Development Alternatives

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POLICY BRIEF

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Understanding Sustainable Material Use in Social Housing in Urban India

Key Messages

- India's urban housing shortage is primarily driven by the EWS and LIG categories. However, the majority of the housing supply that has been built across urban India is beyond the affordability of the EWS and LIG segment.
- The CEEF (Cost Effective Environment Friendly) technology based on indigenous materials and labour intensive methods has turned out to be costly compared to conventional technologies.
- The overall building process in EWS-LIG category requires support from a strong network of different stakeholders and institutions to achieve its objectives, including beneficiaries, local community, and local government
- The findings of this research strongly argue in favour of formulating a support mechanism "Housing Support Organizations" for capacity building and for enabling people to address their own housing needs.

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Front cover photo credit: Development Alternatives

Introduction

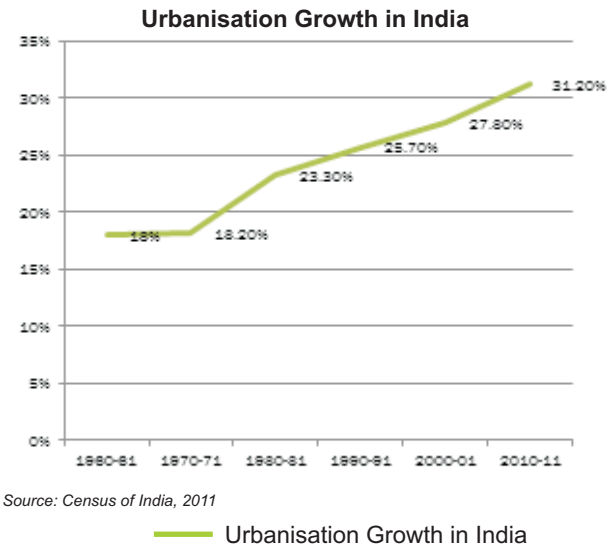
By 2050, Indian cities will be home to 900 million people (FICCI, 2011). The rapid pace of urbanisation owing to the rural–urban migration is resulting in a strain on the urban infrastructure in these cities. As urban development steams ahead, a growing concern for urban planners is the massive urban housing shortage plaguing the country. The shortage, prominent within the EWS (economically weaker sections) and LIG (lower income groups), is estimated at 18.78 million households in 2012 (Ministry of Housing and Poverty Alleviation, 2012). It is opined that this trend is likely to continue on the back of robust economic development across the country. Given this scenario, it becomes critical to fill the existing gaps in the country's strained urban infrastructure and in particular, housing. Primarily, it would be important to address the need in the EWS (economically weaker sections) and LIG (lower income groups), which currently account for 95 percent (Ministry of Housing and Poverty Alleviation, 2012) of urban housing shortage in the country.

Urban Population

India's urban population has grown at a CAGR (Compound Annual Growth Rate) of 2.8 percent over 2001-2011, resulting in an increase in the urbanisation rate from 27.8 percent to 31.2 percent (Census of India , 2011). Out of India's 1.21 billion people, 377 million are urban dwellers (Census of India, 2011). The Federation of Indian Chambers of Commerce (FICCI) estimates that by 2050, the country's cities would witness a net increase of 900 million people (FICCI, 2011). Furthermore, over 2012-2050, the pace of urbanization is likely to increase at a CAGR of 2.1 percent – double than that of China (Credit Suisse, 2012).

Impending Housing Shortage in Urban Areas

Growing concentration of people in urban areas has resulted in an increase in the number of people living in slums and squatter settlements. Skyrocketing prices of land and real estate in urban areas have induced the poor and the economically weaker sections of the society to occupy the

