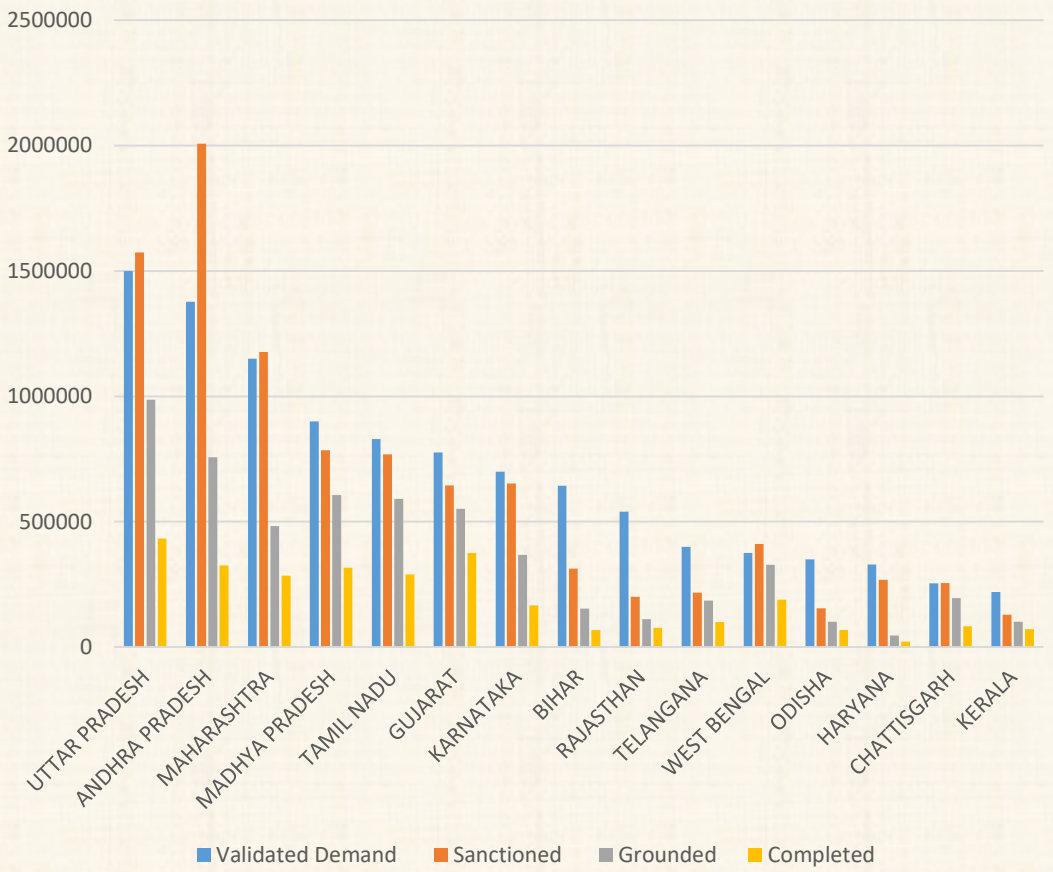
Beyond the four walls of PMAY

- 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

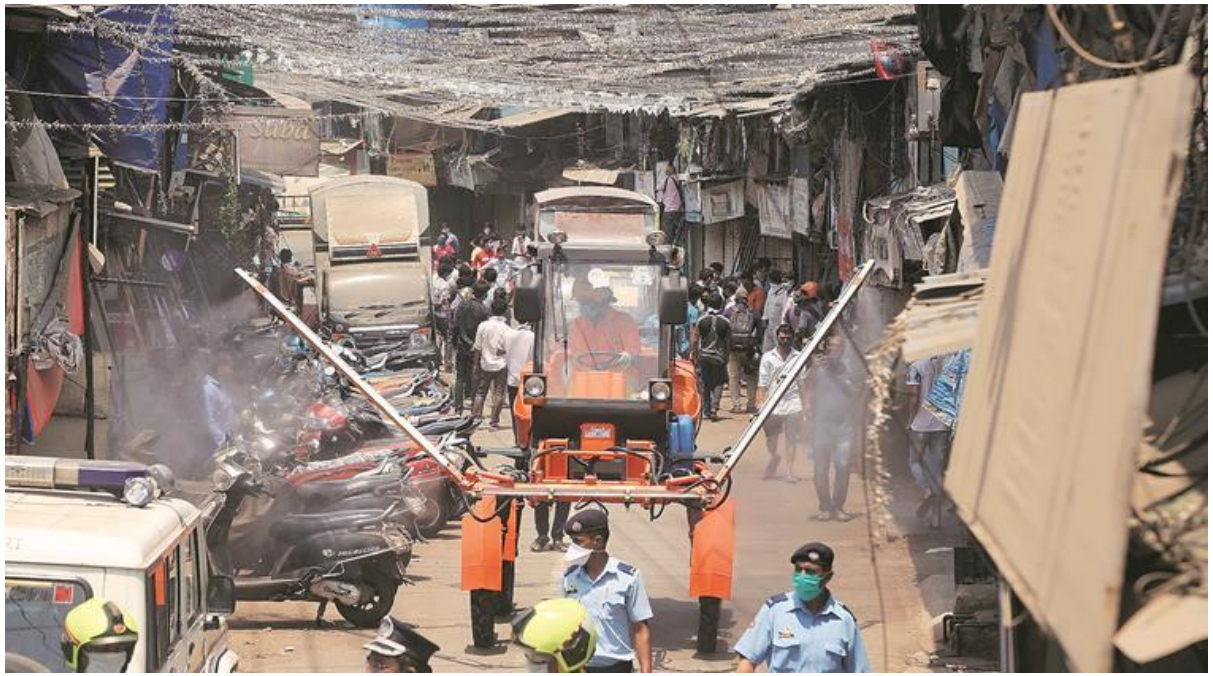


Need clarity on housing demand in each state

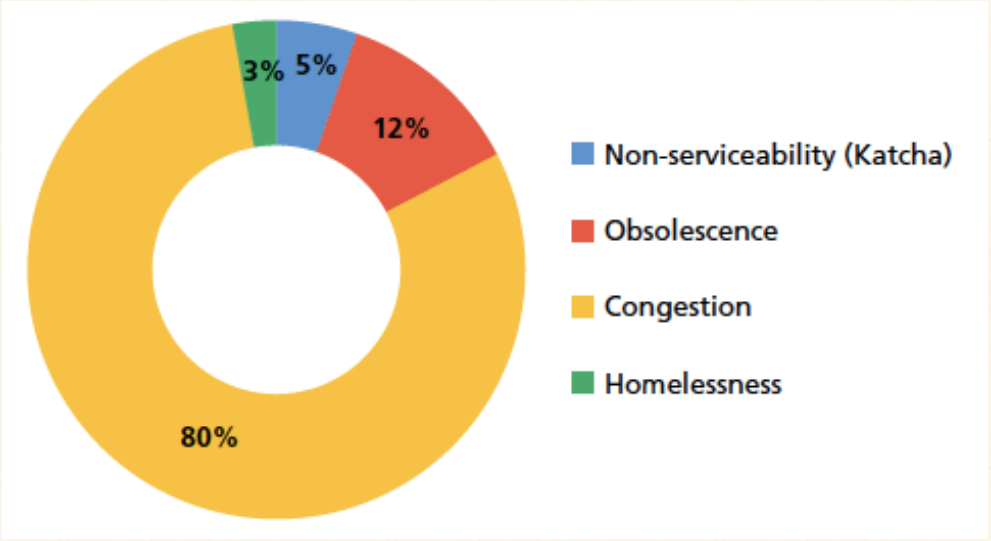


Progress as of 10 February 2020, MoHUA

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.



Source: Technical Group on Urban Housing Shortage 2012

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

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

Thermal comfort, energy efficiency and liveability

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

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

Decentralized environmental services for sustainability

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

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

Master plans and urban planning

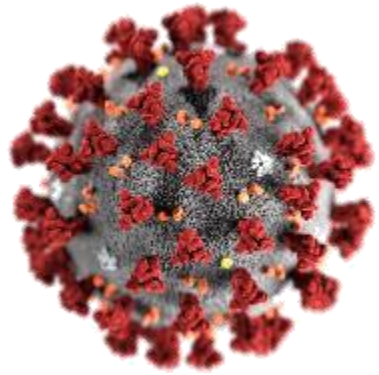
- Location characteristics and access to services

Thermal comfort, energy efficiency and liveability

Healthy housing:

- Temperature
- Humidity
- Ventilation

Research avenues opening up for housing in COVID times



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

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

Demand-supply and vertical-wise progress

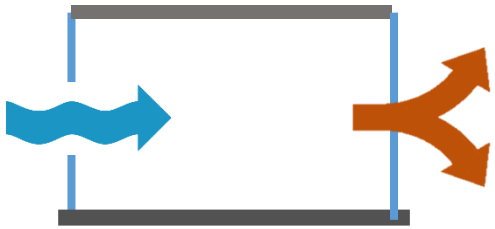
- Rental housing needs to be focus
- Definitions for housing shortage need to incorporate health as criteria

