

# Healthy Affordable Homes and Neighbourhoods

IGBC CONGRESS

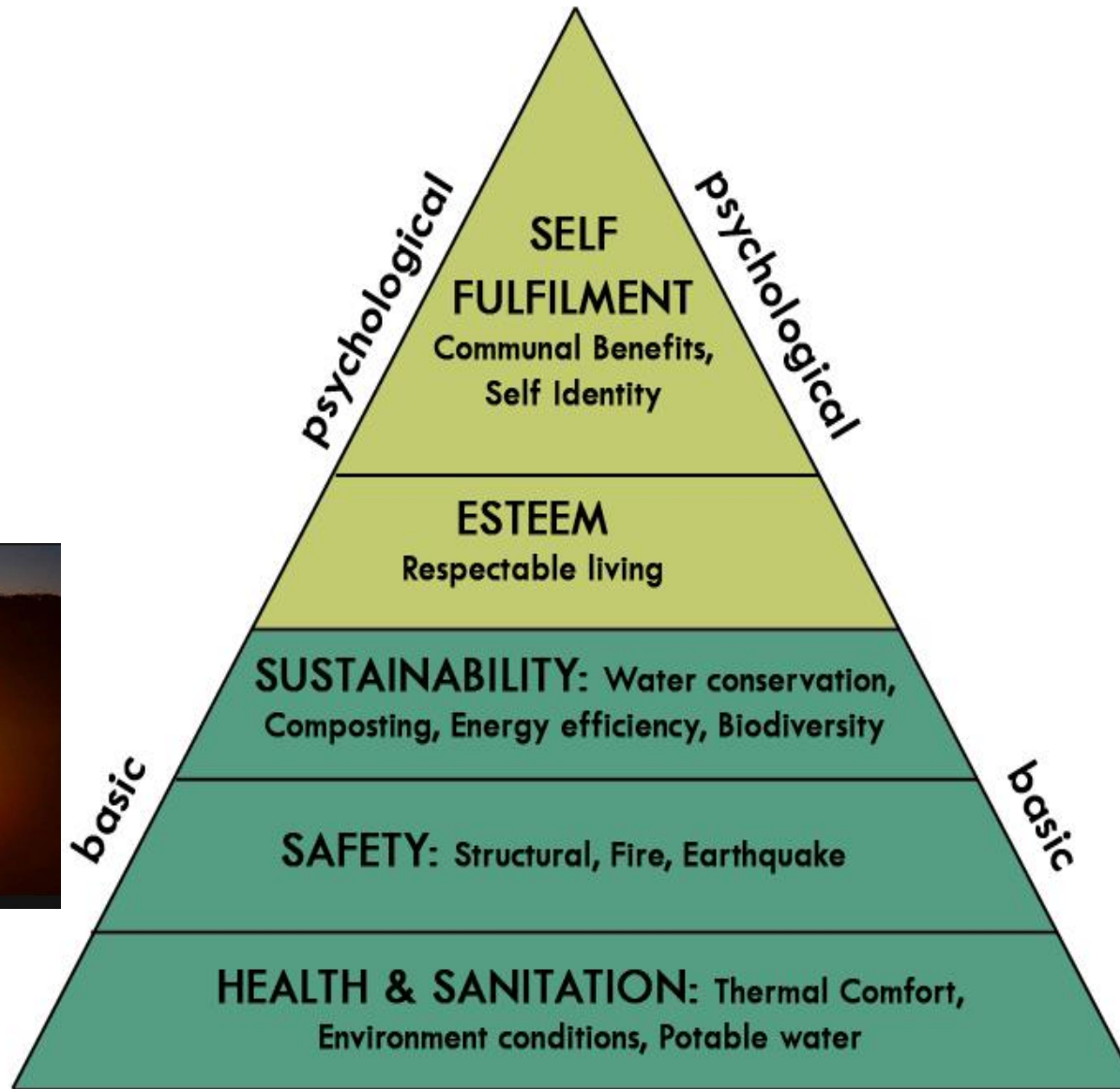
HYDERABAD

OCTOBER 2022

Work-in progress supported by GBPN  
Ashok B Lall Architects with IIPH Gandhinagar



# HIERARCHY OF NEEDS – WHAT WE MUST HAVE



**Swastha Jivan**



**Swastha Paryavaran**

# AFFORDABLE HOUSING

AFFORDABILITY THRESHOLD >> ASPIRATIONAL RANGE

DURABILITY  
FUNCTIONALITY  
SIZE  
ROOM LAYOUT  
FINISHES  
COMPONENTS

EDUCATION  
HEALTH  
LEISURE  
COMMERCE



PERFORMANCE



ROBUSTNESS/  
ADAPTABILITY



ROBUSTNESS/  
ADAPTABILITY



PRODUCT  
SUSTAINABILITY

TIME  
COST  
CLIMATE RESPONSE  
SITE RESPONSE

MOBILITY  
WATER  
ELECTRICITY  
WASTE



HOME

NEIGHBOURHOOD

## 3 key aspects

1.  
**Climate change  
and resilience**

2.  
**Affordable  
Housing for  
lower income  
groups**

3.  
**Mainstreaming  
Gender  
perspective**

# CLIMATE CHANGE AND CITIES

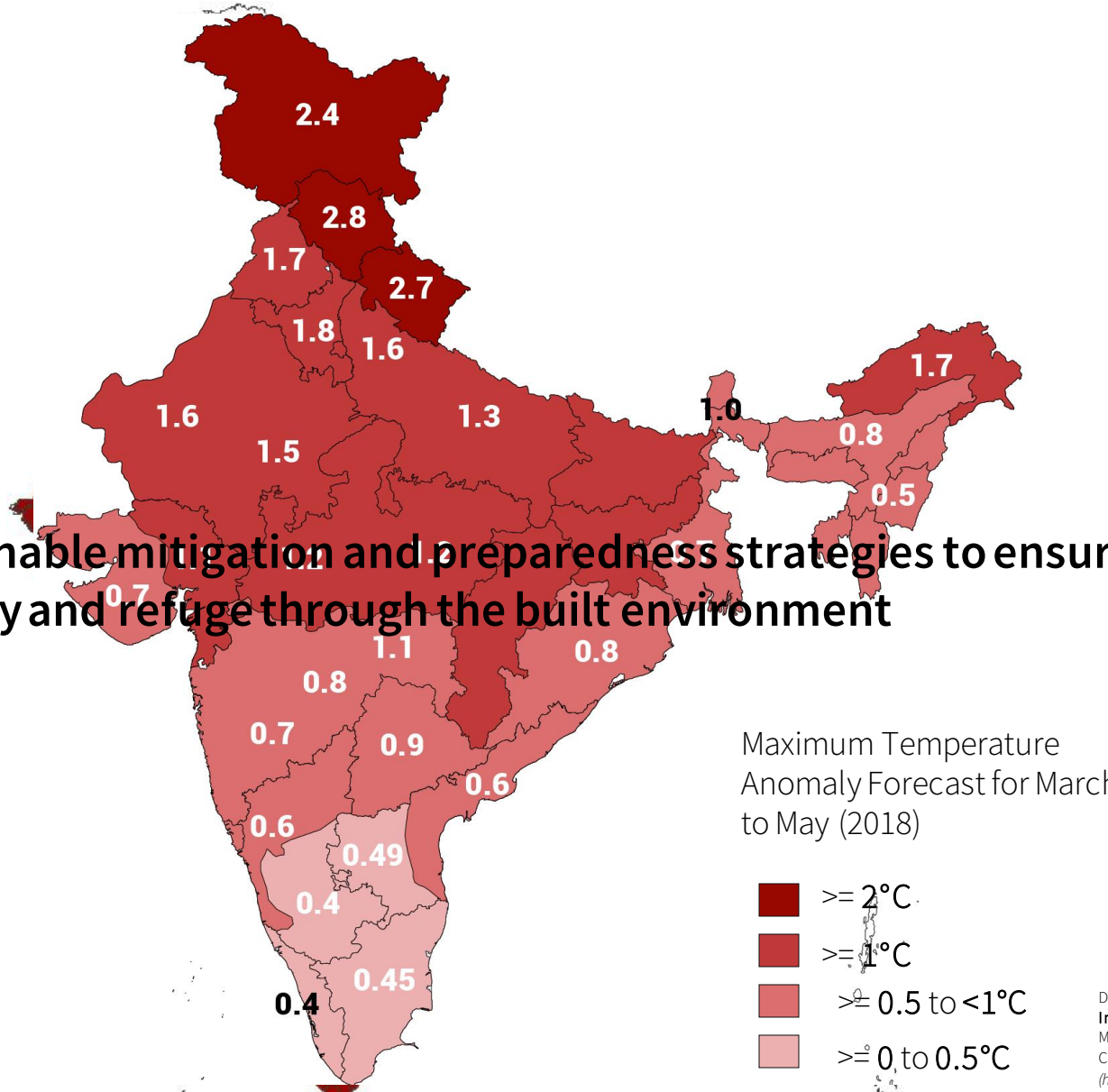
more than

# 75%

of India's districts are above normal in over half the country during months between March-May

need to enable mitigation and preparedness strategies to ensure safety and refuge through the built environment

