

Technological Solution for Sustainable Rural Housing by 2022

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Abstract: Housing is undisputedly a core basic need of human beings. It involves a variety of processes through which habitable, stable and sustainable public and private residential facilities are created for households and communities. Rural housing in India is a problem of a multi dimensional complexity, both in terms of economic development and adequate provision of housing and support services, and remains as a serious concern even after 60 years of independence. Houses in a typical Indian village are self-built, self-managed with locally available materials and skilled as also unskilled labour. India is well endowed with both technology and human resources. A number of environment-friendly, energy-efficient, cost-effective building materials and components have been developed in India. Several organizations, Non-Governmental Organizations (NGOs), innovators and creative practicing professionals have come up with many innovative options which can contribute to cost reduction in the construction of houses. As a result, an extensive technological knowledge has been developed in India. There is call of the present and future coming ahead by 2022 to deliver technology at the user end in rural India.

1. Introduction

Housing is undisputedly a core basic need of human beings. It involves a variety of processes through which habitable, stable and sustainable public and private residential facilities are created for households¹ and communities. In fact, the concept of housing has been coterminous with growth of civilization.

In Maslow's theory of hierarchy of basic needs, housing ranks next only to food and clothing, where people sleep, take rest and carry on their occupational activities (Maslow, 1952). In fact, it is one of the important indicators of quality of life.

Access to adequate housing is an essential constituent of human development. Most families in rural areas² use their house as a workplace. Economic activities like processing of crops, dairy

¹ A household is defined as a group of persons who commonly live together and take their meals from a common kitchen (Census of India, 2001b).

² Rural areas comprise any village including the area outside of urban cities and towns, where livelihoods depend on agriculture. They comprise any village in Gram Panchayat (local self government) including the area comprising any town not exceeding 5,000 people as per the 1991 census (Census of India, 2001b).

activities, poultry, farming, weaving, pottery, animal husbandry, cycle repairing, carpentry, black smithy and other livelihood activities are operated from the house. But, millions of people are homeless in India at present. It is a global phenomenon, but problem is more acute in India. It is predominantly connected with poverty (Joshi, 2004).

Majority of the Indian people live in rural areas, most of which are economically under-developed. According to the Census of India (2001a), about 742 million people (72.2 per cent) live in rural areas in 0.63 million rural villages, out of the total population of 1027 million. Environmental and living conditions in rural areas are usually unsatisfactory, where livelihood depends on agriculture, livestock, forestry and natural capital. A large percentage of the rural population is deprived of adequate shelter and access to safe drinking water, electricity, proper sanitation, etc.

2. Rural Housing in India: An Overview

The condition of rural housing in India is well portrayed by the Census of India (2001b). Rural areas account for 72 percent of the total households in India. Housing shortage was estimated to be 14.9 million units in rural areas of India in 2001 (Anand and Niazi, 2006). Although homelessness is a global phenomenon, yet the problem is relatively more acute in India (UN, 1973).

The housing conditions in rural areas of India are not satisfactory, to put it politely. Out of 138 million households in rural India, 56.8 million (41 percent) live in permanent³, 49.4 million (35.8percent) in semi-permanent⁴ and 23 percent in katcha⁵ houses(Census of India, 2001b). The rural housing crisis has been mainly due to rapid population growth leading to the addition of about 1.0 million new families every year (MORD, 2004). Moreover, natural calamities like flood, earthquake, fire and high intensity windstorms render about one million rural households homeless every year, which further aggravates the housing shortages (BMTPC, 1999).

3. Government of India Initiative

Since the inception of planning in India, rural housing has been recognised as a social need. It has accordingly been assigned due priority and treated as a welfare issue. However, the appalling living conditions in rural areas have received adequate attention only since the Eighth Five Year Plan (GoI, 1992-1997). Over the last three decades, several measures have been taken by the government for the development of housing in rural areas to meet the housing shortages. These have been in the form of policies, guidelines, housing development schemes, rural water supply schemes, sanitation programme, provision of subsidy and institutional credit for construction of houses, setting up of Rural Building Centres (RBCs), empowerment of Panchayati Raj Institutions (PRIs)⁶, etc. During the Ninth Plan (GoI, 1997-2002), the Indian government framed the National Housing and Habitat Policy (NHP) in 1998 as a follow-up measure of the Global Shelter Strategy for rural and urban areas which aims to provide 'housing for all' (NHP, 1998). The National Housing and Habitat Policy emphasize the importance of propagating cost effective environmental friendly technology, design and construction materials.

³Houses, the walls and roof of which are made of permanent material (Census of India 2001b).

