Case Study Title:

Developing Healthy and Climate-resilient Affordable Housing in India: A Design Guidebook

Project Name	Healthy Affordable Housing in India
Location	India (across climatic zones)
Climate Zone	Hot-Dry, Warm-Humid, Composite, Temperate, and Cold
Latitude/Longitude	India
Building Type	Residential (Affordable homes)
Floor Area [sqm]	Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf" - Page No. 96 - 109 https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf
Building Height [m]	Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf" - Page No. 96 - 109 https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf
Number of Storeys	Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf" - Page No. 96 - 109 https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf
Completion Year	March 2025
Project Team	Global Buildings Performance Network (GBPN) - funding and project management agency Monash University, Australia - international research partner, Ashok B Lall Architects (ABLA) - implementation partner, Indian Institute of Public Health – Gandhinagar (IIPH-G) - consortium partner, Greentech Knowledge Solutions Pvt. Ltd. (GKSPL) - technology partner.

1. Project Description

Project Overview
Three factors – rapid urbanisation, the demand for affordable housing, and accelerating climate change – have converged critically for India. By 2050, It is estimated that over 50% of India's population will be living in urban areas. This creates a huge demand for affordable low-income housing. Additionally, low-income people, especially women, the elderly, the sick, and children, are most vulnerable to the palpable effects of climate change - heat waves, droughts, storms and floods. These effects get exacerbated in towns and cities as they expand and densify. Analysis of recent trends in the construction of affordable housing reflects that an arithmetic approach with a focus on rapidly delivering quantities of dwelling units overlooks qualitative attributes such as climate appropriateness for comfort, resilience to climate change and holistic health and well-being of residents. High-rise and high-density affordable housing - for small homes (30 to 60 m^2) with large households – exacerbate social and psychological stress due to limited community resources. In this context, GBPN worked with other partners as mentioned to research and develop this guideline document which provides standards for improving the health and wellbeing of residents, with a specific focus on the needs of women, children, and the elderly. It outlines low-cost and practical strategies and actions for the design and construction of healthy affordable homes and neighbourhoods that co-benefit climate change adaptation and mitigation. These include providing resilience against climate change impacts, reducing cooling energy demand through passive design strategies, and minimizing the embodied carbon of construction. The guidelines are developed through a living lab process, which includes field surveys, discussion with residents, collaboration with builders, expert consultations and empirical evidence on the costs, benefits and carbon mitigation potential. ***These guidelines are not ideals or 'best practices', rather pragmatic strategies that are affordable and administratively implementable, without the need for extensive technical assessment*** For safeguarding the health of residents, this guidelines document puts forth the following determinants of health and associated recommended actions – **Physical Health** 1. Thermal Comfort - Design optimization through climate responsive passive design strategies 2. Visual Comfort - Provision of shading system 3. Protection from Diseases and Pollution **Social Health** 1. Social Interaction 2. Gender Equity 3. Limits to Densities and Crowding - Limit FAR (Floor Area Ratio) **Psychological Health** 1. Adequate Space, Privacy and Safety 2. Access to Nature 3. Aesthetics, Choice and Flexibility **Resilience against Climate Change** 1. Protection against Disruptions

2. Building Community Resilience 3. Disaster Preparedness https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf

2. Climate & Site Context

Basic Climate Conditions		
Temperature	Annual Average	Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf" - Page No. 96 - 109 https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf
	Annual Range	
Relative Humiditiy	Annual Average	
	Annual Range	
Annual Degree-Days (ASHRAE Standard 169-2020)		

Climate Analysis
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Site Analysis
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Passive Cooling Strategies (please tick implemented passive cooling strategies)
þ Building Orientation & Form (site orientation, building shape, etc.) þ Envelope Design (insulation, air-tightness, shading, window system, thermal mass, etc.) þ Natural Ventilation (cross ventilation, stack ventilation, night ventilation, etc.) þ Evaporative Cooling (direct/indirect evaporative cooling, etc.) ☐ Ground Cooling (geothermal, ground-coupled systems, basement/underground space,etc.) þ Radiative Cooling (cool roof, night sky radiation, radiant barriers, reflective surfaces, etc.) þ Nature-based Solutions (green roof/wall, tree shading, etc.) þ Others (human behavior, clothing, semi-passive (fans, etc.))
Description (please describe one strategy per box – you can add more boxes below if needed)
Physical Health **Thermal Comfort** ▪ Optimise the integration of climate-responsive passive design strategies and low-energy devices to maximise indoor thermal comfort.

- Adhere to Eco Niwas Samhita (ENS) or ECSBC-R for thermal comfort – prescriptions for walling, windows, external shading and roofing.
- Enable good ventilation in habitable spaces; Enable the provision for mechanically aided ventilation.
- Provide an integrated window design for daylight, ventilation, shade and air-tightness.
- Mandate roof construction with reflective coating and high insulation.

Visual Comfort

- Optimise availability of diffused daylight; Enable the provision for installation of an
- operable external shading system to enable its modulation

Protection from Diseases and Pollution

- Ensure on-site drainage of all exterior surfaces for no stagnant water.
- Protect indoor spaces from mosquitoes with netting.
- Provide a minimum buffer between land for affordable housing and major transportation arteries to minimise air and noise pollution.