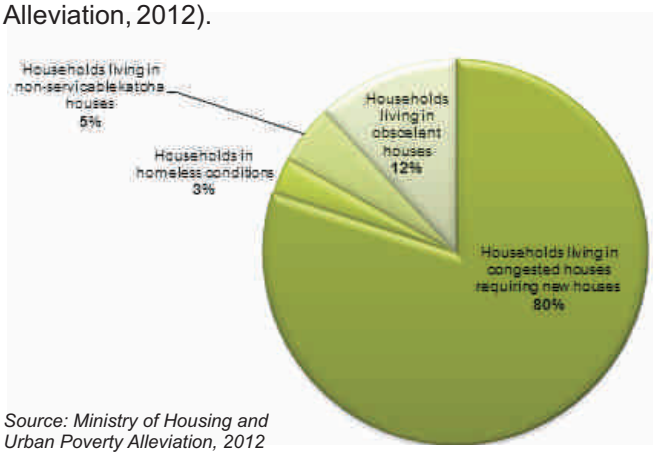


Source: Census of India, 2011

marginal lands typified by poor housing stock, congestion and obsolescence. It is apparent that substantial housing shortage looms in Urban India and a wide gap exists between the demand and supply of housing, both in terms of quantity and quality. According to a report submitted by a technical committee to the Ministry of Housing and Urban Poverty Alleviation (MHUPA), India's urban housing shortage is estimated at nearly 18.78 million households in 2012 (Ministry of Housing and Poverty Alleviation, 2012). Besides those living in obsolescent houses, 80 percent (Ministry of Housing and Poverty Alleviation, 2012) of these households are living in congested houses and are in requirement of new houses. The report also highlights that nearly one million households are living in non-serviceable katcha houses, while over half a million households are in homeless conditions (Ministry of Housing and Poverty Alleviation, 2012).

Of the total urban housing shortage, nearly 62 percent houses are self-owned, while 38 percent families live in rented homes. The below graph illustrates the break-up of housing shortage in both these categories in urban India:

Urban housing shortage is prominent across the economically weaker sections (EWS) and low income groups (LIG) which together constitute over 95 percent of the total housing shortage. The shortage amongst the middle income groups (MIG) and above is estimated at 4.38 percent (Ministry of Housing and Poverty Alleviation, 2012).



Source: Ministry of Housing and Urban Poverty Alleviation, 2012

A Note on Affordable Housing

India's urban housing shortage is primarily driven by the EWS and LIG categories. However, the majority of the housing supply that has been built across urban India is beyond the affordability of the EWS and LIG segment. Real estate developers, private players in particular, have primarily targeted luxury, high-end, and upper-mid housing segment owing to the higher returns that can be gained from such projects (KPMG, 2012). (Further, high land costs, archaic building bye-laws, stringent licensing norms, delay in project approval, and unfavorable banking policies made low cost housing projects uneconomical for private developers. Hence, traditionally, low cost housing has been the domain of the Government.) In the past three decades, the Government has adopted several policies assisting the delivery of affordable housing for the EWS, LIG, and lower MIG. These policy initiatives focused on the transition of the public sector role to a facilitator, increased role of the private sector, decentralisation, development of fiscal incentives and concessions, accelerated flow of housing finance, and promotion of environment friendly, cost-effective and 'pro-poor' technology. Taking into account the emerging challenges of required shelter and growth of slums in urban areas, the Government further launched Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005 and formulated the National Urban Housing and Habitat Policy in December 2007. The real estate sector in India underwent considerable changes post the global liquidity crisis. Downturn and liquidity crunch forced developers to adopt a two pronged strategy - smaller units at lesser prices. This oriented developers to focus on the Affordable Housing segment, which has become the buzz word in the real estate market for the last few years. During 2009–2012, various real estate developers in the country launched projects in the affordable segment across Indian cities, with units priced between INR 5-10 Lakhs (USD 10,000–20,000) (Jones Lang LaSalle, 2012).

State of Housing in Kerala

Introduction

The performance of Kerala in the sphere of social development is often projected as a model to be emulated. The State's accomplishments show that well-being of the people could be augmented and social, political, and cultural conditions improved, even at low levels of income, provided there is appropriate public action (Gopikuttan, 2002). According to Census 2011, Kerala has an urban population of 47.72% with an annual exponential growth rate of 6.56% (Census of India , 2011). Despite the general improvement, pockets of deprivation are visible in all the rural villages of the State. Slum-like human settlements or colonies in rural areas constitute one such example. There has been a housing boom in Kerala in recent years. House construction

TENURE	NO. OF FAMILIES LIVING IN OLD HOUSES	FAMILIES LIVING IN KATCHA HOUSES	NO. OF FAMILIES LIVING IN CONGESTION	FAMILIES WITHOUT HOMES	TOTAL URBAN HOUSING SHORTAGE
Self-owned	1,395,735	770,817	9,188,746	326,430	11,681,728
Rented	870,417	219,183	5,700,019	203,570	6,993,189