⁴ Houses in which either the walls or the roof is made of permanent material (Census of India 2001b).

⁵ Katcha: The houses, build with bamboo, mud, thatch, grass, reed, etc. (Census of India 2001b).

⁶The 73rd Constitutional Amendment Act, 1992 of the Government of India has empowered the PRIs to perform the duty of rural housing development and related infrastructure like drinking water supply, sanitation, waste management, electricity supply, etc. The Act has undergone amendments to turn villages into local self-governments.

Technology application is very crucial input to housing development. By adoption of technology, the cost of house would be reduced. It reduces the consumption of materials and capital both. Technology would be particularly harnessed to meet the housing needs of the poor and also the specific requirements of rural housing (GOI, 1998).

In response to NHP 1998, the Ministry of Rural Development (MORD), Government of India has constituted the National Mission for Rural Housing and Habitat to facilitate the induction of science and technology inputs. The National Mission aims to concentrate on task of preparing a Techno-legal Regime⁷ for rural housing (MORD, 2003).

4. Scenario of Technical Intervention in Rural Areas

At present the technological intervention in rural area is almost negligible. The mode of construction in the rural areas is now changing from mud and thatch to brick and concrete without any technical inputs. This is leading towards more vulnerability from the seismic point of view and rural people are not aware about it. Generally, rural houses have been constructed by local artisans without building plan, master plan, by-laws, guidelines etc. The services of trained professional, engineers, development authority, housing developers, financial institution and housing cooperative societies are not available in rural villages. In this respect, the housing construction is people's process in rural areas. (Shah, 2000).

Different type of technologies has been developed for the benefit of rural people, but it has not reached to the people for whom it has been developed due to communication gap between generator and user. Some of the important **barriers** in technology transfer are:

- Lack of awareness about technologies
- Lack of linkages between technology developer and Rural People
- Inadequate demonstration of rural housing technology
- Technology mismatching with local conditions
- Lack of information flow
- Illiteracy of rural people
- Limited exposure and access to new building materials
- Lack of extension services
- Lack of small-scale entrepreneurs.
- Lack of Institution Mechanism
- Institutional Mechanism

5. Technical Solution for Sustainable Rural Housing

In the competitive world, there is a strong need of deployment of appropriate technology solutions for rural housing construction by leveraging the existing Government of India Policies and financial incentives. India is well endowed with both technology⁸ and human resources. Throughout history, it is with the help of technology that man has transformed resources available to him into use values (Drucker, 1970; Fisher and Pry, 1972). Technology is said to be basically an integrative phenomenon and as such the same is to be expected in housing development also (Giriappa, 1992). NHP (1998) recognized this role of technology in the

⁷Building regulation /Bye-laws for regulating building activity from planning and designing to completion of construction (www.ndmindia.nic.in).

⁸ *Technology is variously treated as the knowledge to accomplish job of housing constructions, knowledge applied to practical, productive output, means of manipulating environment, productivity enhancing qualitative changes in human inputs through education, experiential learning, new management techniques and organizational innovations.*

housing sector. By adopting appropriate technology the cost of house would be reduced through reduced consumption of both materials and capital, thereby resulting in enhancement of affordability of the rural masses.

A number of environment-friendly, energy-efficient, cost-effective building materials and components have been developed in India (India: National Report, 2001). The Council of Scientific & Industrial Research Laboratories, particularly the Central Building Research Institute (CBRI), have devised a wide range of technologies for low cost housing and innovative building materials, components and systems (CBRI, 1997). Several organizations, Non-Governmental Organizations (NGOs), innovators and creative practicing professionals such as Late Laurie Baker⁹ have come up with many innovative options which can contribute to cost reduction in the construction of houses. Baker has also done several useful experiments in low cost technology and materials for rural housing based on locally available materials such as Mud, Waste product, Bomboo, etc. His contribution reveals a holistic view par excellence of what he calls “cost efficiency” in the making of building (Achwal, 1979; HUDCO-COSTFORD, 1989). As a result, an extensive technological knowledge has been developed centered around research and development laboratories and institutions. Despite the availability of technical skills, repertoire of innovative and cost effective technology, it has not been transferred effectively from the generator to the user till date due to lack of information flow (Kumar et al, 2004). There are virtually no arrangements for free flow of information about appropriate technology from R&D institution to the user end. The rural people are yet to get the benefit of technology.