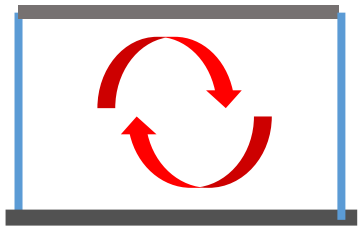
Master Planning

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

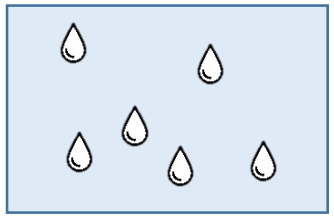
Thermal comfort and health in a Post coronavirus world

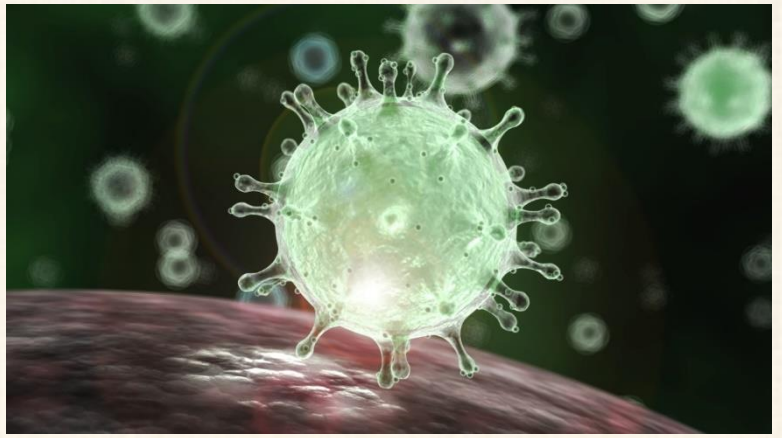
Coronavirus can be airborne upto a certain distance and remain suspended in air for some time.





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.

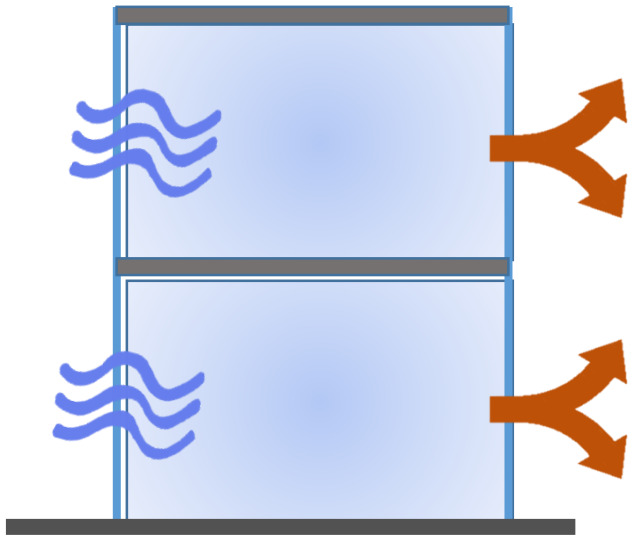
The study of the transmission of COVID-19 virus in 100 cities of China indicates that high temperature and high humidity significantly reduce the transmission of influenza.

Sunshine

Ventilation

Humidity

Thermal Comfort



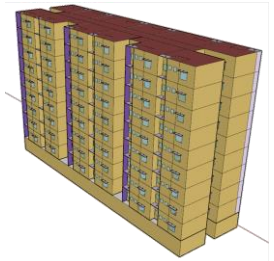
OPPORTUNITY

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

CSE study



Base Case checking of adherence of ECO-NIWAS SAMHITA 2018 (ECBC-R) and other analysis

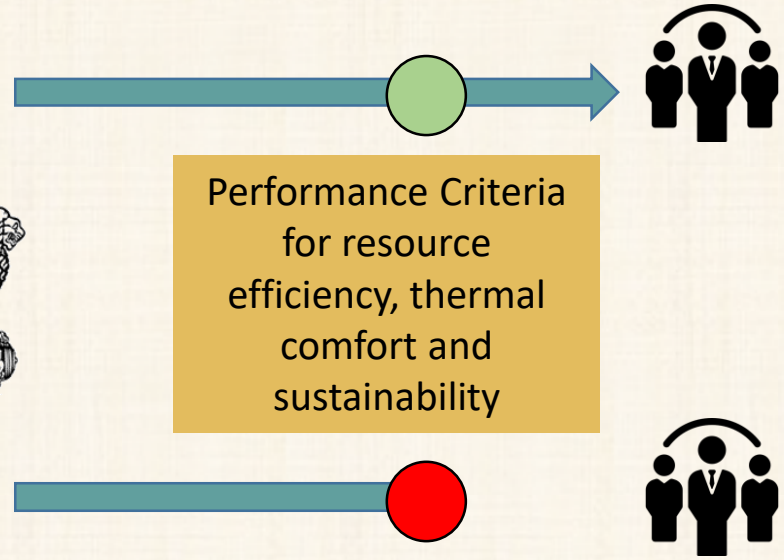
- Visual Light Transmittance
- Window opening to Floor area Ratio
- Residential Envelope Transmission value
- Daylit area
- Annual Thermal Comfort