Source: Ministry of Housing and Urban Poverty Alleviation

being a labour intensive and capital-light activity, investment in housing has significant multiplier and accelerator effects, which might benefit the weaker sections of society. Even otherwise, additions to the housing stock are expected to benefit the poor either through a filtering process or through its trickle down effects. At a time when the boom was at its peak successive governments of the state implemented massive public housing schemes as a support strategy to help the poor. All these have resulted in the palliation of the housing problem in terms of reduction of the difference between the number of houses and the number of households. The average size, quality, and value of houses in rural Kerala are far higher than in the rest of the States in India. Notwithstanding the positive developments, it is worrisome to observe that slums have come up in rural parts of the State. Given the scale of public assistance and the magnitude of private investment, housing problem of all the socioeconomic groups should have been already solved in the State. What is disturbing about the Kerala experience is that both the housing boom and the support led security strategy seem to have failed to satisfy the needs of the weakest sections of the society. It is observed that those social, economic, and ethnic groups depending on the primary sector for their livelihood are living in extremely poor quality houses. Their habitats are characterised by overcrowding, lack of basic amenities and facilities such as drinking water and sanitation. The rich minority in the villages lives, on the other hand, in luxurious houses with all built-in facilities and conveniences comparable to the standards observed in urban centres of advanced market economies.

Table: Number of Census Houses in Kerala

Household Items	Absolute Number	Percentage
Total Number of Census Housing	5360068	-
Total Number of vacant Houses	603146	11.3
Total Number of Occupied Houses	4756922	88.7
Occupied Houses used as Residence	3592197	75.5
Residence Cum Other Use	21896	0.4
Shop/ Office	541656	11.4
Other non-residential Use	331681	7
Number of Locked Houses	50001	1.1

Interventions

As per Census 2011 there are total 5.3 million housing units available in Kerala. Out of these total figures 11.3% houses are vacant i.e. 0.6 million houses, whereas approximately 4.7 million houses are occupied cumulating to total of 88.7% houses. Out of 5.3 million houses 3.5 million are used for residential purpose i.e. 75% and others are used as shops/ offices and other use. The figures for locked housed cumulate to 1.1% of total number of houses present in the state.

State intervention in the housing sector had begun in Kerala from the 1950s; till 1970, it was confined to implementation of schemes sponsored by the central government; from the beginning of the 1970s, the central government transferred their housing schemes to the State governments. Several favourable institutional and structural changes had been occurring in Kerala during the 1960s and the 1970s, which opened up possibilities for better housing particularly for the poor. Among them, the legislation in agrarian relations and the inflows of remittance income from the Gulf emigrants deserve special mention.

The government of Kerala introduced several novel programmes of intervention in the housing sector. The 'One Lakh Housing Scheme' implemented in 1972 was the first of its kind. It was designed to provide permanent dwelling for the landless agricultural labour households that had not received homesteads under the Kerala Agrarian Relations Act. The government implemented the scheme with generous support from voluntary organisations. This programme implemented with participation of local inhabitants, political parties and social and cultural organisations became popular and kindled desire in the hearts of all the houseless poor to become house owners.

In these favourable circumstances, a housing boom began in Kerala in the late 1970s. The share of the construction sector in the Gross Domestic Fixed Capital Formation of Kerala during the last two years of the 1970s was more than 90 percent (Gopikuttan, G., 1988). Yet, the State economy languished (Ramachandran, 1996). According to two surveys conducted by Government of Kerala in 1980 and 1981, the annual compound growth rate of new construction leaped up from the pre-boom rate of 0.85 percent to 5.8 percent. Housing quality was also undergoing more rapid improvements in Kerala than in the rest of India. One of the positive innovations implemented in Kerala in recent

years is the participatory people's planning process launched in 1996. The problems in the housing sector do not seem, however, to have become, less intractable than earlier. An evaluation of the process made by the State Planning Board, for the year 1997-'98, has shown that the highest priority was given to the housing projects for the economically weaker sections in the panchayats. Yet, the problem of housing of the rural poor continues to remain grave.

