

CHAPTER – VI

PROMOTING COST-EFFECTIVE CONSTRUCTION TECHNIQUES AND DISASTER MITIGATION

National Housing and Habitat Policy (1998) and the Govts. policy visualizes promotion of appropriate building materials and region-specific construction techniques as an integral component of demand management strategy to meet the need of cost-effective, affordable and acceptable housing for families in different economic brackets living in varying geo-climatic regions. Housing demand is built of requirement of new houses, upgradation of existing ones and replacement of old dilapidated stock. Retrofitting and strengthening of non-engineered houses in natural hazard prone areas making them resistant to earthquakes, cyclones, floods, landslides etc. is yet another important component for improving the housing stock quantitatively and qualitatively. Planned growth of housing stock call for integrating housing finance with appropriate construction technology, availability of affordable building materials, periodic upgradation and retrofitting of walls and roofs for poor sections' housing against forces of natural disasters. Human resource development and training at institutional and enterprise levels also merit emphasis under demand management strategy.

The facilitating measures solicited include the establishment of appropriate standards for validation, certification and evaluation, extension of adequate fiscal concessions and creation of awareness and acceptance through ardent dissemination. An equally increasing concern has been provision of housing which are affordable to the people at large. Efforts made by Building Materials and Technology Promotion Council through an integrated approach involving simultaneous action for standardisation, creating awareness, promotion through governmental recognition in terms of policy support and fiscal incentives have certainly enhanced acceptability and have demonstrated the efficacy of an integrated system of technology transfer. The concerned user groups now appear ready and willing to adopt most of the non-conventional innovative building materials/products after their durability, reliability and comparative economics has been convincingly established. Rather than the absence of alternative building materials and technologies which are acceptable and affordable, it is the absence

of a grass-root level mechanism for technology transfer, which has been the major hindrance in the process of facilitation. It is at this juncture that the building centres step in as an effective mechanism for transfer of technology at the grass root level.

6.1 INSTITUTIONAL MECHANISM FOR TECHNOLOGY TRANSFER:

6.1.1 Building Materials and Technology Promotion Council (BMTPC)

The Building Materials & Technology Promotion Council (BMTPC) was established in June 1990, under the aegis of erstwhile Ministry of Urban Development and now Ministry of Housing & Urban Poverty Alleviation, Govt. of India as an apex level organisation with the prime objective of bridging gap between the laboratory development and large scale field application of cost effective, environment-friendly and energy-efficient innovative building materials and technologies.

The objectives of BMPTC are to develop & promote innovative and cost effective building material and construction technologies; to develop and promote appropriate and energy efficient materials using renewable raw material resources like wastes, natural fibres etc.; extending a special thrust on building materials from agricultural & industrial waste tough R&D; to develop and promote disaster resistant construction technologies for regions prone to earth-quakes, cyclones and floods; advice on fiscal concessions for waste based material & technology; evaluation and standardization of new construction materials; and giving technical advice to the Ministry of Housing & Urban Poverty Alleviation.

In pursuance of its objective to operationalise an integrated approach to technology transfer in housing and building sector, efforts of BMTPC for promoting innovative technologies, over the period have amply demonstrated potential and possibilities for commercialisation and large scale adoption of innovative building materials and construction techniques developed within and outside the country. New products and techniques have been standardised and commercial production has commenced in several cases. Some of the new production processes developed by the

R&D organisations earlier have been upscaled and disseminated to entrepreneurs for commercialisation.

A major achievement is the preparation of Vulnerability Atlas of India for formulating pre-disaster mitigation plans and establishing Techno-legal regime in disaster prone States. This Atlas has been revised in digitized format with latest data. As an extension of the Vulnerability Atlas, the Council has brought out the Landslide Hazard Zonation Atlas of India. BMTPC has also formulated guidelines for construction of safer and durable houses to withstand earthquake/cyclone etc.