As per ECBC – Residential 2018

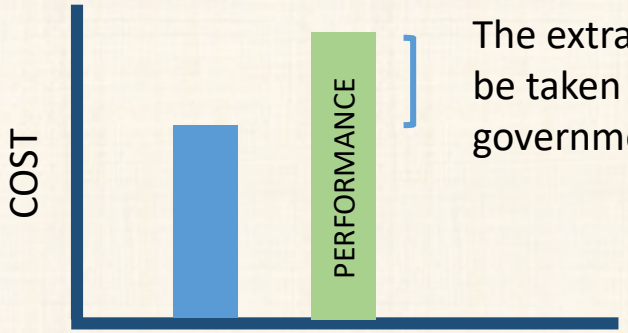
As per National Building Code of India 2016

Using whole building energy & thermal simulation. Comfort standard as per NBC 2016

Link subsidies and incentives with performance of the housing stock



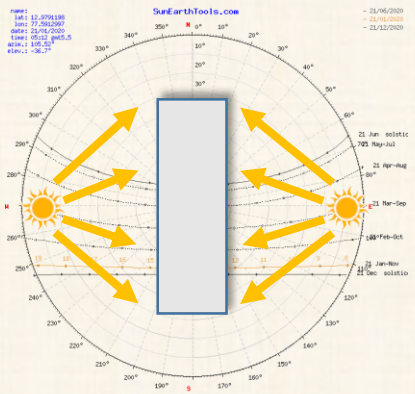
Guide and bring private sector to construct housing that performs

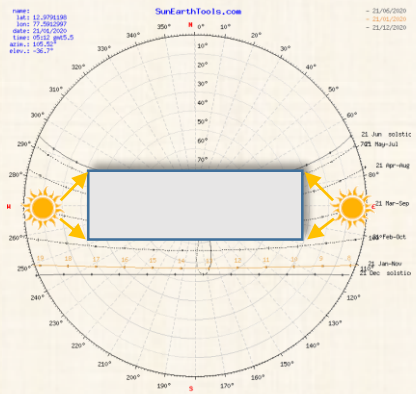


The extra cost should be taken up by the government

Eco-Niwas Samhita based performance

North-South facing buildings performed better in terms of Residential Envelope Transmittance Value by 3W/sq.m.





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

17% reduction in heat gain

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

Thermal comfort based performance

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.

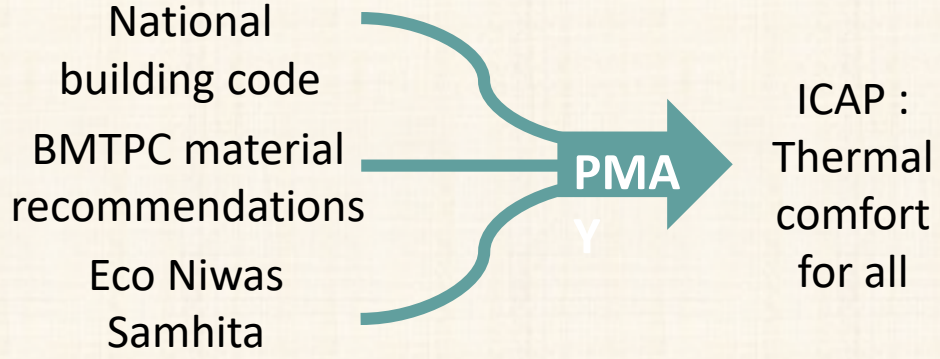
Materials with low thermal mass or insulation performed poorly.

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

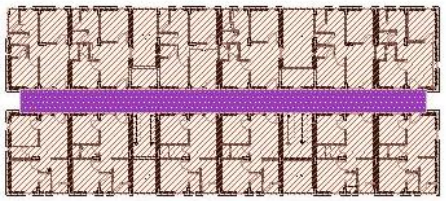
Logic used for natural ventilation, windows are open when:

- 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

Climate file	**: Hyderabad**
Exterior & Interior Walls	: 150mm Flyash Bricks
Glazing	: 6mm Clear Glass
Window Shades & Size	: As per design
Interior Lighting Load	: 5W/sqm
Interior Equipment Load	: 10W/Sqm
No. of Occupants per DU	: 4 Nos
Thermal Comfort System	: Natural Ventilation with Ceiling Fans Only
Thermal Comfort Range	: 18 Deg C - 32 Deg C (As per NBC 2016)

