

The Case of the Indian Housing Sector and the Adoption of Appropriate and Cost-Effective Technologies

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Abstract

Construction expenses in India are growing at a rate that is about 50% faster than inflation. It has risen by up to 15% every year, owing mostly to rising prices for basic construction materials such as steel, cement, bricks, timber, and other inputs, as well as labour expenses. As a result, traditional building materials and construction are becoming costly, particularly for low-income and a large segment of the middle-income population. As a result, cost-effective building methods must be used, either via the improvement of traditional technologies utilising local resources or by the employment of modern construction materials and processes with efficient inputs leading to economic solutions. Because of the large number of houses to be built in both rural and urban areas, as well as the limited resources such as building materials and money, this has become the most crucial component. This article offers an overview of the housing issue in India as well as the country's adoption of relevant and cost-effective technologies.

Keywords: *Appropriate, Cost Effective, Ekra, Five year plan, Poverty*

INTRODUCTION

Along with food and clothing, housing is one of the three most fundamental human requirements. The availability of adequate and proper dwelling accommodations is

crucial to one's existence. India has a serious housing shortage, which is compounded by the country's rapid population growth. The national housing scenario for the conclusion of the tenth

five-year plan projects a shortage of 24.7 million units for 67.4 million households (31st March, 2007). The economically weaker sections (EWS) and lower income grade (LIG) sectors are anticipated to account for 99% of the total gap. The entire housing demand for the eleventh five-year plan (April 1, 2007 to March 31, 2012) will be 26.53 million units for 75.01 million families [5]. The country's rising annual growth rate, which is now 2.7%, has put the country's already precarious housing situation out of whack[2].

Every year, around one Australia (population 20 million) is added to the Indian population. With population growth and urbanisation, the difficulty of providing housing for the poor will only worsen in the coming years. Planners and engineers must currently design techniques and means to reduce building costs by utilising locally available resources and suitable technologies. Local circumstances and requirements should be taken into account, and local labour should be utilised in the construction.

HOUSING PROBLEM

The incapacity of economically disadvantaged individuals and low-income families to acquire homes in cities is directly proportional to the extent of urban

poverty. Poverty in India has fallen from 320.3 million in 1993-94 to 301.7 million in 2004-05. While the total number of poor people in India has fallen by 18 million, the national sample survey organisation (NSSO) reports that the number of urban poor has grown by 4.4 million during the same time period. Poverty affects one-fourth of the country's urban population, or 80.7 million people[1]. The urban poor account for 26.7% of the country's impoverished population. The fact that the number of urban poor has grown contrasts dramatically with rural poverty, which has declined in both absolute numbers and incidence relative to the rural population. Basic services are scarce for the urban poor. According to the 2001 census, there is a 9% drinking water scarcity, a 26% bathroom shortage, and a 23% drainage shortfall. It is obvious that slums will bear the brunt of this deficiency [2].

Adoption of Sustainable Technologies

Recognizing the urgency of the problem, the need of sustainable low-cost housing technologies that might give cheap homes to the masses grows. The current stresses on the Indian economy, as well as the ever-increasing demand for housing, need the adoption of appropriate building technologies that can achieve maximum economy and speed in construction. These

are created by the country's many research and development organisations, which include:

1. Central Building Research Institute (CBRI),
2. Structural Engineering Research Centre (SERC),
3. Centre for Application of Science and Technology to Rural Areas (CASTRA),
4. Regional Research Laboratories (RRL),
5. National Environmental Engineering Research

Furthermore, several state governments, Building Centers, and the Building Materials and Technology Promotion Council (BMTPC) have played outstanding roles in evolving and promoting low-cost housing technology, which has contributed to the solution of the housing problem for the masses by providing houses at affordable prices through the adoption of appropriate and cost-effective technologies. As a result of a number of breakthroughs in the field of low-cost housing technology, it is now possible to obtain total construction cost reductions of 10% to 30% [3] as compared to the cost of ordinary houses. The following technologies are employed;

Walling materials

Housing unit designs span from single to multi-story, based on the local circumstances (rural, urban, and metropolitan), the demands of target groups, and land pressure.

The materials used for walling can consist of

1. Mud
2. Sun-dried bricks
3. Rammed earth
4. Stabilized soil blocks
5. Kiln-burnt bricks
6. Laterite/stone
7. Timber/bamboo
8. Stone block masonry
9. Precast/factory-made walling units using light weight cellular concrete
10. Concrete hollow blocks
11. Ferro-cement

Depending on the availability and quality of existing soils, many sites use mud, sun-dried bricks, and rammed earth. To stabilise soil, stabilisers such as cement, lime, asphalt, and molasses are utilised. Late rite masonry blocks are available throughout the southern part of the country. Many places use stone masonry with dress stone and rubbish. Single brick load-bearing walls of up to five storeys are viable in the Indo-Gangetic plain (Haryana, Uttar Pradesh, Bilhar, and

Bengal), with kiln-burnt brick strengths ranging from 40 to 200 kg/sq.cm. Many houses in Uttar Pradesh have half-brick thick zig-zag pattern load bearing walls. The use of "Modular" bricks can also result in cost savings when it comes to brick and mortar[4].