6.1.2 BMTPC's Action Areas during 11th Five Year Plan Period

Recognising that technology as a social sub-system is the main force behind development and a key driver of competition, it has been possible to identify major constraints in the large scale promotion of non-conventional building materials. Consequent to economic liberalisation policies an increasing tendency is being noted in the domestic entrepreneurs bringing in technologies from abroad thereby further marginalising the competitive edge of home-grown technologies. While promotion of available building material technologies from within the country will be a continuing effort, the Council now proposes to focus on the following Ten strategic areas during the 11th Plan:

- i) Selection and evaluation of materials and processes.
- ii) Upscaling and modernisation of home-grown production technologies
- iii) Selection, evaluation and establishing economics of emerging methods of construction
- iv) Economy and efficiency in housing/building construction projects
- v) Strengthening technology dissemination and demonstration capabilities.
- vi) Training and skill upgradation including entrepreneurship development.
- vii) Field level applications of innovative building materials and construction technologies in mass housing projects.
- viii) Use of bamboo in housing and building construction
- ix) Vulnerability reduction, risk assessment and disaster resistant construction.

x) Technology Transfer

The total estimated requirement of funds for BMTPC during the 11th Plan is Rs. 55.19 crores.

6.1.3 Technology transfer is only possible through a combination of varied efforts at several levels. The building centre movement represents one of the most significant efforts for technology transfer of appropriate construction technologies. However, at policy level too, some of the issues to be tackled to remove bottlenecks in the widespread adoption of alternate technologies include:

- In order to enable increased reach of information on the innovative, cost effective, and affordable building materials and technologies, It is proposed to promote HUDCO HAAT as Building Technology Exposition and Housing Guidance Centres through HUDCO in all State Capital cities with the active assistance of the State Governments and the BMTPC. This would involve a grant requirement of Rs.15 crores with a cost of Rs. 50 lakhs for each HUDCO HAAT.
- Till few years ago, non listing of the new technologies in Indian Standards was generally quoted as main reason hindering their adoption in schedules of housing agencies. Now the Bureau of Indian Standards have designated proper Standards and Codes of Practice to cover most of new Items. Still large number of public construction agencies still to adopt new technologies have not adopted these in their building works and have not incorporated new items in the departmental schedules of specifications and rates to permit their use in tender documents.
- These alternative materials like flyash based bricks/blocks, simple prefab systems for slabs/roofing, ferrocement components, wood substitutes, bamboo based products are being commercially produced and have been utilised in large number of private sector projects and also in several public housing schemes. Such

projects have demonstrated well that atleast 15 to 25% economy in overall construction cost can be achieved besides improving speed of construction.

- Most public construction agencies perhaps do not have a practice to examine cost-effectiveness of different options while designing the building projects, as the “planning”, “structural design” and “preparation of specifications” are dealt in separate sections of the agency. Unless It is an integral process where specifications are considered during the planning and design stages, it is difficult o achieve economy by using new materials and construction techniques. This calls for efforts for disseminating information on new technologies amongst the contractors and design as well as supervisory staff of construction agencies. What is actually desired is that the Departmental Design Cells should involve themselves, in assessing the cost-effectiveness for different options of materials and techniques to arrive at the most cost-efficient option that should be duly certified by the Design Cell indicating the comparative values particularly in the cases of large building projects involving buildings repetitive nature.
- The BMTPC has formulated detailed specifications on the selected technologies which stand proven and can be incorporated in the schedules of specifications by State PWDs, housing agencies, development authorities etc. The CPWD has taken a lead and several of these have been incorporated in their schedules of specifications. Besides, the housing agencies in few States have also incorporated the new items in their schedules and contract documents. It is, therefore, suggested that the State Governments may constitute a Technical Group to examine the various new building materials and construction techniques which are suitable for their States and induct the same in the schedule of specifications and rates so that tender/contract documents may automatically include the various options. This would enable agencies to reduce the cost of construction.
- It is seen that the existing building bye-laws and regulations (which were mostly drafted long-long back) in many States inhibit use of innovative building

materials, construction techniques in the design and construction of buildings. The Technical Group if constituted at the State level may be entrusted with the task of examining the existing bye-laws and regulations with a view to update them and to introduce modifications wherever necessary to permit the use of new building materials and construction techniques.