- In India, an upward trend has been observed with many states experiencing **high temperature and humidity conditions** for several days.
- 5 to 6 heat wave events occur in Northern parts and 8-10 heat waves in Southern parts



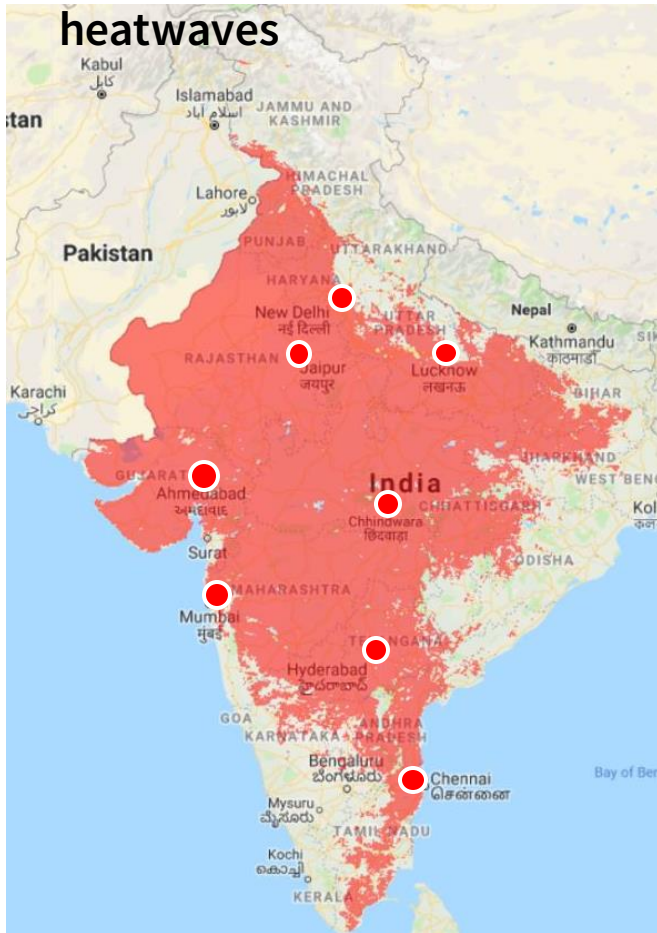
Drawn by author, Source : WRI, www.indiawatertool.in

Drawn by author, Source : Mohanty A, Preparing India for Extreme Climate Events Mapping Hotspots and Response Mechanisms, CEEW Dec 2020, (<https://www.ceew.in/publications/preparing-india-for-extreme-climate-weather-events>)

### 3. climate change AND HEALTHY AFFORDABLE HOMES

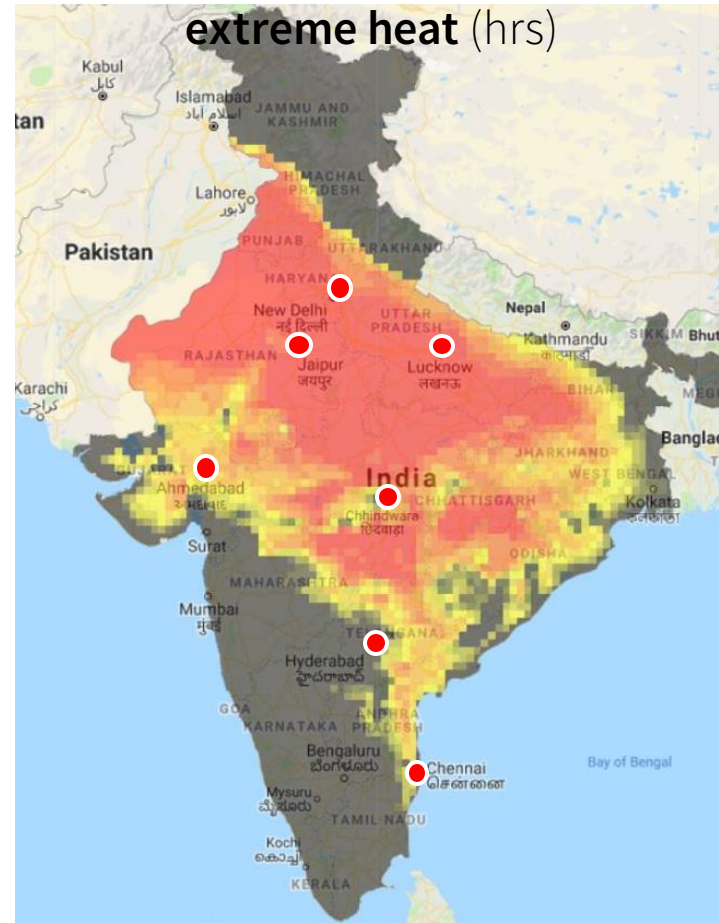
#### HEATWAVES – An increasing phenomenon

##### Population exposed to heatwaves

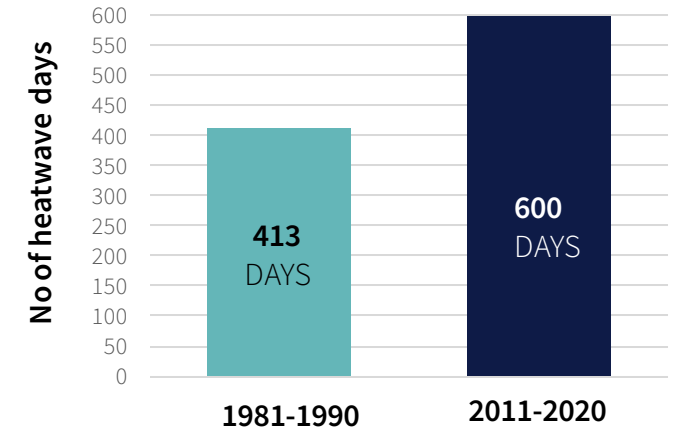


Exposed Population

##### Daily duration of exposure to extreme heat (hrs)



0 hrs 6 hrs 12 hrs Major cities



- Study recently released by ILO said, **India would lose 5.8% of its working hours to heat stress by 2030.**
- According to recent Lancet Report- **India alone lost close to 75 billion labor hours in 2017 due to extreme heat**

#### Maps for hottest day of 2019

Source Data: GFS Temperature Estimates, GPWv4, MODIS (LPDAAC – NASA); Processed by Raj Bhagat Palanichamy using Google Earth Engine

### 3. climate change AND HEALTHY AFFORDABLE HOMES

**HEATWAVES** – increasing health risks

#### INDIRECT IMPACTS

**IMPACT ON HEALTH SERVICES**



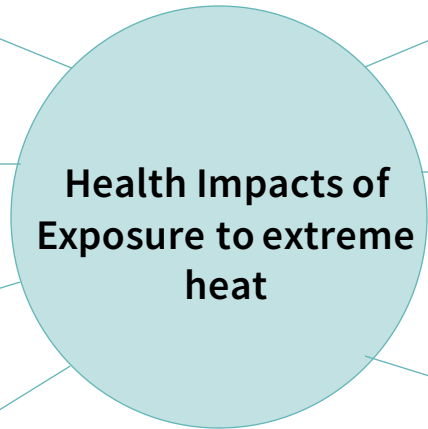
**INCREASED RISK OF ACCIDENTS**



**INCREASED TRANSMISSION OF**



**POTENTIAL DISRUPTION OF INFRASTRUCTURE**



#### DIRECT IMPACTS

**HEAT ILLNESS**



- Dehydration
- Heat cramps
- Heat stroke

**HOSPITALIZATION**



- Respiratory disease
- Diabetes mellitus
- Renal disease
- Stroke
- Mental health conditions

**ACCELERATED DEATH FROM**



- Respiratory disease
- Cardiovascular disease
- Other chronic disease (mental health, renal disease)

\*Source - WHO



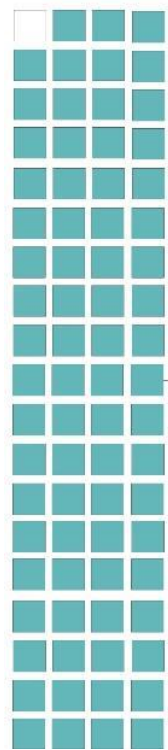
### 3. climate change AND HEALTHY AFFORDABLE HOMES