Processes

The house-building process in Kerala, particularly in the rural areas, has not yet become fully market-determined or functionally related either to the operations of the price mechanism or to the price policies of the government. House construction remains, by and large, an activity organised primarily by the consumers themselves. Though the production decisions are not market-directed, allocation of materials and labour for all types of construction is. Demand in excess of supply has led to rise in input prices. Building materials and skilled labour have become relatively scarce owing to the construction boom. The first direct impact of the boom was on the price of basic factors - land and labour - and then on construction materials. The demand for labour in the house construction sector is so high that if all the building materials required were produced within the state itself, the state could have provided full employment to about 10 percent of its workforce in the housing and housing-induced materials production sectors. One-half of this 10 per cent could have been employed in onsite house construction work alone (Gopikuttan, G., 1988).

Material Use

The building boom has brought about drastic changes in the material use pattern in house construction. In earlier times, before the boom, locally available or indigenously produced materials such as timber, stone, rubble, mud-mortar, coconut palms and leaves and tiles were the predominant materials used. People had relatively free access to non-produced materials. Even in the case of produced materials, the cost involved was meagre. Until the early Seventies, thatch was the most popular form of roofing in rural houses. Annual re-thatching done on a self-help or mutual-help basis involved little labour cost. Again, materials of thatch were available in plenty and at low cost. The enormous increase in demand for residential construction unleashed a growing scramble for the available limited supply of materials.

Owners of large holdings in which building materials such as trees (for timber), stone, coconut palms, bamboo and grass existed, began to deny free access to them. Their control over the supply of sources enabled them to push up prices of all such materials. The traditional practice of community co-operation in house-building, re-thatching, and other related activities became obsolete and impracticable in a situation in which labour became a commodity, its price rising and the average size per housing unit getting larger and increasingly 'modern'. Relative prices of factory-produced inputs declined. Technologies alien to the resource endowments of the region became popular, allegedly for reasons of efficiency, economy, flexibility, and aesthetic appeal. The use of new technologies and materials created a variety of job opportunities that demanded team work and group efforts. Increased demand for work teams in a highly segmented market with inelastic supply pushed up wage rates to newer heights. Real as well as nominal wages of the informal sector workers increased manifold since the mid-seventies.

The transformation of the building process and the resultant intrusion of factory-produced materials should be expected normally to manifest their multiplier and acceleration effects on production. Unfortunately, such effects leaked out into the other states and were hardly realised in Kerala. The majority of the house construction materials consumed in Kerala are produced outside the state. Average prices of indigenous building materials were increasing at rates far higher than those of factory-produced materials during the period since the 1970s. People began to look down upon several indigenous materials because of their non-durability and inelegant appearance.

Though technologies to improve the durability and strength of such materials are available, they had not reached the builders in the countryside. Because of cost efficiency, durability, and flexibility, modern materials are more acceptable to the people and hence popular. Drastic changes in material use patterns are seen in the study region.

Flows of Building Materials

Conditions of housing and the pattern of use of building materials vary with the socioeconomic status of the households. A poor household is housed, in general, in a small thatched or tar-sheet-roofed hut raised on six pillars with cow-dung plastered floor and mud walls. A middle class dwelling is one constructed on rubble foundation with cement-plastered laterite or brick walls and roofed with tiles or reinforced cement concrete (RCC). Modern houses with mosaic / marble / granite flooring and RCC roof have all the facilities of modern houses in urban centres. Building materials and labour are brought from nearby places, but in some cases, from far away places, as well. Long stretches of rice fields in Kadapra are now kept fallow due to the fact that rice cultivation has become uneconomic. Owners of rice fields find that it is profitable to lease rice land out for clay mining. For every 10 cent of wetland leased out, the owner get Rs 2000 to Rs 2500, an amount much higher than the purchase price of rice land. Once leased out for clay mining, the land can be reclaimed for cultivation only after a long period. Further, rice cultivation in the fields

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adjacent to the one in which clay mining has been done becomes difficult due to problems of irrigation and drainage.