- The Indian Standards brought out by Bureau of Indian Standards and guidelines brought out by A&D institutions and BMTPC are recommendatory and not mandatory. In order to make structural safety aspects mandatory in our future building projects, it is, therefore, essential that Building Bye-laws and Development Control Rules are suitably amended to incorporate use of disaster-resistant construction features as mandatory provision in design and construction of buildings.
- It is seen that construction cost of houses varies widely. The wide variation in cost of construction under public housing call for introspection of funding pattern adopted by financial agencies in the reasons leading to variation in cost. There appears to be a strong need' for looking into appraisal systems in housing projects being funded by different institutions and the Government.

6.2 THE BUILDING CENTRE MOVEMENT:

(a) The Technology Transfer Instrument at the Grass-root level

A major impediment to the application of the fruits of these research efforts at field level has been the lack of an effective technology transfer mechanism. The pioneering lead-towards bridging this gulf was taken through the establishment of a “Nirmithi Kendra” in Kollam district of Kerala State (India) in August 1986. The Government of India, Ministry of Urban Development and Poverty Alleviation, had launched the programme for the establishment of a National Network of Building Centres in 1988, implemented with the organizational and logistic support provided by HUDCO, envisaging at least one building centre in every district of the country, With the flexible Organizational pattern, approved Educational Engineering Institutions, Housing Agencies, NGOs/CBOs,

Charitable Trusts. professional entrepreneurs etc. have all come forward It is heartening to note that the total number of Building Centres in the country today (2006) stands at 655.

The Building centres function as the grass root level mechanism serving the major objectives of transfer of technology from 'lab to 'land'; skill upgradation and training to the artisans (masons, carpenters, bar-benders, plumbers, electricians, etc.); production and marketing of various cost effective components using local resources and sales outlets; employment generation through construction work using the relevant technologies in housing and building programmes; and, housing guidance, information and counseling centre for the local population on cost effective technologies.

(b) Impact of the Building Centre Movement

1. Cost Reduction

The Building Centre movement has been able to demonstrate cost reduction of 15% to 40% as against conventional methods of construction in construction of houses for all income categories, and a wide range of private and semi public buildings.

2. Employment Generation

The building centre movement has been effective in the employment generation., wherein the masons trained by the building centres have reported enhanced living standards and earning abilities. Women, who are at the lowest rung of the informal construction work are being given training in masonry and production of building components by the building centres, enhancing their earning capacity besides imparting confidence and skill.

3. Skill Upgradation and Training

At grass-root level, human resources have been built up by imparting skills through training grants. At the managerial levels, intensive capacity building efforts, partly subsidised by HUDCO, both at the level of project managers and master masons, has been carried out. These Building Centres have trained over 2.96 lath construction

artisans. Over 871 project managers have been trained at HSMI, New Delhi, and the Zonal training centre, Chennai.

4. Promotion of Local and Appropriate Technologies

A widespread network of 655 building centres (including 78 Rural Building Centres) is able to lay more emphasis on locally a building materials and traditional technologies besides incorporating improvements and up gradation on the basis of inputs from BMTPC and R&D institutions.

5. Taking Technologies from ‘Lab to Land’

Various seminars, workshops and demonstrations involving R&D institutions through a vast network of building centres set-up at grass root level makes the technologies reach from lab to land. The major impact and contribution of use of these technologies has been made in social land community buildings such as Village Offices, Primary Health Centres, Anganwadis, Balwadis, Kalyanamandapams, Mangal Karyalayas, Baratghars, Community Centres, Operation Black Board School Buildings etc. Building Centres have executed construction work amounting to Rs. 794 crores so far.

(c) Continuation of Building Centre Movement:

The Building Centre scheme was discontinued in the Xth plan. It is sought to revive the scheme and provide support to opening of new Building Centres in the Country.