#### HEAT ACTION PLAN - recommendations



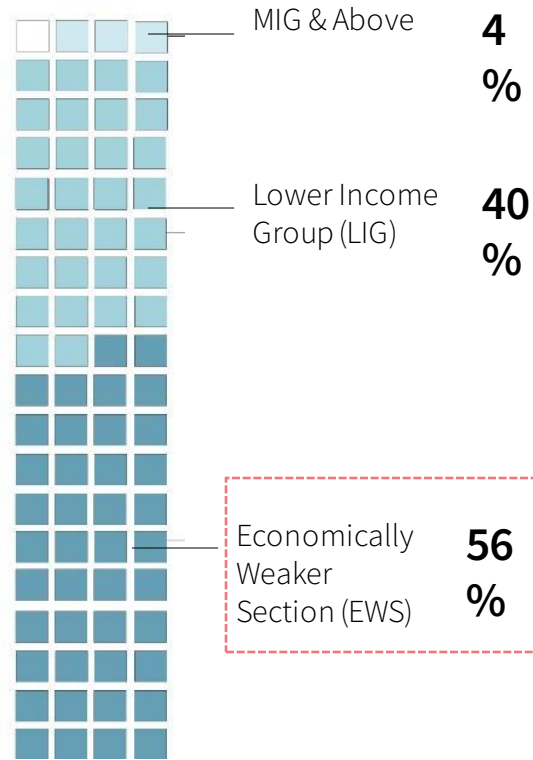
Within town-planning there should be **community cooling center** or facility that should be accessible to the population during extreme heat events specially for vulnerable areas. **Existing community spaces and places of worship can be re-purposed** for the same during a heatwave

# AFFORDABLE HOUSING for low-income groups



18.78 million

Total Housing shortage (2012)



MIG & Above 4%

Lower Income Group (LIG) 40%

Economically Weaker Section (EWS) 56%

Income group

## 11.2 million houses

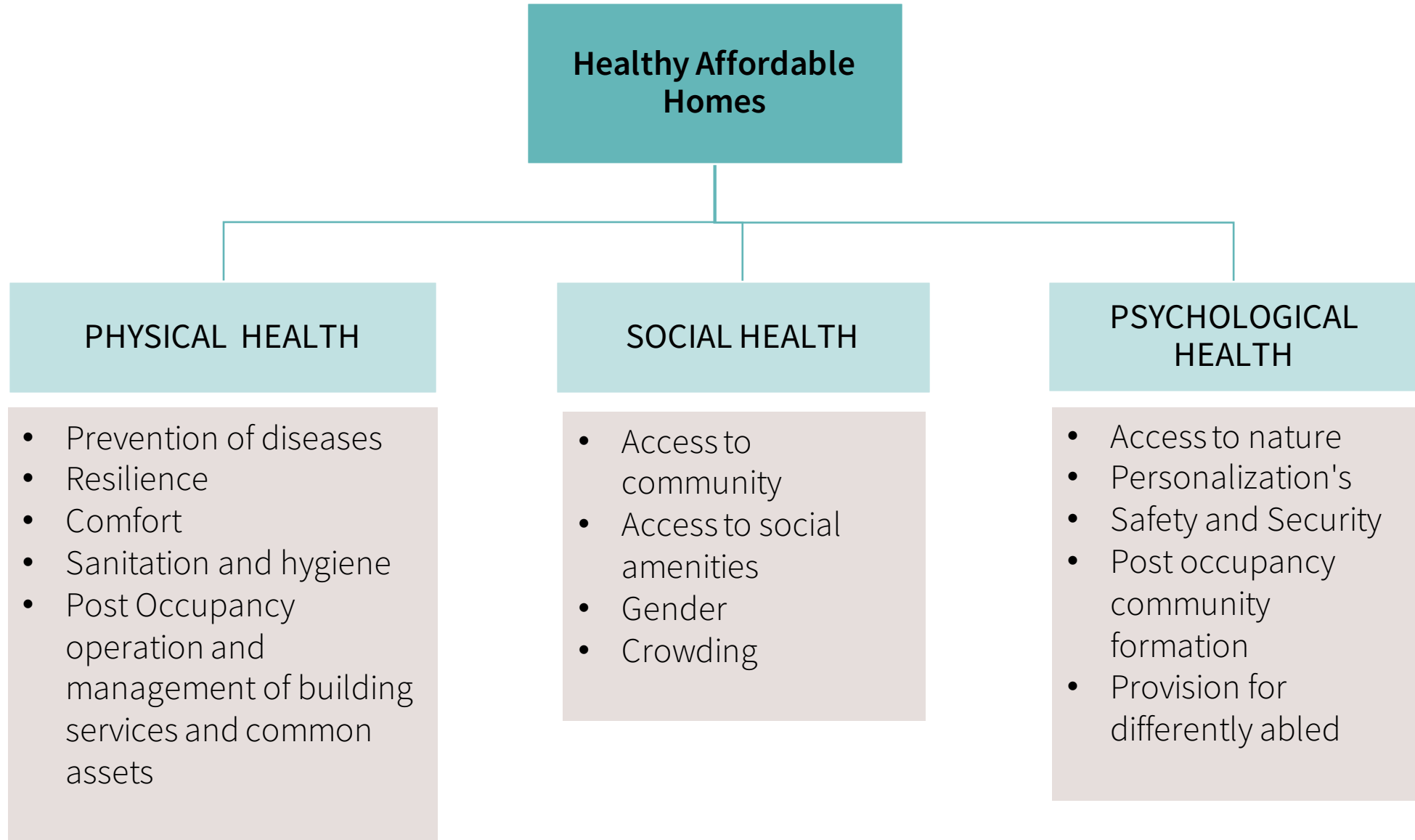
are currently being constructed under the PMAY(U) mission.

- Houses built under the Mission **will last at least 50-60 years** and **thus have a potential to impact resource usage** during their life span.
- The **demand** for affordable housing in India **far outweighs supply**.
- This demand potential is **forecasted to grow 1.5 times** from an estimated 25million in 2010 to 38million in 2030.

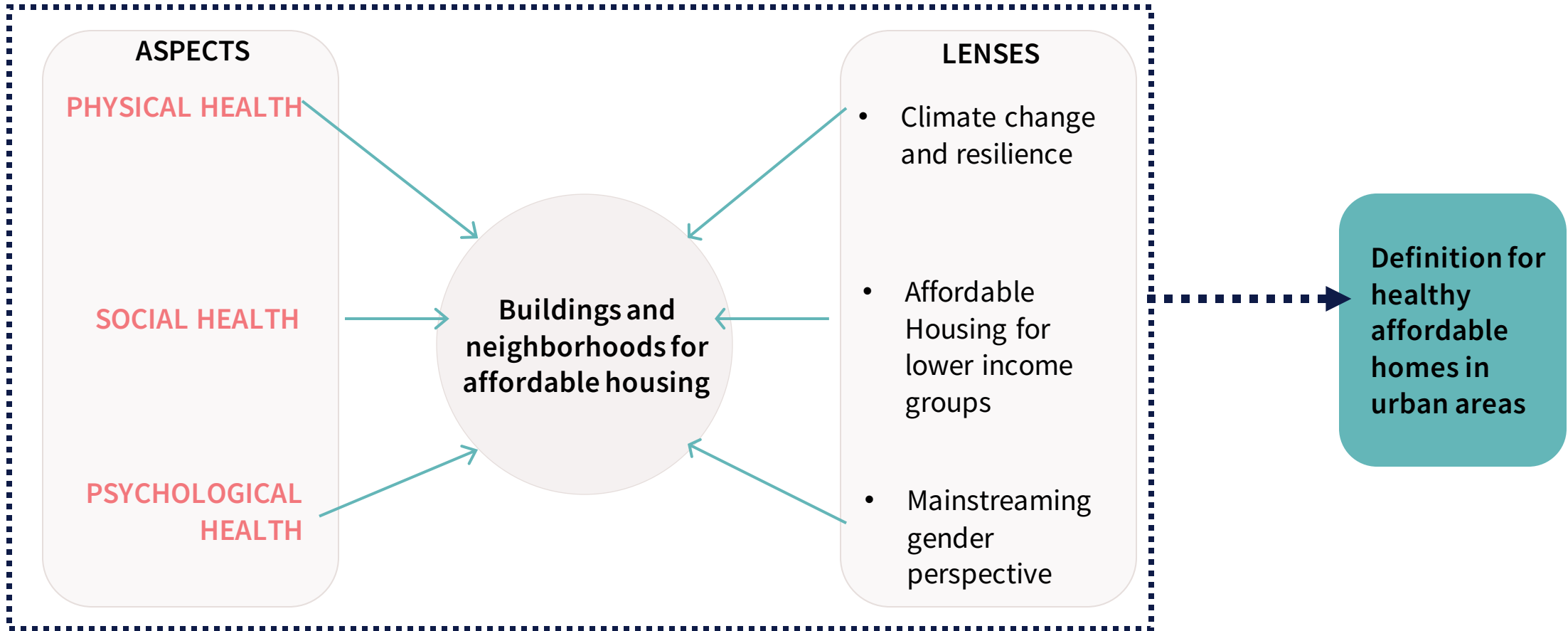
## Literature overview

- Healthy Building definition is of many kinds : WHO, UNEP, Wellness rating.....
- Much of the concerns for ‘healthy buildings’ in the literature were for **artificially controlled indoor environments** in the **developed world** : **sick building syndrome, indoor air quality**, communicable infectious **disease, active cooling** anticipating temperature rise and heat waves.
- There seems to be **no theoretical framework to define ‘healthy buildings’** for **the developing countries** like India where majority of buildings, especially residential buildings for lower income groups, **will not be closed and artificially conditioned.**
- In this context, **strategies of managing ambient conditions** that surround buildings, **optimizing passive design** and **providing community resilience facilities** to cope with extreme events become more important.