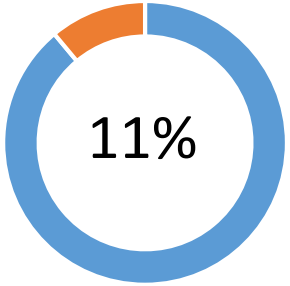


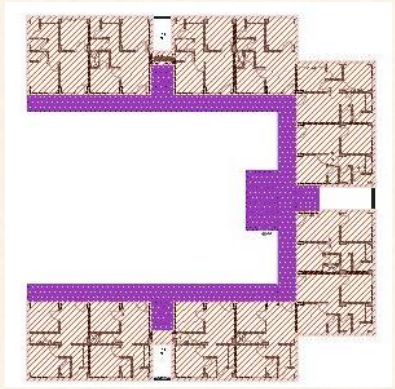
Circulation Efficiency: Circulation Area / Plinth area

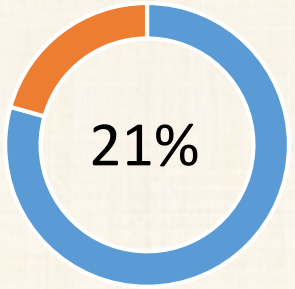


Circulation

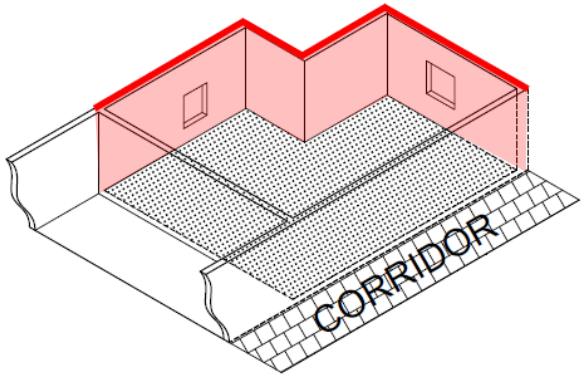
Dwelling space



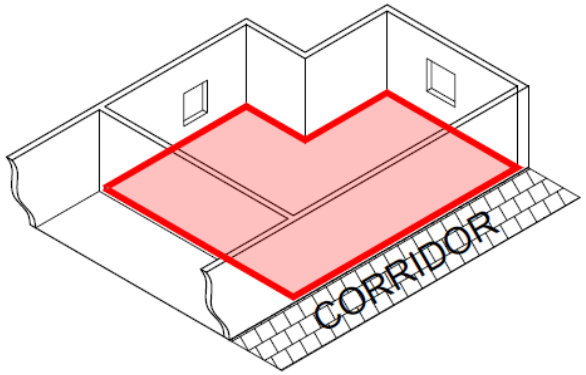




Envelope Efficiency: Envelope Area (not roof) / Carpet Area of DU



Envelope Area of Dwelling units. (Walls towards corridor, shafts or common walls are excluded)

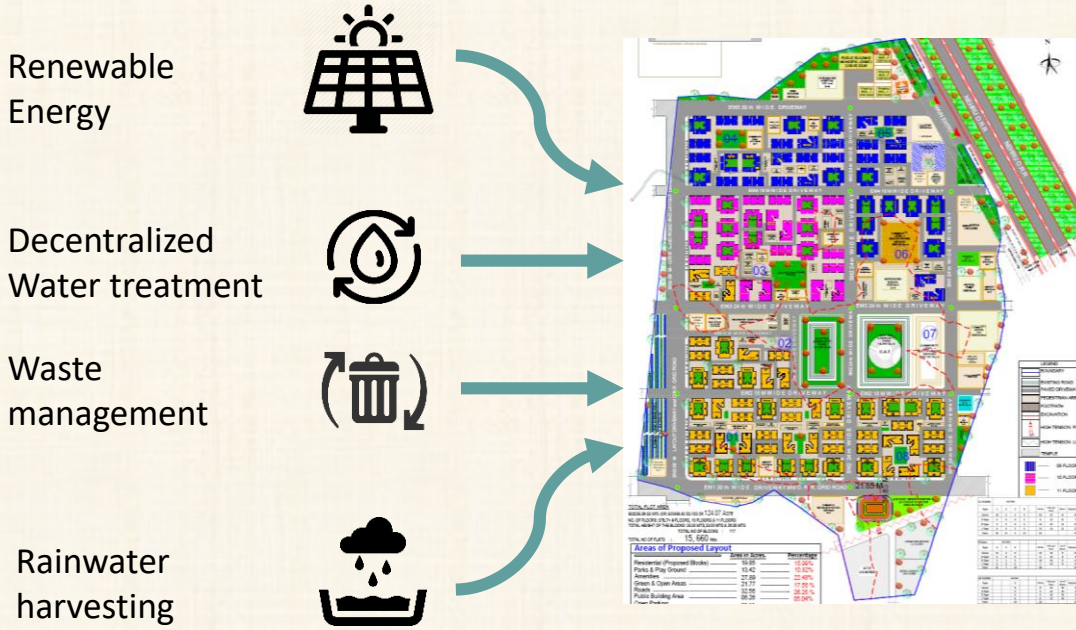


Carpet Area of Dwelling units. (partition walls are included)

