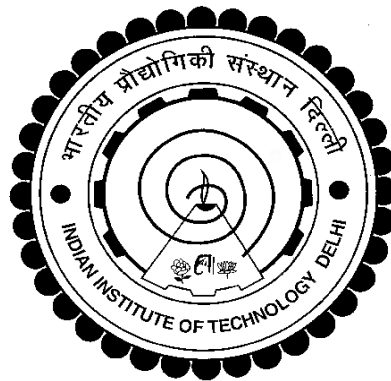


**PROMOTING CLIMATE RESILIENCE OF
HOUSING IN INDIA - A FRAMEWORK FOR
SOCIAL HOUSING**

(ABSTRACT)

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APRIL 2022

Abstract

Housing is one of the primary needs for the survival of human beings. It protects us from the external environment and serves as a critical asset for social and financial security.

The Government of India's Working Group on Rural Housing for the 12th plan estimated the total housing shortfall between 2012-2017 at a little over 39 million houses (Planning Commission, 2012). Over 90 percent of the total shortage pertains to Below Poverty Line (BPL) households. Financial support for rural housing in India is limited and spread over a large geographical area of the country. From time to time, national and state governments have launched housing schemes as a part of their welfare initiatives. However, the country-wide flagship scheme of the Government to support rural housing, namely Indira Awaas Yojana (IAY), now known as the Pradhan Mantri Awaas Yojana - Grameen (PMAY-G), has been in existence the longest. It has had different components such as providing assistance for constructing new houses with a built of 20 sq m excluding toilet. Apart from providing financial and technical support to the below poverty line households living in 'kutcha' houses for construction, house sites are also provided for those who do not have a homestead.

The scheme has resulted in both positive and negative outcomes. Some reports observe that the scheme has resulted in high user satisfaction as it does not consist of any predetermined layout or material requirements, and a full subsidy is granted without any component of credit (Raman, 2012). On the other hand, the scheme has been unable to address the housing requirements of the poorest in the community due to the inadequacy of funds to build, leading to other debts. (Ameya Athavankar, 2013; Raman, 2012). Additionally, the climate impact of using "pucca" or strong/industrial materials in the form of brick, cement, and steel at the expense of the environment has been under-represented in the drive for 'permanent' construction. Given the massive scale of the

programme and its evident precedence for the design of smaller, sub-national / state-level housing programmes across India, there is a need to explore the program's decarbonization potential. This is an important fact given the ongoing discourse around climate change. According to the report by IPCC, the building sector is a primary culprit of climate change, contributing to 19% of energy-related Green House Gas emissions and around 30% of black carbon emissions, while globally consuming 32% of total final energy use in 2010 (Lucon O., 2014). Manufacturing of building materials contributed to 11% of global GHG emissions in 2018 (International Energy Agency, 2019). Building materials that contribute to two-thirds of GHG emissions are concrete and steel, while brick contributes 18% (Zhong, et al., 2021), (Herczeg, 2014), (Müller D. B., 2011). India is estimated to become the largest GHG emitter in 30 years, surpassing China(ibid).

To reduce GHG emissions as part of strategies for mitigating climate change impacts, India needs to adopt policies to discourage the use of building materials such as brick, concrete, and steel and explore low energy options, especially for large-scale housing construction, using government funds.

This research explored the core question: 'Why does social housing in rural India continue to depend on energy-intensive construction materials, and what needs to change to make social housing more resilient to climate change ?' Therefore, the research focused on developing an Actionable Framework for Climate Resilient Rural Housing (CRRH), which would be helpful for policymakers and practitioners to contribute to this cause meaningfully. To do so, a detailed study of existing literature on rural housing to understand the potential of upgrading vernacular construction characterized by the use of local materials with low embodied energy. This underscored the need for a framework that closely connects the above-related purposes. The literature study also brought out the fact that while vernacular construction still holds a lot of promise, the challenges

around the use of the same in mainstream rural housing, given the unique context of India, are enormous.

This Study delved deeper into the factors that guide homeowner choices while constructing a house and explored possible avenues for enhancing the sustainability of rural houses, especially those funded through public money. A review of the existing literature on climate resilience was undertaken, including the potential of vernacular construction to support mitigation and adaptation actions.

The Study includes a structured analysis of critical challenges in the use of vernacular in social housing in the current context of India through a field survey in three states, namely Rajasthan, Himachal Pradesh, and Sikkim. Key informant interviews and Focus Group Discussions with key stakeholders involved in this problematique helped deepen understanding of these issues. The findings were synthesized through casual loop analysis.

Case studies reinforced these findings and provided valuable insights for defining the contours of the framework for the up-gradation of vernacular construction for promoting climate resilience of social housing. The Climate Resilient Rural Housing Framework (CRRHF) was vetted through stakeholder consultations. It was subsequently tested and validated in the state of Sikkim in India. The Study also fed into the development of "Pahal I and II," a compilation of upgraded vernacular type designs for different states in India. Based on the upgraded CRRH designs developed as part of the Study, the Government of Sikkim demonstrated their use in different parts of the state. The application of the CRRHF in Sikkim helped influence the state policies on Rural Housing.