# “HEALTHY AFFORDABLE HOMES” – THREE ASPECTS



# DEFINING “HEALTHY AFFORDABLE HOMES”



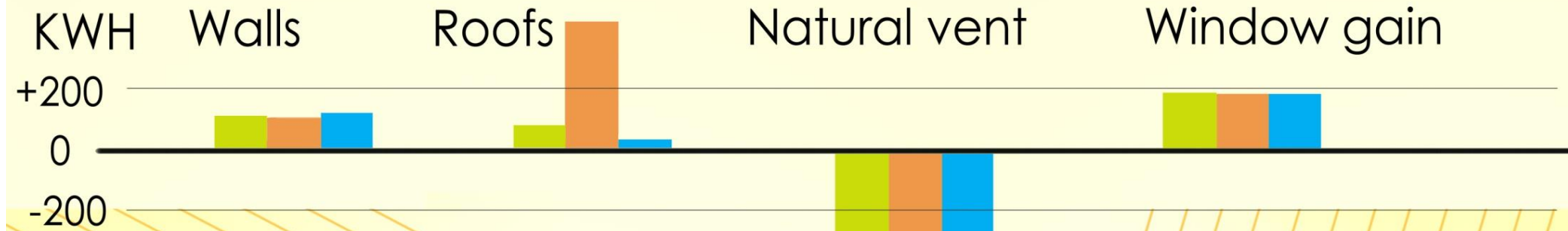
# “HEALTHY AFFORDABLE HOMES” – PHYSICAL HEALTH

## Pollution Resilience

- Healthy Affordable Homes and its neighbourhood will **optimise the integration of climate responsive passive strategies** and low-energy devices to maximise the duration of **indoor thermal comfort**.
- Healthy Affordable Homes will **enable good ventilation in habitable indoor** gathering and meeting spaces.
- Healthy Affordable Homes will **ensure protection of habitable spaces and essential services against flooding and contamination** of drinking water during extreme rainfall events.
- Healthy Affordable Homes will **optimize availability of diffuse daylight during warm/hot periods** in all habitable spaces
- Healthy Affordable Homes will **modulation with external shading systems to be adopted** in their design as well as **provision of additional facilities** at the neighborhood level for the more vulnerable sections of the resident population as a measure **for resilience during periods of extreme events.**

## Prevention of Diseases

- Healthy Affordable Homes **will avoid causes of dampness in indoor spaces** and provide means of flushing out or removal of humidity.
- Healthy Affordable Homes **will protect indoor spaces from mosquitoes, cockroaches and vermin.**



**SHADE**

**INSULATE**

**VENTILATE**

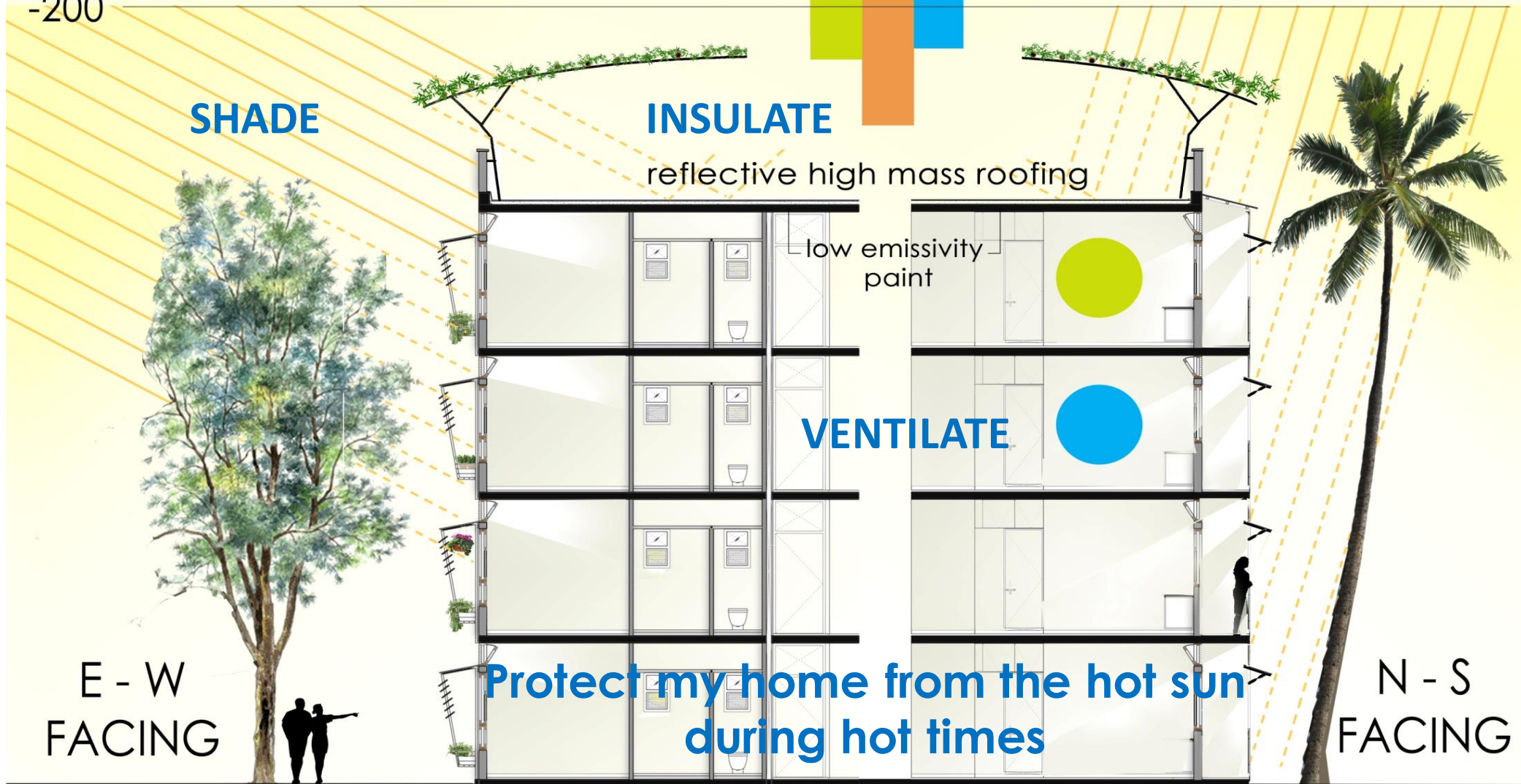
**Protect my home from the hot sun during hot times**