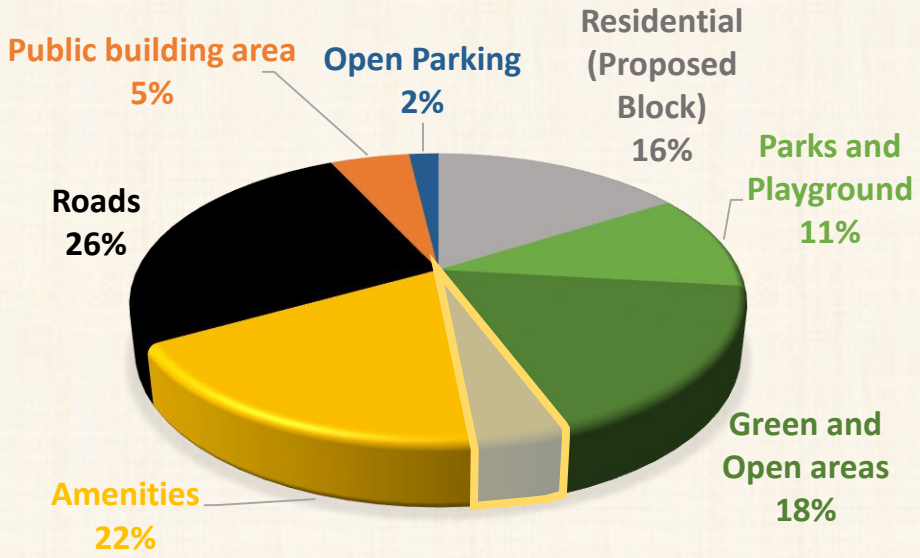
A lower value denotes a more efficient envelope design , this has an impact on heat gained or lost through envelope

Decentralized environmental services for sustainability

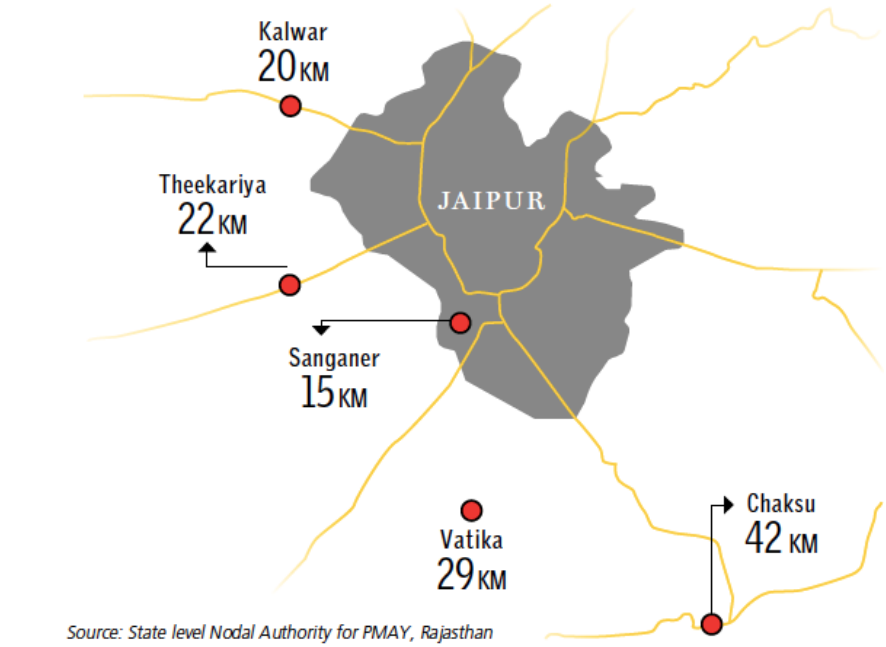
- States are yet to exploit solar rooftop potential in affordable housing, even when solar power is subsidized
- Bring convergence from a number of national or state-level initiatives into affordable housing – Jal shakti Abhiyan, Swachh Bharat Abhiyan, National Solar mission, ECBC, etc.