Adoption of economical and unique bonding technologies, such as "rat trap bond" as opposed to "English and/or Flemish bond," is another incredibly inventive area where prices may be decreased. You may save up to 25% on bricks and mortar by combining proven structural strength and better thermal efficiency. Not only has technology proven to be helpful and affordable, but it has also resulted in visually beautiful housing options. Semi-skilled labourers use stone blocks and lime/cement mortar to contribute to research and development in stone-block masonry. Its success has been demonstrated in a number of low-cost home constructions in India.

In the northeast, which is a seismically active zone, The traditional method of timber, bamboo, mat-based walling known as "Ekra" walling is a historically popular and structurally resilient walling system in the seismically active North-eastern region. With appropriate R&D, it is

possible to supply plaster over cladding material with stretched wiremesh and enough frameworks of timber or reinforced cement concrete (RCC).

Factory-made cellular concrete wall panels have been used in Madras, Pune, Bombay, Ahmedabad, and Delhi. Masonry blocks must be created when access to masonry construction blocks made from local resources is not available. Hollow concrete masonry blocks and aerated light weight concrete blocks are examples of this. Flyash, a byproduct of thermal power plants, can be utilised to produce flyash-based bricks or aerated light weight blocks. Flyash may be used in a number of ways owing to several technologies developed at CBRI and other national research institutions. Hollow concrete block masonry can be used for structural as well as non-structural uses. Large prefabricated panel modules have been used in mass construction projects. However, due to limitations in lifting/erecting equipment as well as problems in wall-to-wall and roof-to-wall interaction joints, its deployment in the country has been limited.

Hollow concrete block masonry has had a considerable effect due to the poor quality of burnt brick and the expensive cost of

local fuels, mainly timber and coal for burning kilns. Even structures constructed by cooperative organisations and commercial contractors use hollow concrete block masonry for walling. Many construction locations around the country can also contribute to the increasing usage of hollow concrete blocks as walling material.

Roofing materials

Reinforced cement concrete foundation slabs are widely used in many residential buildings, particularly in urban areas. However, in large housing complexes, the use of various economic options may play a considerable role.

The various alternative systems that can be used are:

1. Clay/micro-concrete tiled roofing
2. Stone roofing with distributors
3. Corrugated sheet: galvanized iron (GI) and asphaltic
4. Prefabricated brick panel
5. 'L'panel roofing
6. Plank and Joist system
7. Filler slab roofing with various filler material
8. Clay tile - RCC batten roof
9. Precast cellular concrete roofing unit
10. RCC channel units

11. Precast joist and hollow block construction
12. Precast RCC solid planks/joists
13. Funicular shells over edge beams
14. Precast plate floors
15. Ferrocement roofing elements
16. Filler slab roofing with various filler material

Using prefabricated roofing parts, large-scale housing developments may be erected at a minimal cost. These systems have a number of successful applications around the country. Using these technologies can result in 10% to 30% cost reductions.

Doors and windows

Timber is used for door and window frames and shutters, as well as structural and non-structural walling and roofing components, in various parts of the country. Secondary species of timber have been employed to increase the economic use of timber while simultaneously protecting prime species by proper seasoning and chemical treatment prior to use. However, the moment has come to look at wood substitutes. Steel shaped frames are becoming increasingly widespread, as are precast concrete and magnesium ox chloride cement door and window frames. Precast concrete

door/window frames are equivalent in price and performance, and they do not require periodic maintenance.

Precast concrete door and window frames are popular among both public and private home builders. Precast door and window frames, as well as ferrocement shutters, are also becoming more popular in the country's housing industry. Alternatives to wood door shutters, such as cement bonded particle boards and bamboo boards, are becoming popular in many locations.

Other elements

The scope for the use of precast elements is coming into sharp focus for areas of application such as:

1. Thin precast lintels
2. Thin ferrocement precast shelves
3. Ferrocement based sanitation units/cladding
4. Ferrocement water tanks
5. Precast well rings for water wells
6. Precast sanitation unit rings
7. Precast septic tanks
8. Ferrocement bio-gas units
9. Precast tree guard
10. Precast poles for street lighting
11. Precast posts for boundary walls

The use of ferrocement water tanks has gained in popularity in India during the last two decades. The use of precast well rings for water wells has grown in popularity as a result of their popularity and the fact that they are manufactured by private sector shops as well as building centres. Sanitation plans utilising twin pits are also fuelling sanitation ring production. Precast poles for street lighting have become more popular for land development and electrical boards because to the scarcity of timber poles and their high cost. Precast concrete poles are increasingly being used to replace metallic telephone poles. Precast shelving and tree guards are also gaining popularity due to their appealing appearance and low cost.

CONCLUSION

There are several technology solutions available for various aspects of building construction, resulting in cost-effectiveness while keeping the performance attributes expected of a quality home. It is desirable to be more familiar with the various materials and technological options, their structural and functional features and efficiencies, and, most importantly, the application techniques. To allow implementation, a number of further actions would be necessary. Work on regulatory measures,

organisational development needs, and the formation of technology transfer mechanisms would be among them. This would go a long way toward assuring the adoption of suitable and cost-effective technology in the housing and building construction industry, which is one of the crucial inputs to making inexpensive and acceptable housing a reality for the great majority of the country's low-income inhabitants.

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