reflective high mass roofing

low emissivity paint

E - W  
FACING

N - S  
FACING



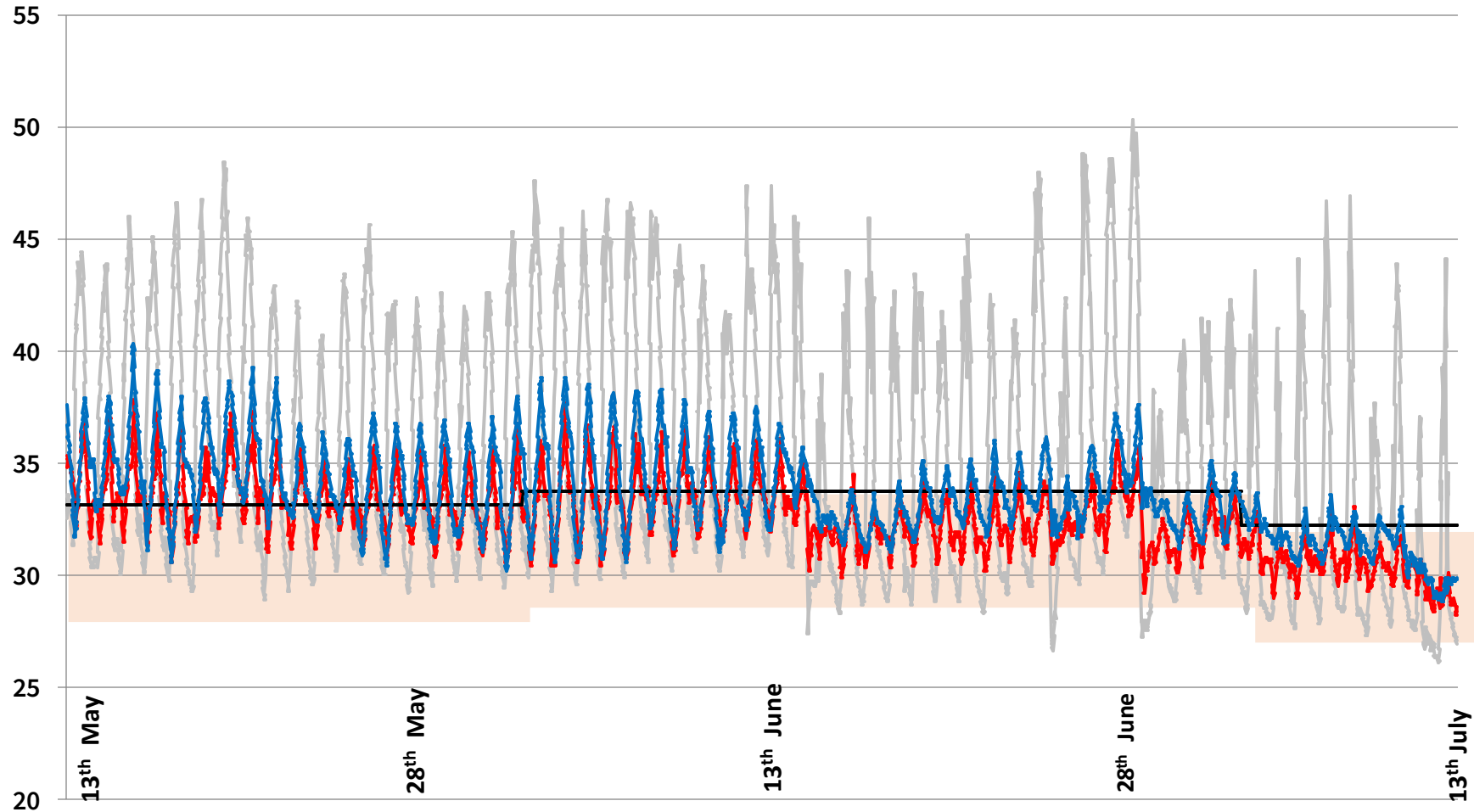


**Let me enjoy nature: places for plants**



# THERMAL PERFORMANCE SURVEY

MATRUBHUMI HOUSING SOCIETY , AHMEDABAD

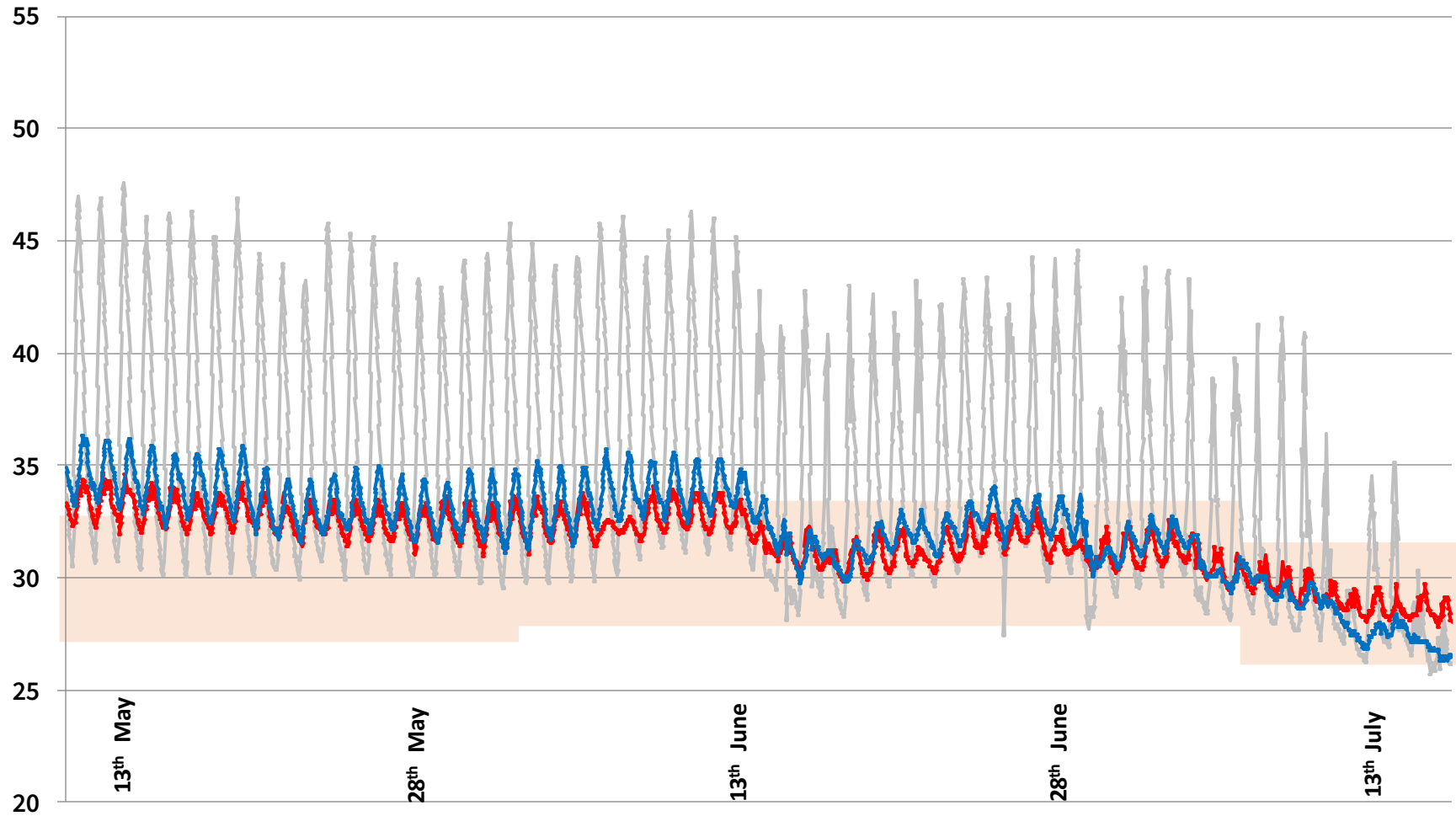


Comparing indoor DBT variation of 7<sup>th</sup> floor DU and 2<sup>nd</sup> floor DU

- DBT Living room of flat no. 703 (7<sup>th</sup> floor)
- DBT living room of flat no. 203 (2<sup>nd</sup> floor),
- DBT ambient (roof)
- IMAC Neutral Band

# THERMAL PERFORMANCE SURVEY

## SMART GHAR , RAJKOT

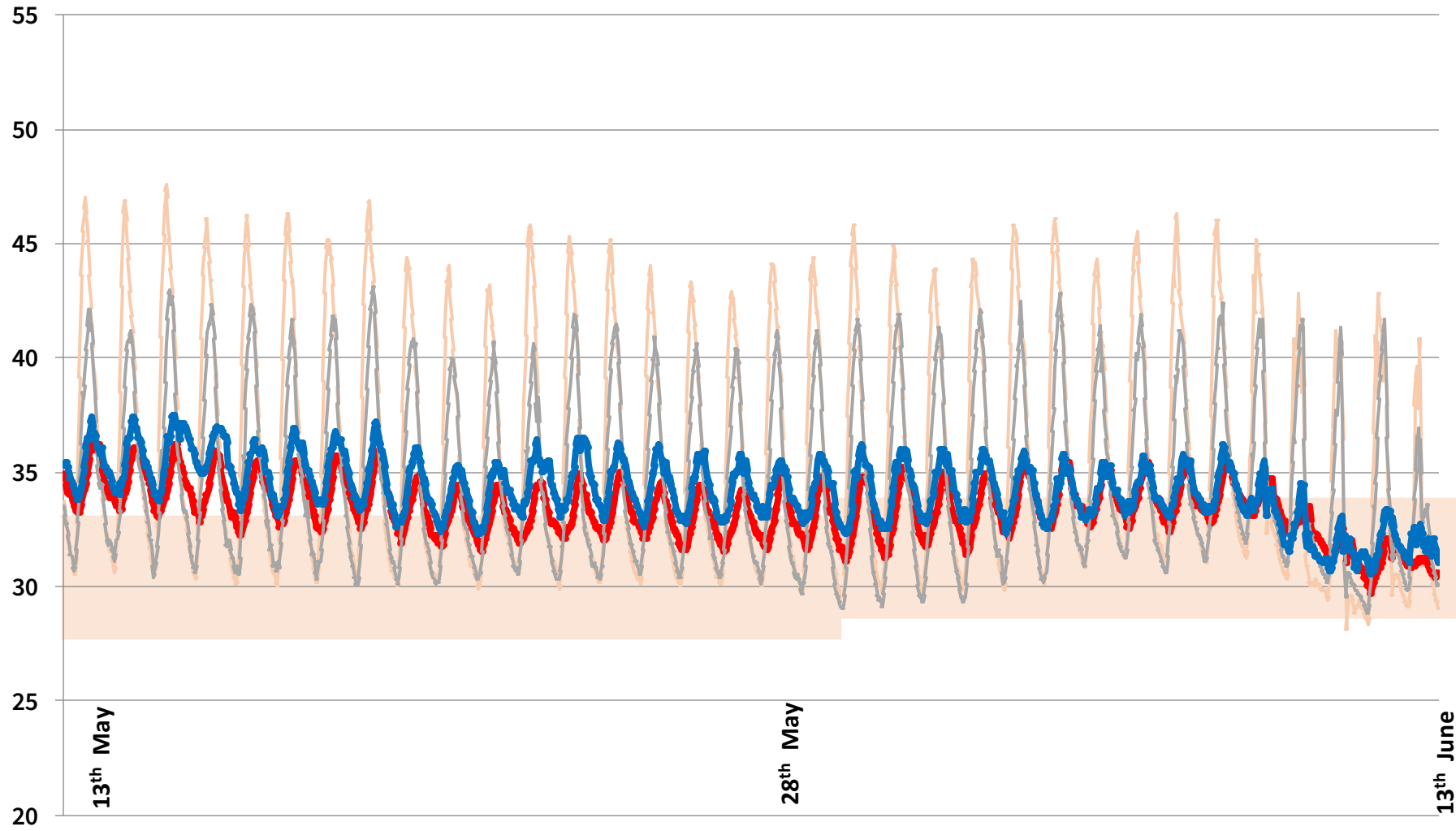


Comparing indoor DBT variation of top floor DU and 4<sup>th</sup> floor DU






- DBT Living room of flat no. K-703 (7<sup>th</sup> floor)
- DBT living room of .G-415 (4<sup>th</sup> floor)
- DBT ambient (roof)
- IMAC Neutral Band