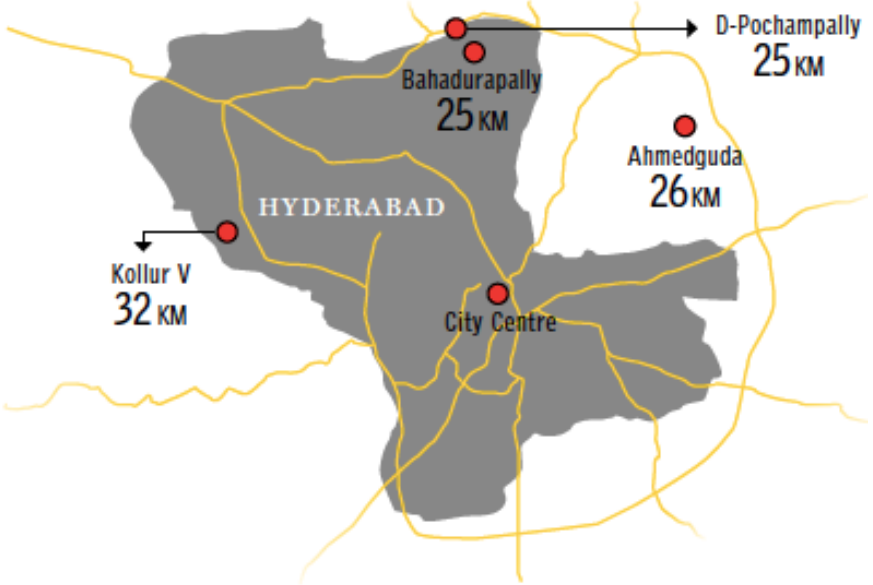
Optimize land utilization



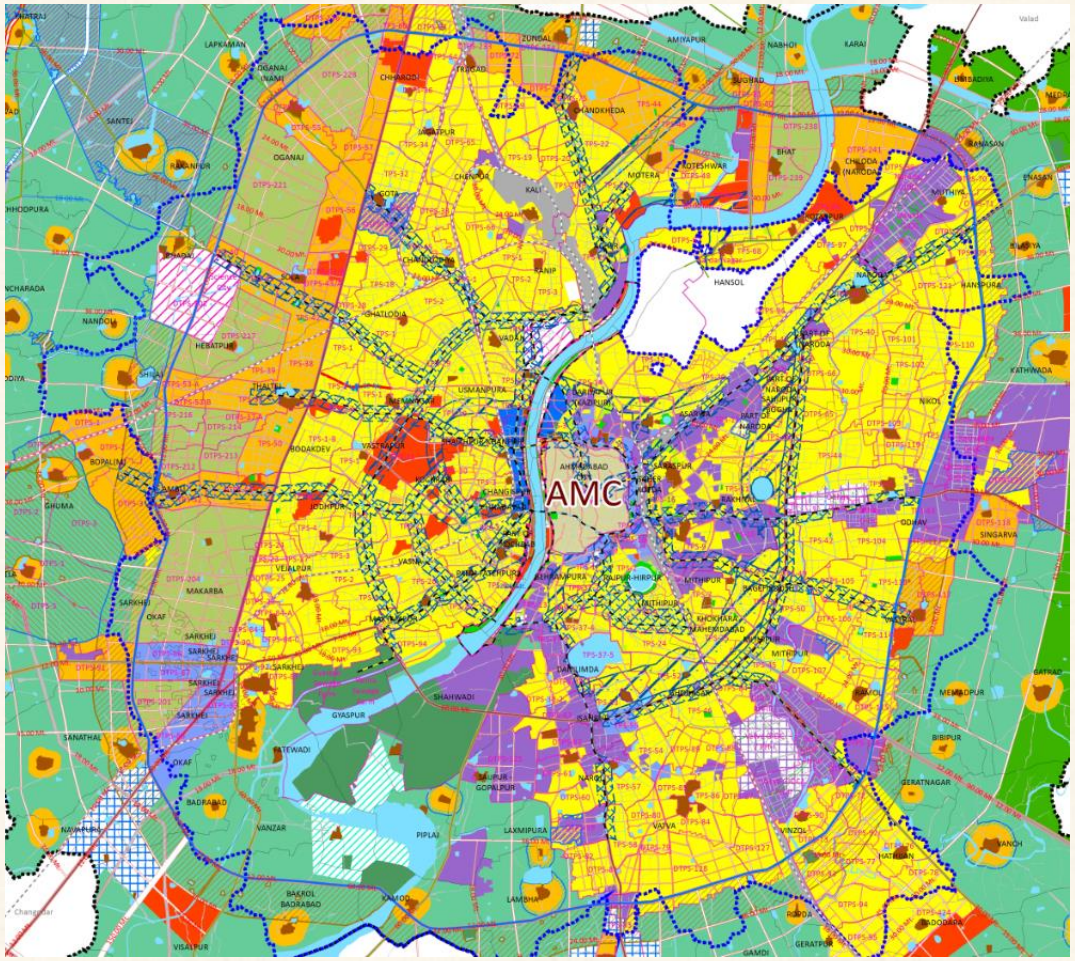
Planning for affordable housing missing from PMAY-U