6. What need to be done for Technical Solution by year 2022?

There is virtually no institutional structure available in the country to support rural housing initiatives. There is absence of organisational mechanism to collect, document, preserve and disseminate scientific and technical information for rural housing, thus, there is a need for creation of an Institutional Mechanism. Institutional mechanism is meant to ensure delivery of technology, plan and designs of rural houses, up-gradation of skills of local artisans, value addition of local materials, guidance, extension, linkages and coordination. Besides, it would also help to develop vocabulary of building materials, technologies, components of building, building system which permits local artisans and households to build functionally efficient houses in response to local needs, affordability, and vulnerability to natural calamities (Sihag, 2000). This would be possible only if the necessary institutional arrangements exist.

6.1 Human Resources for Technology Transfer

An institution needs a core competent team of professionals for knowledge accessing, knowledge sharing and knowledge capturing. Information collection, information handling, and information processing related to appropriate technology all need human resources. Further, skill upgradation and training of masons, artisans, carpenters, and other building related workforce including professionals like architects, engineers, and supervisors depend upon the sound human resource base of the institution. Design of extension network with trained manpower for delivering technology as an input into housing construction also depends upon the skills of professionals. There is no dearth of competent professional in India. There is a repertoire of technologies available in different research institutions for adoption in rural housing in India. They may be captured, acquired and documented with the help of a core competent team of professionals and Information and Communication Technology (ICT) to make them more accessible and usable.

⁹A great freelance architect in India.

6.2 Information and Communication Technology (ICT) for Rural Housing

NHP (1998) has emphasized that the information system management is one of the prerequisites for rural housing development. ICT support is a vital necessity to help rural people to take full advantages of available technology for housing development (Kumar et al., 2004b). To fulfill the needs of technology for housing construction, ICT may play crucial role. The benefits could be transferred to the end users, if Institutional Mechanism for information system on rural housing is evolved. It would be the major source of technology dissemination for housing construction in rural areas.

The Information and communication technology (ICT) is the technology of communication of information, sharing of information, the speed of information flow, volume of information process capabilities etc (Emma, 1994). Information Technology is the non human resources responsible for storage of data, processing, retrieve, and communication of information. It is not the substitute for Land, Building Materials, Technology and Finance required for rural housing development. However, it has great supporting power in accelerating the development activities related to housing development. The power of ICT has immense potential to contribute to rural housing development. ICT support is a vital necessity to help rural people to take full advantages of available technology for housing construction. It can be helpful in delivering the innovative technology, construction technique, building plan, design, and other information related with Government rural housing schemes and financial packages to the user ends. The Government has taken initiative for application of ICT for delivery of information for rural housing development. On web site of Ministry of Rural Development of Government of India ([http://: www. rural .nic. in](http://www.rural.nic.in)), details guidelines, physical and financial performance of housing schemes, Rural Sanitation and Accelerated Rural Water Supply Programme are available. But data on appropriate Technology such as vulnerability (floods, cyclone, droughts) conditions; materials for cost effective and disaster resistant housing; environment-friendly, energy-efficient products for low cost housing; cost effective technologies developed for rural housing by CBRI and other Research and development Institutions are not available on web site of MORD.

Enriched **data warehouse** is needed on technical aspect of rural housing. The information for data warehouse may be collected from the different sources. This information domain should be identified. The information sources are many laboratories of Council of Scientific & Industrial Research (CSIR), Technical Institutions, BMTPC, HUDCO, CBRI, Building Centers, Non Governmental Organization (NGO), etc. In this way, all the relevant information related with technology would be collected, documented and disseminated for rural housing development from the single source in multilevel organizational system. The information infrastructure can be a milestone in the accessibility of cost effective technology.

6.3 Linkages with R&D Institutions

Housing development in the rural areas is still languishing due to lack of linkages and integration between different research and development institutions. Functional linkage would enhance the participation of all actors in delivery of the appropriate technologies at the user end for rural housing. This linkage is also considered to facilitate two-way flow of knowledge, information and resources between the government institution and other organizations.

6.4 Extension Network for Dissemination of Technology

The basic philosophy of extension is self-help (people fix the problems themselves), participatory approach (involving a two-way channel of knowledge and experience), persuasion and education of the people (Dahama, 1986). In the context of rural housing, self-help implies significant contribution of households in the process of construction of dwelling units by themselves. In this self-help process, households also need help from the external agencies as per the recommendations of NHP, 1998. The self-help strategies include personal contacts between rural inhabitants and trained extension workers. It should be broad based, better planned, region specific, participatory and bottom up and top down to meet local needs for sustainable rural housing development. Therefore, the extension programme should be designed including PRIs, RBCs and Government Agency.