Uncultivated rice fields have left large numbers of farm workers unemployed. Clay mining has affected the availability of drinking water in the households in the neighbouring areas, during the dry season. Similarly, inadequate drainage facilities result in water-logging for a relatively long period in the year, which in turn, has resulted in the deprivation of workers dependent on the farm sector for livelihood. Though a few of them have managed to get occasional non-farm jobs, the majority remains unemployed during most days in a month except during the busy season. Conditions of housing vary with the socio-economic status of the household. Moreover, the materials-use patterns vary widely among the different types of houses. Till the early 1960s, a typical poor household in midland and lowland villages lived in small thatched huts raised on six pillars with cow-dung-plastered floor and mud walls. Mud, bamboo, coconut trees, coconut leaves, palm leaves, and grass had been the popular building materials of the poor households in all the three panchayats. Common property resources were available and accessible to the poor. Several materials owned by private individuals also used to be made available to them at low and affordable prices or even free of cost. A middle class dwelling was one constructed on rubble foundation with laterite walls and tiled roofs with separate and open verandas. Their sizes varied with the socio-economic status and the size of the household. Large, modern houses were few, and were owned by rich cultivators.

Socio-economic changes since the early 1970s had their impacts on the uses and prices of indigenous building materials. Average prices of indigenous building materials (eg: sand, clay) increased by about 15 to 20 times since the mid-seventies. During that period, the average price of factory-produced materials (eg: cement, iron rods, sanitary ware, and electric goods increased only less than 10-fold). Because of commodification, marketisation, and extensive cultivation of commercial crops like rubber the rural poor lost accessibility to common property resources. At present, they have to compete with the rural elite to command building materials from the market. The partial financial support of government agencies is too inadequate to procure the materials needed for a standard house. Moreover, several materials like mud, clay, palm leaves, and coconut leaves, which had been in use for centuries, began to be looked down upon for their non-durability. Though technologies to improve the durability and strength of such materials are available, the rural poor are not aware of them. Since the housing agencies insist on the use of durable materials, the beneficiary households are forced to use factory-produced modern inputs. Though unfriendly to ecology and environment and energy-intensive in their production, modern materials are flexible, durable, and aesthetically appealing. Because of economies of scale, relative costs of such materials are low for large houses. Since transportation cost accounts for a major proportion of its value, use of small quantities of modern materials will be uneconomical. Government-assisted scheme houses are relatively small and therefore, on-the-site cost of materials is higher. Radical changes in material use patterns are a recent phenomenon.

Year	Building Material
1930	Mud, laterite stone, bamboo, Palmyra leaves, coconut leaves, timber, sun-dried mud bricks, grass, and rubble
1940	Mud, laterite stone, bamboo, Palmyra leaves, coconut leaves, timber, sun-dried mud bricks, grass, coconut stem, lime, and rubble
1950	Mud, laterite stone, bamboo, Palmyra leaves, coconut leaves, timber, sun-dried mud bricks, grass, mud, coconut stem, lime, and rubble
1960	Mud, laterite stone, bamboo, Palmyra leaves, coconut leaves, timber, sun-dried mud bricks, coconut stem, lime, cement, river sand, sun-dried clay bricks, and tiles
1970	Mud, laterite stone, bamboo, Palmyra leaves, coconut leaves, timber, coconut stem, lime, cement, river sand, sun-dried clay bricks, tiles, burnt bricks, iron, and steel
1980	Mud, laterite stone, timber, lime, cement, river sand, tiles, burnt bricks, iron, PVC, glazed tiles, mosaic chips and steel
1990	Mud, laterite stone, timber, lime, cement, river sand, tiles, burnt bricks, iron, PVC, glazed tiles, mosaic chips, marble, granite, asbestos, tar sheets, cement hollow bricks, aluminium and steel

Success Story of Karimadom Colony, Thiruvananthapuram

A population numbering 234, occupy the 9.73 acres of land that forms Karimadom Colony, close to the Chalai Market and Manacaud Market of Trivandrum. A mere one kilometer from the railway station and central bus stand, it is a convenient location for the underprivileged that don't have their own means of transport. Unfortunately the site also houses the city's sewage collection pond, owned by the Kerala Water Authority. As is the case with many other slums world over, the Colony land is at a 2 feet depth below ground level causing the site to flood with sewage during heavy monsoons. This results in unhygienic conditions that breed multiple diseases and worsen the already pitiable condition of the slum inhabitants. However relocating from this Colony is not a feasible option to the residents for multiple reasons. Most of them work in varied menial jobs in the vicinity and relocating them would adversely affect both their job opportunities and their employers.