# THERMAL PERFORMANCE SURVEY

## SMART GHAR Vs Lal Bahadur Shastri, RAJKOT



Comparing SMART GHAR, Rajkot and LAL BAHADUR SHASTRI, Rajkot top floors

-  DBT Living room of AH-32 (3<sup>RD</sup> floor) Lal Bahadur Shastri Township
-  DBT living room of K-703 (7<sup>th</sup> floor) Smart Ghar
-  DBT ambient (roof) Lal Bahadur Shastri Township
-  DBT ambient (roof) Laxman Township, Smart Ghar
-  **IMAC Neutral Band**

# “HEALTHY AFFORDABLE HOMES” – SOCIAL HEALTH

## Interaction with community

- Healthy affordable homes and neighborhoods **will provide sheltered spaces for social interaction** and **community events**.

## Access to social amenities

- Healthy affordable homes and neighborhoods **will provide recreation facilities for youth and children**. They **shall provide resilience centers for refuge and care** for vulnerable persons during heat waves and infectious pandemics.

## Gender

- Healthy affordable homes and neighborhoods **will evolve design briefs with respect to hygiene and safety** giving **due consideration to the varying needs according to gender**.

## Crowding

- Healthy affordable homes and neighborhoods **shall place limits on the FSI and densities** to **prevent social conflicts** due to overcrowding.

# “HEALTHY AFFORDABLE HOMES”

## PSYCHOLOGICAL HEALTH

### Interaction with community

- Healthy affordable homes and neighbourhoods will give **symbolic focus to spaces and facilities for cultural activities, community gatherings and recreation.**

### Access to nature

- Healthy affordable homes and neighborhoods **will establish open, greens as core spaces** towards which the residential building blocks are positively oriented. **Utilization of balconies, terraces and roofs for cultivating organic food** would be permitted and promoted.

### Aesthetics

- Healthy affordable homes **will permit and promote the cultural, aesthetic preferences of residents** and **will enable personalization and flexible arrangement** of interior partitions.

### Safety and security

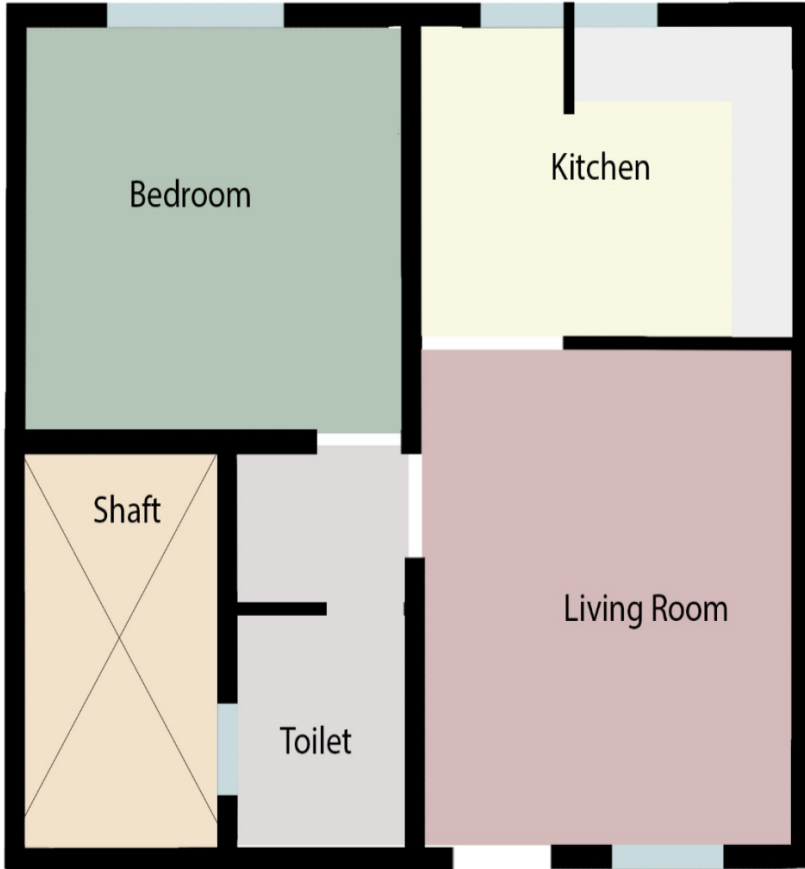
- Healthy affordable homes and neighborhoods will **provide safe play spaces for young children** and **secure social spaces for women and girls.**

### Post occupancy operation and management:

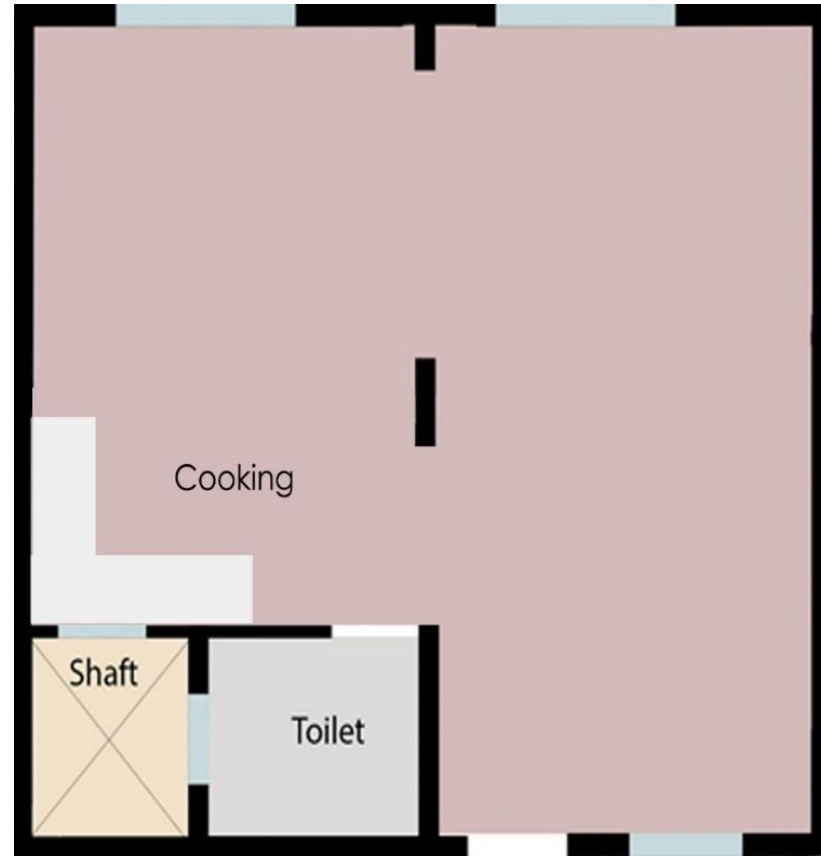
- Healthy affordable homes and neighborhoods **will engage women residents in propagating a culture of sustainable living – in the operation and maintenance of common assets, management of waste and urban farming.**

# Small homes different needs

WITH PRESCRIPTIVE BY-LAWS



WITH ENABLING BY-LAWS



## WHAT DO WE SEE FROM OUR WINDOW?



# REVIEW OF POLICIES AND PROGRAMS

## The Central Government Policies

- National Urban Housing and Habitat Policy 2007 (NUHHP)
- National Health Policy (NHP)

## National level Programs

- PMAY(U)
- AMRUT

## REVIEW OF CODES AND REGULATIONS

- National Building Code (NBC)
- Model Building Bye-laws (MBBL)
- Comprehensive Development Control Regulations (DCR) & Municipal Bye-laws

## REVIEW OF GREEN BUILDING RATING SYSTEMS IN INDIA

- GRIHA
- IGBC Green Affordable Housing
- EDGE

The white paper would seek to harmonise recommendations for Policy, NBC, MBBL and Green Building Rating Systems



# EVALUATING POLICY FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF POLICIES AND PROGRAMS

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Since all policies flow from the provisions of the Constitution, it would be desirable to adopt an amendment that directs the State to recognise its responsibility toward global environmental sustainability and environmental security for its citizens.