6.3 PREVENTING LOSS OF HOUSING STOCK AND ACCESS TO HOUSING DUE TO NATURAL DISASTERS

About 59% of the land area of the country is vulnerable to disasters on account of earthquakes, 8.4% of area is vulnerable to cyclonic wind and storm surges and 4.9% of are is vulnerable to flood damage. The country loses roughly 1% (12 lakh houses) of the national housing stock on account of these calamities. On an average, natural calamities claim 3000 lives annually, besides loss of income and unemployment in the affected regions. No amount of human ingenuity and effort can help to eliminate occurrence of natural disasters, but human misery and economic losses can be reduced substantially by

advance planning, preparedness and by taking appropriate mitigation measures. A proactive strategy, therefore, has to be adopted to minimize expenditure and socio economic losses. The strategy would include providing easy access to low cost-finance for undertaking retrofitting of houses in the identified districts which lie in severe hazard prone areas (Zone V & IV of Seismic Zoning Map) and cyclone prone zones (as per IS 875 (3)1987).

This scheme would be location specific and the first phase would cover only 145 districts where the threat of damage is highest on account of multi-hazard proneness. The houses belonging to EWS and LIG categories are mostly non-engineered and are highly vulnerable to the hazards like earthquakes and cyclones. According to an estimate, these houses can be strengthened and retrofitted at an average cost of 10% of the cost of construction of a new house. In nut-shell, it is possible to save these EWS and LIG non-engineered houses at a nominal cost of 10% of the new house. The scheme, therefore, would save on huge losses incurred every year in repair and reconstruction of housing stock in such vulnerable areas.

It is planned, that for the financial assistance for retrofitting of vulnerable housing stock, the Central Govt. would provide 20% of the cost for a EWS beneficiary and 10% for an LIG beneficiary. The interest on loan component would be 8% per annum which would come down slightly when once the subsidy component is included in the loan package.

Following would be the broad budgetary provisions required for the subsidy:

Year	Rs. in Crore	Houses to be retrofitted per year
2007-2008	45	3,00,000
2008-2009	63	4,20,000
2009-2010	81	5,40,000
Total	189	12,60,000

With this subsidy support the scheme will be implemented by HUDCO and BMTPC in conjunction with State Govts. Local bodies Panchayats. Technical support by way of

guidelines for disaster resistant and retrofitting of houses will also be provided by Building Materials & Technology Promotion Council (BMTPC) under the Ministry of Urban Development & Poverty Alleviation. This would be a techno-financing package for giving maximum priority to the areas which have faced natural hazards. In the recent past, hands-on-assistance to households will be given through Building Centres spread all over the country. In addition new Building Centres will be established and strengthened by HUDCO and BMTPC. These Building Centres will actually demonstrate retrofitting technologies relevant to the specific disaster prone area. The scheme will have substantial demonstration effect and motivate the uncovered categories also to resort to timely retrofitting of houses

6.3.1 The major actions in the area of increased disaster resistance of dwellings and settlements which need to be given thrust during the Plan period should include:

1. As extension of the Vulnerability Atlas large scale hazard maps in disaster prone States for developing of appropriate disaster reduction measures in the districts and the states. Funds may be allocated for including such disaster reduction projects in the 11th Five Year Plan.
2. Promoting disaster knowledge networking between related institutions and related agencies.
3. In view of the huge amounts involved in the retrofitting exercise if all the existing buildings are considered for retrofitting, it will be necessary to prioritize the buildings to be taken up. The prioritisation could be based on the following parameters:
 - a. Severity of the hazard - the most severe zones taken first, the other zones in decreasing severity.
 - b. Social buildings such as schools, health centres, and water supply be taken at high priority in view of their post disaster use as shelters and essential services.
 - c. Housing and other buildings of economic activities. The whole exercise may be planned over a period of 15 to 20 years, the top priority buildings to be taken up in the 11th Five Year Plan.

- d. The private buildings and those in private sector may be encouraged to be retrofitted through awareness programme and a system of incentives, reduced insurance premium etc.