Laurie Baker observed that every family needed some open space for their daily activities and even tasks that formed a part of their livelihood. This created the sprawl like spread of homes as every family tried to occupy units with some open area near them by in-situ rehabilitation process. Another challenge in such a development is the restriction on the permissible height of construction owing to the fact that basic essentials like water needed to be carried up to the houses by the residents. Baker's other concern was that it is not merely sufficient to provide the people with proper houses; he wanted to work beyond that. A slum only truly loses that tag and the stigma associated with it, when its residents can lead a fulfilling life with access to necessary public amenities and when people in the neighboring areas cease to view it as a blot or scar upon the urban landscape of the city.

The slum inhabitants numbered to 140 families and the proposal was designed to accommodate 28 buildings with 20 units each, allowing a unit for every family. Each building was built in a stack like formation with 8 units on the ground level, 6 units on the first floor, 4 on the second and only 2 on the third. As the saying goes, this stacked module killed two birds with one stone. First by moving vertical, the demands on the ground space were lessened and allowed the formation of vacant plots that could be developed into community and open spaces. Secondly, by reducing the number of blocks on each floor, a staggered form was created allowing each dwelling on the upper floors to have a small terrace space adjoining it thereby compensating the residents for their share of ground space.

Every unit had a simple linear layout where one entered the living room from the terrace, then accessed a small space with a kitchen to one side and toilet to the other and on walking further in, came into the bedroom. Baker's design of the multiple function terrace spaces provided the families some flexibility in personalizing their own homes and adapting it to suit their needs. The launderers could dry clothes, craftsmen used it as their work space, people housed their pets there, women used it as an extension of their kitchen and alternately they used this very space to relax with friends and family. Larger families had the option of enclosing this terrace to create an additional room.

Materials like mud interlocking blocks, stones, cement and steel were used to construct the project, space has been given in balcony, if occupants wish to extend their room sizes.

While the stacking and staggering of apartments created very functional living units and building blocks, Baker and the COSTFORD (Center Of Science and Technology For Rural Development) team were now faced with the challenge of the spaces in between the buildings. Unlike other typical housing developments with only a central open space, there were also a lot of smaller spaces between these long buildings. These 'dead spaces' as they came to be known are now being developed into mixed-use areas such as stores and libraries that would create a better environment within the Colony and possibly attract the people around the slum area to come and utilize these public amenities provided. This strives to create an interaction between the slum dwellers and the neighboring people, thus creating a healthy relationship between the city at large and this so called 'blemish' on the city's urban fabric.

Changes in Building Materials

Indigenous inputs had been extensively in use for construction of residential houses until the 1960s. Cement, river sand, and iron and steel were only sparingly used till the mid-seventies and that too only for middle and high-class constructions. Popular use of materials such as glazed tiles, mosaic chips and tiles, asbestos, and PVC began only in the 1980s. Tar sheet as roof material was not used until the early 1990s. Cement bricks and cement hollow bricks for walls of all classes of houses and marble and granite for floors of middle class and high class houses began to be used only in the 1990s. The use of tiles for roof declined drastically during the Nineties. None of the houses constructed in the 1990s used lime for mortar preparation or for plastering. Several factory- produced materials became popular in the 1990s. Tar and tin sheets took the place of grass and leaves as roof materials of the houses of the lowest income groups.

Materials Used for Housing in Kerala

The natural building materials available for construction in Kerala i.e. stones, timber, clay, palm leaves, coconut

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shells, mud, mango wood, and Areca-nut have anchored and guided the acceptance or rejection of outside influences. The availability of granite - a strong and durable building stone is restricted mainly to the highlands. Accordingly, the skill in quarrying, dressing, and sculpturing of stone is scarce in Kerala. Laterite stone however, is found in large quantities as outcrop in most areas, with greater abundance in northern Kerala. Soft laterite, available at shallower depths can be easily cut, dressed, and used as building blocks. It is a local stone that gets stronger and durable with time. Blocks of this stone may be bonded in mortars of shell lime, – the classic binding material used in traditional buildings. Lime mortar can be improved in strength and performance by admixtures of vegetable juices. Such enriched mortars were utilised for plastering and low relief work. Timber remains the prime structural material abundantly available in Kerala, in many varieties – from bamboo to teak and rosewood. The skillful choice of timber, artful assembly, and delicate carving of wood work for columns, walls and roofs frames are the unique characteristics of Kerala architecture, using accurate fit of joints. Clay was used in many forms – for walling, in filling the timber floors and making bricks and tiles after firing in kilns, tempered with admixtures. Palm leaves are still used effectively for thatching the roofs and for making partition walls and along with mud walls (clay) is still the "poor man's" construction material. Mangalore tiles, mud interlocking mud with slight mixture of cement and concrete hollow block are few innovations emerged as material alternatives in the state. Construction and demolition waste remains a negligible source of building material. *Kerala imports burnt bricks from state bordering regions of Tamil Nadu.