Source: State level Nodal Authority for PMAY, Rajasthan

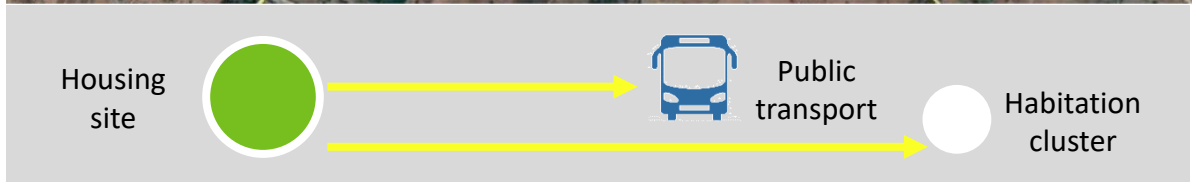


Source: Greater Hyderabad Municipal Corporation

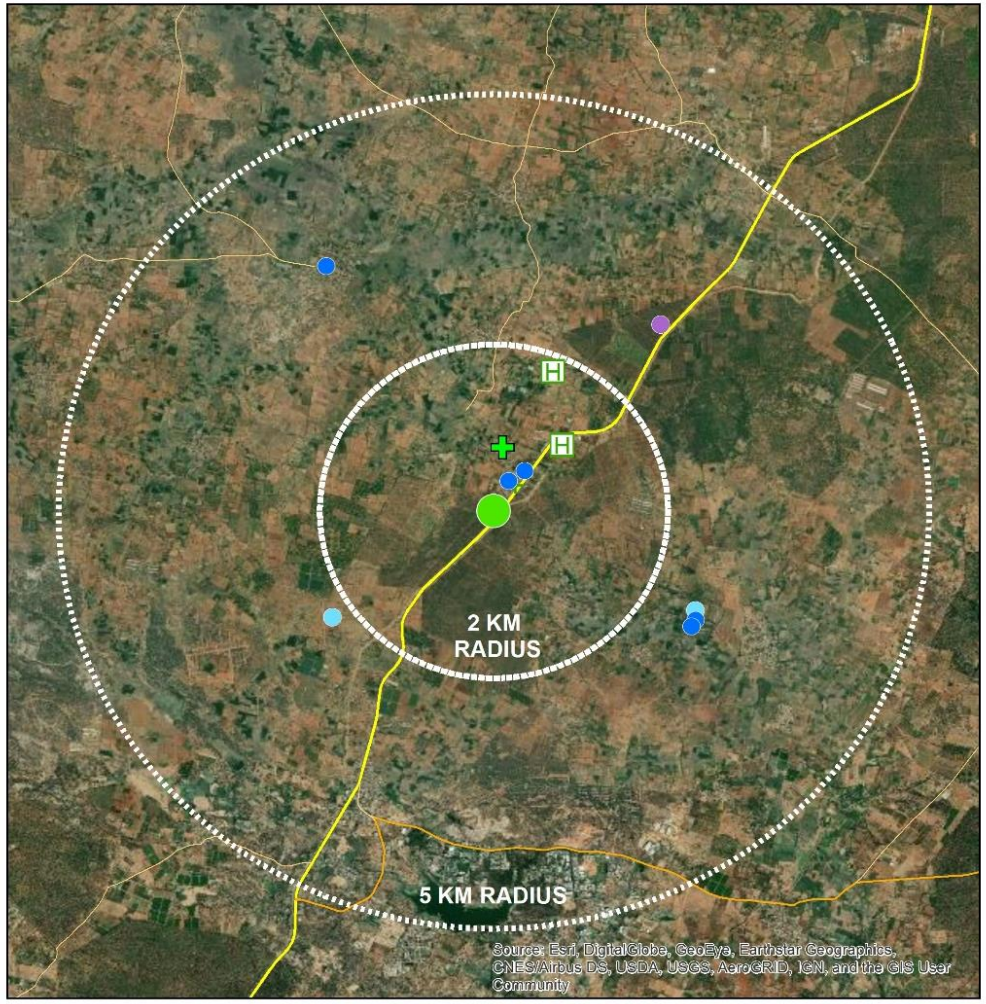


- Perspective planning needs to be done

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

2 April, 2020

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.

WATER

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

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HEALTH

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

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By Javanta Basu

AIR

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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

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By Anumita Roychowdhury
Last Updated: Tuesday 17 March 2020

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 Pans 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.