**The NUHHP may be expanded to include**, with special reference to Affordable Housing –

- **Coordination of Town Planning and Urban design** to mitigate Climate Change impacts – Floods and heat waves
- **Climate Change Resilience measures** and community facilities in coordination with Heat Action Plans
- Development of **transportation and mobility systems** to **minimise pollution.**
- **Limits to densities** to ensure social and psychological health

# EVALUATING POLICY FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF POLICIES AND PROGRAMS

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The **NHP may be expanded to include**, with special reference to Affordable Housing in cities –

- Requirement of **neighbourhood level resilience centres** to cope with heat waves and pandemics
- Requirement from Urban Local Bodies **monitor air pollution and to develop transportation and mobility systems** to minimise pollution.
- Requirement from Urban Local Bodies to **institute building bye-laws to prevent vector diseases.**

# EVALUATING POLICY FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF POLICIES AND PROGRAMS

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- PMAY(U)
- AMRUT

### PMAY (Urban)

- PMAY is the **Central Government’s flagship programme** to meet the enormous shortfall of housing for the low-income groups.
- The **thrust of the programme is quantitative** – where the **home is defined** simply as **a permanent structure with sanitary services**.
- As this programme goes forward it **may include the objectives of health and well-being and to develop key qualitative standards that are affordable**.

### AMRUT

- This **Mission for Rejuvenation and Urban Transformation** supports the **city utility services and transport** to improve quality of life.
- As **a complementary activity to the provision of Affordable Housing** this needs to continue.
- Its objectives **may include environmental security – especially air quality, response to Climate Change and resilience measures** for extreme events

# EVALUATING CODES AND REGULATIONS FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF CODES AND REGULATIONS

- National Building Code (NBC)
- Model Building Bye-laws (MBBL)
- Comprehensive Development Control Regulations (DCR) & Municipal Bye-laws

- The NBC and MBBL are prepared by the Central Government.
- These are recommendatory and may be modified by State Governments and Urban Local Bodies.
- Significantly, the NBC’s Part 11 is devoted to an Approach to Sustainability.
- The MBBL has a section devoted to Low Cost Housing, Green Buildings and Sustainability which also covers city and site level greening
- Climate Change related provisions in both documents may be added –
- **Passive design against heat ingress**
- **UHI and Microclimate enhancement**
- **Protection from vector diseases**
- **Resilience provisions during extreme events and infrastructure breakdown**

# EVALUATING CODES AND REGULATIONS FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF CODES AND REGULATIONS

- National Building Code (NBC)
- Model Building Bye-laws (MBBL)
- Comprehensive Development Control Regulations (DCR) & Municipal Bye-laws

- The DCR and Municipal Bye-laws for each city become legally binding.
- We look at these for Gujarat State and for the Municipalities of Ahmedabad and Rajkot
- The DCR and the Municipal Bye-laws generally follow the NBC and MBBL, but omit some key recommendations.
- Upon enhancement of the NBC and the MBBL for “Healthy Affordable Homes” the following provision may be made legally binding at the level of the DCR and MBBL :
- Limit to densities and FSI
- **Passive design against heat ingress**
- UHI and Microclimate enhancement
- **Protection from vector diseases**
- **Resilience provisions during extreme events and infrastructure breakdown**

# EVALUATING GREEN BUILDING RATING SYSTEMS FOR “HEALTHY AFFORDABLE HOMES”

## REVIEW OF GREEN BUILDING RATING SYSTEMS IN INDIA

- GRIHA
- IGBC Green Affordable Housing
- EDGE

- **EDGE** deals principally with **environmental factors and energy efficiency**
- **GRIHA and IGBC** add **social and psychological/experiential factors**
- As these certification by these rating systems is recognised for financial support, subsidies and incentives. It would be opportune to extend their scope to include following mandatory provisions:
  - **Passive design against heat ingress**
  - **Protection from vector diseases**
  - **Resilience provisions during extreme events and infrastructure breakdown**

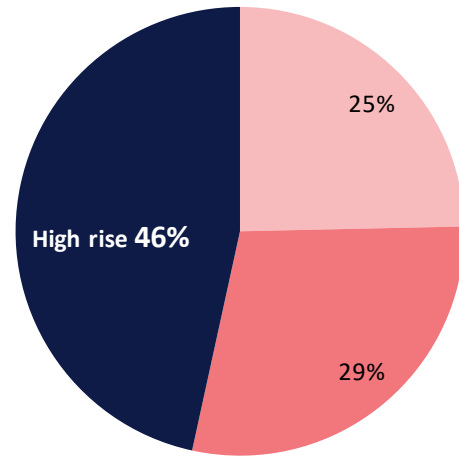
**A white paper would to harmonise recommendations for Policy, NBC, MBBL and Green Building Rating Systems**

# EVALUATING CURRENT PRACTICES **WARNING !**

## CONSTRUCTION TRENDS

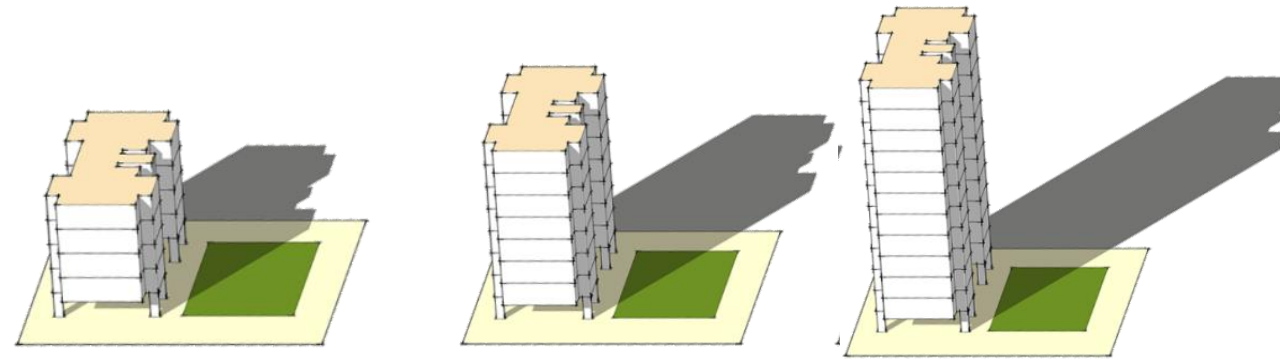
### REVIEW OF CURRENT PRACTICES

- Study done by ABLA –GIZ to understand current construction trends in the affordable housing sector



■ High rise ■ Mid rise ■ Low rise

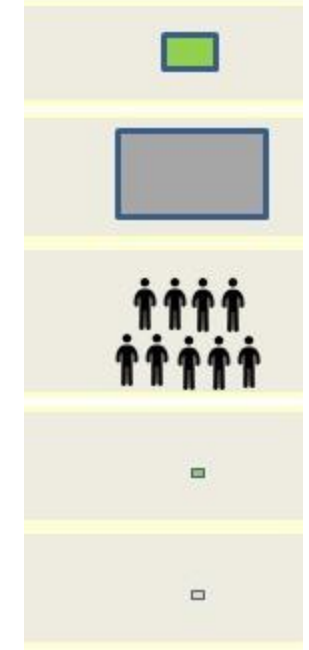
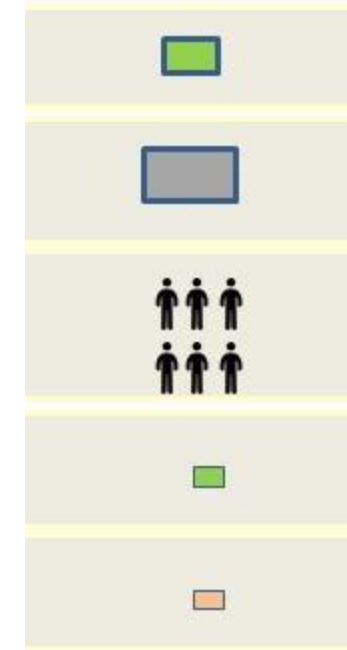
High-rise construction **goes against economy and affordability, cultural and social suitability**, (incurs a higher carbon footprint because of higher EEI) and is also the **less resilient in the event of infrastructure disruption, fire, earthquake**.