Technology Alternatives for the Housing of Economically Weaker Sections in Kerala

The AT (alternative technology) initiatives which began with high expectations failed to achieve the primary goals mainly due to multiple factors that involves economic, socio-cultural, and political dimensions. This study has been started with a few basic questions such as, what is AT? What are the determinants of appropriateness? What are the technology options in housing for EWS? What are the conflicts and challenges, if any, in the practical application of AT? AT in a dynamic framework, should satisfy three elements: economic viability, social acceptance and adaptability and sustainability. Appropriateness of a technology is assessed on the basic premises of (a) satisfaction of basic human needs, (b) self-reliance through participation and control of resources and (c) harmony with environment. On the housing front, the purpose of AT is to enable the poor and needy to own dwellings that would serve as a store of value and an appreciating asset. Appropriate building technology is expected to help the poor to construct structurally durable and functionally adequate houses at minimal affordable costs. The present study has been an enquiry into the available alternative building technology options and their practical application in housing for EWS. Besides secondary sources of data, field information was collected using a range of techniques including focus group discussions, semi-structured interviews and observation and household surveys in selected units. Discussions were also held with stakeholders at various levels. Included among these were people's representatives, officials at various levels, NGO activists, and office bearers of AT institutions etc. The CEEF technology based on indigenous materials and labour intensive methods has therefore turned out to be costly compared to conventional technologies. The "poor man's" building materials in the past were mud, bamboo, coconut trees and leaves, palm leaves and grass, which were available, either free of cost or at affordable prices. Market penetration since mid-seventies have pushed up the prices of all the indigenous building materials beyond the levels affordable to the poor. Relatively high price, non-durability and inelegance made the indigenous materials unacceptable to the EWS. Though unfriendly to ecology and environment and costly, modern materials are flexible, durable and elegant in appearance. It is quite natural that EWS who get financial assistance opt for modern materials. Therefore the EWS households rejected alternative building materials and methods since they violated the basic principles of economic viability and social acceptance. Those households who have opted for appropriate technology houses have several complaints. They complained about space constraint, functional utility, workmanship, skill and ability of the workers and technologists. Moreover, several users of AT materials have doubts about strength and durability of cost effective building materials. Since aspirations and ambitions of all sections are high everybody wants to construct durable houses with scope for expansion. Those who do not have the means to meet the aspirations also look for a core durable house with scope for lateral and vertical expansion. Since the mismatch between housing expectations and means to realise them have widened, even those people from poor sections who plan for CEEF technology often end up with modern materials, high cost and debt trap. Production of building materials has significant economic, social and redistributive implications. The more affluent uses capital-intensive modern building materials, construct permanent buildings that are not only stores of value but also appreciating assets. The richer sections thus gain by investing in buildings. The AT institutions partly succeeded to alter this situation in the initial stages with public support. Institutions such as NIRMITHI and COSTFORD constructed several buildings throughout the length and breadth of the State and had produced several durable building materials and distributed to the end users at affordable prices for about one decade since mid-eighties. That was done with enormous government support. But, later on, the political economy and the mainstream decision making forces seem to