6.5 Skill Improvement of Local Artisans

Training of masons, construction workers and building professionals not only develops their skills but also empowers them for livelihood generation and provides effective ways to disseminate technology (GoI, 2002-07; Singh and Das, 2000). As a result, costs of dwelling units can reduce thereby making housing more affordable to rural people. The vulnerability of rural houses to natural onslaughts may be prevented only if local skills of artisans, construction workers and educated youth are developed for safe construction.

6.6 Use of Local Materials

Building materials account for nearly 60 to 65 percent of the cost of house construction. The cost of housing can be reduced by 15-40 percent by use of innovative building materials and technology. Thus, the main thrust for any rural housing technology option would be the adoption of local materials, which are least energy consuming and environmental sensitive, local labour and local skills (Suresh, 2001).

The local Building materials are not just to be friendly to the environment, but also be a healthier place to live for the home's occupants. It will also contribute to minimize the global warming.

The up-gradation or value addition of local materials is only possible by appropriate technology inputs and knowledge as substitutes for costly materials like cement, steel and stones. The realistic solution would be to judiciously combine more local materials with less imported materials, use of skilled artisans, people's own labouring capacity and technical inputs provided by the nodal institution through extension network.

7. Suggested New Paradigm for Rural Housing by 2022

Taking varied requirements of rural housing into account, it is the responsibility of the central and state governments to set up the institutional structure for dissemination of technology to create an enabling situation for rural households. This institutional structure would act as the focal point for assimilation and dissemination of all information related to technology for rural housing development. It would be responsive, credible and efficient in communication; reliable, competent in solving problems and sensitive to housing needs of the rural people. The broader objectives of this institutional structure are as follows:

- Acquisition and collection of all technological knowledge from various sources for housing development.
- Establishment of resource library on all inputs (materials, technology, land, finance, human resources, equipments, etc.) for sustainable rural housing development.

- To establish functional linkages with research and development organizations for large-scale demonstration and dissemination of innovative technology and scientific use of indigenous materials for housing construction at the user end.
- Dissemination of appropriate technology through organizing seminars, workshops, group discussions, exhibitions, demonstrations, training programmes, video films, poster displays, etc.
- To establish state level "technical information service" centre for assimilation and dissemination of appropriate technology by creating a world wide web- site.
- To publish books, housing advice leaflets, newsletter in Hindi to describe traditional as well as modern technology and provide technical information on water supply, sanitation, garbage disposal, greening of villages, energy requirement, solar lamp, etc.
- To create extension system to promote and encourage the use of technology for planning, designing and constructing buildings in rural areas.
- Capacity building of all Building Centres by providing technical inputs and appropriate construction technologies for reducing the cost of different housing components based on local materials and reuse of waste materials.
- Capacity building of PRIs by providing them with technical support based on the felt needs of the people for the preparation of the village master plan, design and development of solid waste disposal plan, design of toilets, etc.
- To organize volunteers from among engineers, engineering students, polytechnic students, artisans and craftsmen to work in the villages towards adopting innovative technology for shelter construction.
- To assist in planning, designing and building prototype buildings in rural areas, where artisans and construction workers may be trained.
- To develop a comprehensive region wise data base for an existing house and network of related infrastructure facilities such as drainages, internal village roads, sanitation, drinking water sources preferably in the computer environments for preparation of a scientific master plan taking socio-economic and physical aspects into consideration for the rural housing development.
- To assist in framing of bye-laws for rural villages by engaging competent technical agencies for regulating building activities ranging from planning to designing to completion of construction.
- To promote standardization efforts and to encourage innovative approach to new materials and techniques of construction, including energy conservation.
- Capacity building for the rural communities and local construction workers, focused towards human resources development in the form of education, skill developments, training and retraining in masonry work, carpentry, wire bending, plumbing, etc.
- To provide advanced technical training for architects, engineers, overseers and government officials working for rural housing development in order to facilitate the introduction of technology based housing construction.
- To establish training halls, maintain training hostels and build training infrastructure for organizing workshops and training programmes for artisans, construction workers, educated youth, engineers, architects, etc.

- To maintain and establish relationship by constant interaction with artisans and craftsmen in the villages to ensure that the relevant technology percolates to the user end for housing development.
- To extend support for establishment of viable small- and medium-scale industries for production of building materials based on local resources to create employment.
- Professional guidance and awareness creation of villagers through network of the Building Centers for use of right level of technology, locally available materials and skills to reduce the cost of construction of house and sustaining the natural calamities (earthquake, flood, fire) for different geo-climatic zones of the state.
- To make action plan, design new programmes and improve existing programmes meant for rural housing based on felt needs of rural society.
- To make suggestion to the state government in formulating necessary policies for rural housing development.

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