**Low rise** (<16.5m),

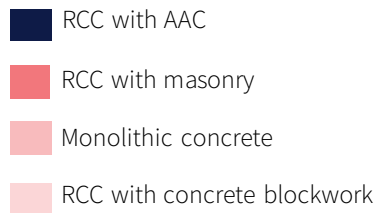
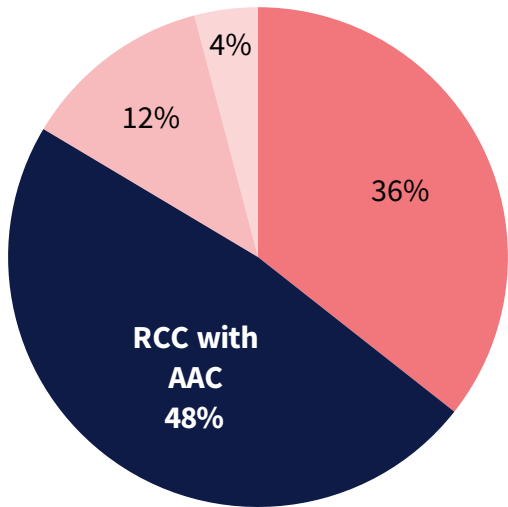
**Medium rise** (16.5-

**High Rise**

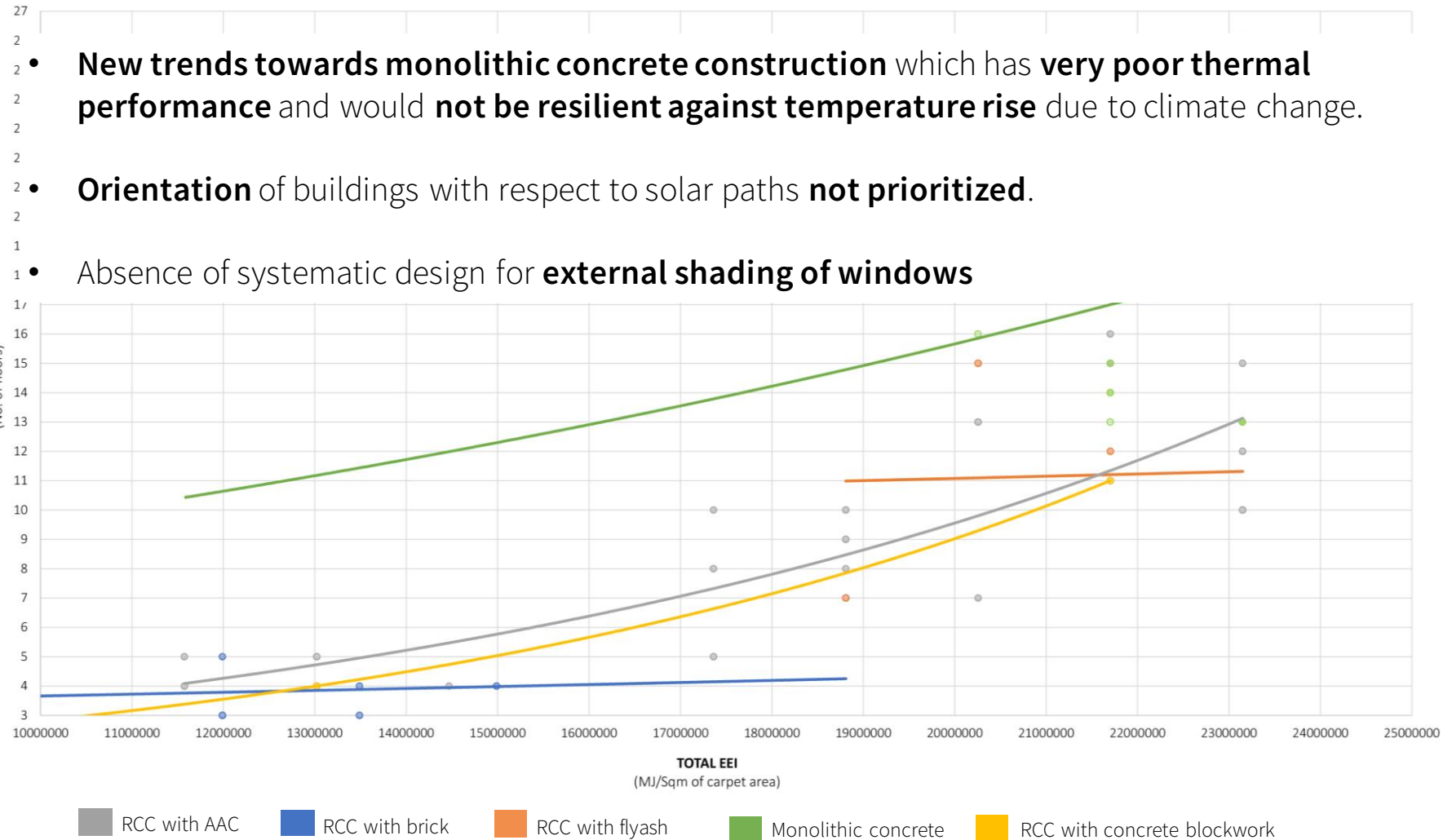


# EVALUATING CURRENT PRACTICES **WARNING !**

## CONSTRUCTION TRENDS



Source : Data collected as part of study done by ABLA and GIZ under the Climate Smart Buildings Project, 2021

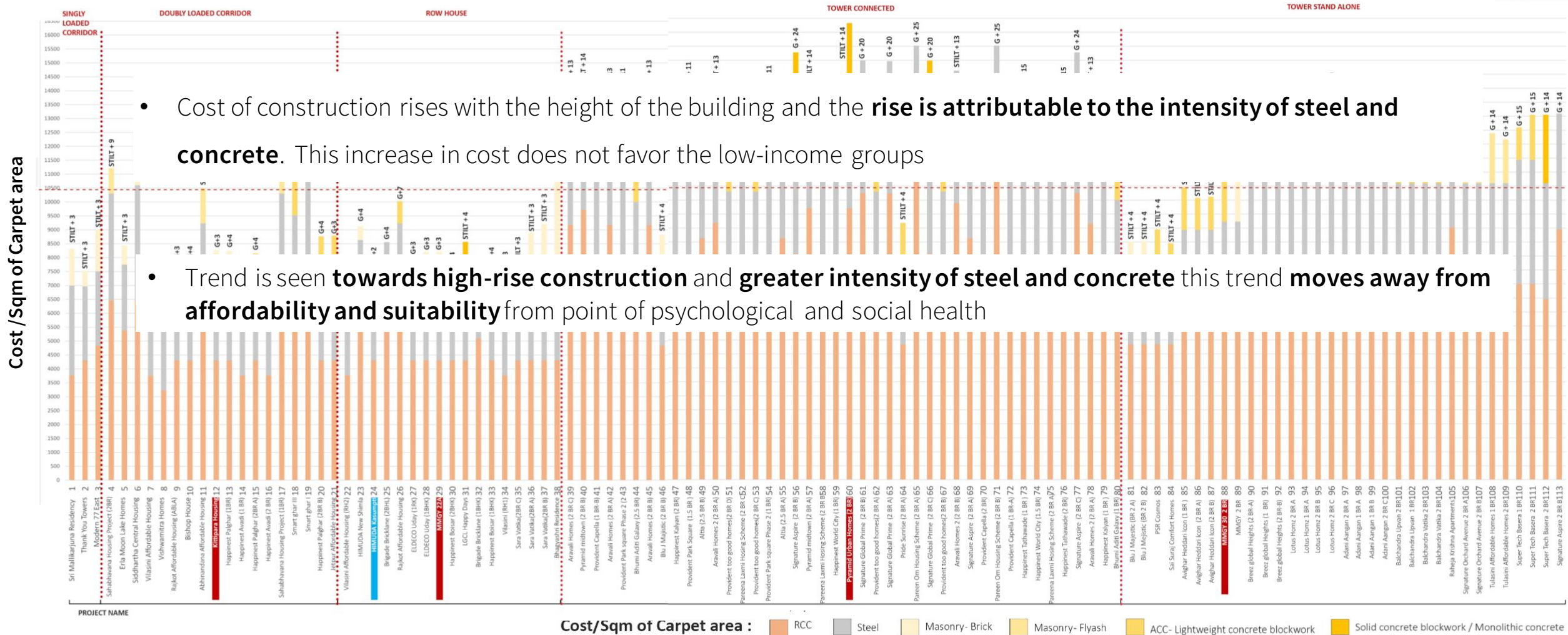


- **New trends towards monolithic concrete construction** which has **very poor thermal performance** and would **not be resilient against temperature rise** due to climate change.
- **Orientation** of buildings with respect to solar paths **not prioritized**.
- Absence of systematic design for **external shading of windows**



# EVALUATING PRACTICE **WARNING!**

CONSTRUCTION TRENDS : ANALYSING CONSTRUCTION COST VS BUILDING HEIGHT AND CONSTRUCTION TECHNOLOGY



- Cost of construction rises with the height of the building and the **rise is attributable to the intensity of steel and concrete.** This increase in cost does not favor the low-income groups
- Trend is seen **towards high-rise construction** and **greater intensity of steel and concrete** this trend **moves away from affordability and suitability** from point of psychological and social health

## Happinest Avadi, Chennai





**Climate change  
and resilience**

**Affordable  
Housing for  
lower income  
groups**

**Mainstreaming  
Gender  
perspective**

Harmonise NHUHHP – NHP

Amend NBC for Affordable Housing and Approach to Sustainability – Climate Change resilience measures

Add simple performance criteria to PMAY for eligibility – Model Building Byelaws for Affordable Housing

Mandate Passive design in building byelaws – external shading, roof and external wall U values

Mandate vector disease prevention measures

Cap density and height in planning regulations for Affordable Housing