Social Health

Social Interaction

- Provide a minimum standard of 6 sqm per person for accessible shared space, sheltered or open, adjacent to homes on the ground or roof terraces, as compensation for small dwelling units with high occupancy.

Gender Equity

- Meet the special concerns and needs of women residents for hygiene, facilities for health care and workspaces for income generation.
- Include women in post-occupancy management of community assets as change-makers for sustainable lifestyles

Limits to Densities and Crowding

- Limit FAR to 1.75 and prohibit FAR incentives that contradict social and cultural
- appropriateness and environmental sustainability
- Limit densities of housing to 250 dwelling units per hectare to avoid overcrowding.
- Limit to building heights to stilts plus four storeys as a fundamental requirement.

Psychological Health

Adequate Space, Privacy and Safety

- Meet minimum standards for space per person in homes, in the common spaces within buildings and as ‘habitable’ outdoors and terraces.

Access to Nature

fire tender access rules to optimise green open space.
rd paving and vehicular access, minimum standards for green and soft ground – aligning with
pen space per person including terraces and green spaces.
on-site provision of vehicular parking to maximise green open spaces.

Aesthetics, Choice and Flexibility

- Provide useful flexibility in the design of structural systems and planning and positioning of internal spaces of the residential units.

Resilience against Climate Change **Protection against Disruptions** ▪ Ensure protection of habitable spaces and essential services against flooding and contamination of drinking water during extreme rainfall events. **Building Community Resilience** ▪ Design for the provision for rooftop Solar PV as a resilience measure for assuring minimum electricity supply for essential services. ▪ Integrate the provision of resilience centre. **Disaster Preparedness** ▪ Enable the provision of emergency water storage at the community level, to meet essential needs during periods of drought

3. Passive Cooling Design Details

Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf"

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- Page No. 96 - 109 – Passive measures as deployed through Design Charrettes conducted across few pilot projects to test the veracity of these guidelines
- Page No. 33 – 90 – Guidelines on passive design measures to be deployed in affordable homes across the globe

4. Active Components

Active (Hybrid) Cooling Strategies (please describe one strategy per box – you can add more boxes below if needed)
Refer annexures of design guidelines – "Healthy-Housing-Guidelines_Final_March-2025.pdf" https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf ▪ Page No. 96 - 109 – Active measures as deployed through Design Charrettes conducted across few pilot projects to test the veracity of these guidelines

5. Performance Data

Cooling Energy Use
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Indoor Thermal Comfort
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6. Financial Data

Cost Benefits
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7. Passive Cooling Operation

Maintenance Requirement
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8. Lesson Learnt / Recommendations

Technical Challenges, Solutions and Achievement

Areas of Intervention	Key Challenges	Solution (as embedded in the healthy affordable building guidelines)
Climate & health	Warm-humid heat, high humidity, floods, vector risks; limited AC	Mandate cross-ventilation; external movable shading; high-SRI insulated roofs; ceiling/exhaust fans; mosquito screens on all openings; site drainage with no stagnant water
Density near Transit Oriented Developments (TODs)	Floor Area Ratio (FAR)/height related incentives reduce daylight, ventilation, open space	Per-capita open space min 6 sqm; cross-ventilated unit standards; larger podium/roof commons in high-rise; green buffers from arterials

Form & operations	Lift dependence and OPEX in high-rise affordable housing	Favor ≤5 storeys+ stilts outside core TODs; where high-rise is unavoidable, ensure cross-vent layouts and robust shared spaces
Existing stock	Large retrofit need vs new-build focus	National micro-grants for roof whitening/insulation, drainage fixes, screen kits; simple rooftop/terrace commons where feasible
Permitting & delivery	Land titling and PBG delays; fragmented local capacity	Pre-approved pattern-book designs; performance checklists embedded in approvals; capacity-building for local implementers
O&M culture	Upkeep of shading, roofs, drainage, greenery, shared spaces	Resident committees (women-led) for hygiene/safety/greenery; simple O&M manuals; periodic community maintenance days
Resilience & outages	Flood exposure and grid interruptions	Elevate habitable floors and critical services; communal emergency water storage; pre-wire/structure for future rooftop PV

Achievement
Developed affordable action steps as guidelines which are implementable without any technical support
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Financial Challenges, Solutions and Achievement

Areas of Intervention	Key Challenges	Solution (as embedded in the healthy affordable building guidelines)
Affordability	Thin margins in subsidized tiers; cost sensitivity for better envelope/windows	Bulk procurement of shading, screens, fans, roof insulation; tie FLPP/VAT to verified passive performance (RETV-equivalent) to reward compliance

Other Challenges, Solutions and Achievement

Refer the detailed guidelines for challenges pertaining to physical health, social health, psychological health, and resilience against climate change (tabulated few of the challenges above).
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9. Free Description

Free Description
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10. Annex

Supporting documentations
Refer attached design guidelines - Healthy-Housing-Guidelines_Final_March-2025.pdf - https://gbpn.org/wp-content/uploads/2025/08/Healthy-Housing-Guidelines_Final_March-2025.pdf

11. Citation

Citation
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12. Contact

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