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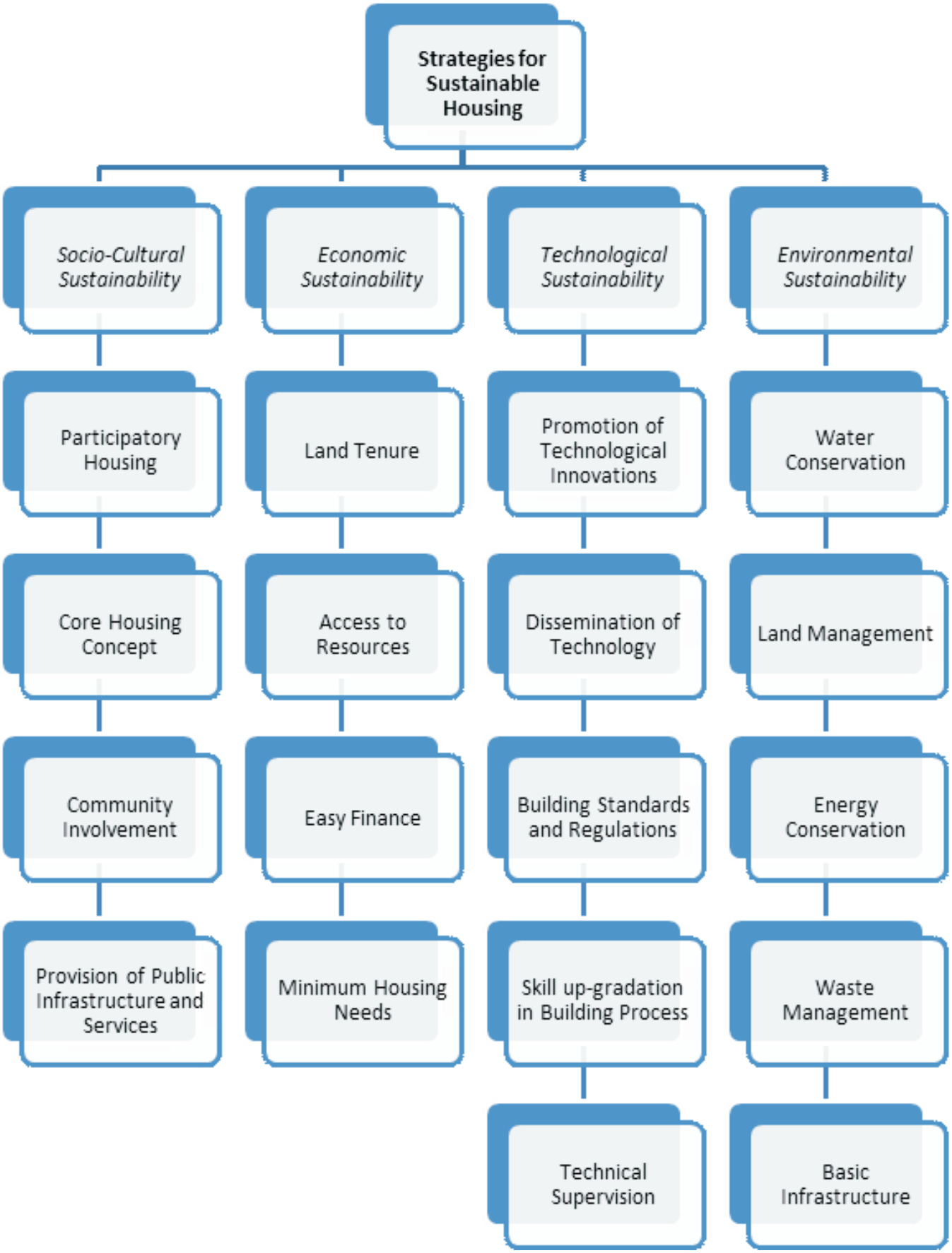

have worked against the AT initiatives. The government and public institutions stopped their support to AT institutions. The government, which supported the appropriate technology institutions to do invention and innovative works for the poor and needy, have now wanted them to take the role of government contractors. Left to the market forces, CEEF technologies and methods are not economically viable for small, heterogeneous and dispersed housing units located in diverse geographical locations. Thus, the AT institutions are at present struggling for their existence. Some of them have already diversified their activities. A few are providing consultancy services to middle income households at a fee. Supervision is also provided at a price which EWS households may not be able to afford. Given the overall changes in the socio-economic context of the State, one major positive sign that is observed throughout Kerala is that public buildings and several middle and high income households at present use CEEF technologies for both residential and non-residential constructions. Roof materials like filler-slab RCC, hollow-clay cement roofing (Huridis), dressed laterite stone, exposed brick walls and RR technology for foundation have gained acceptance among the rich and affluent sections of society. The trend will definitely percolate down to all sections of society. The AT institutions and those concerned with the propagation of appropriate technologies can console themselves that their efforts were not in vain. Popular technology at present is the one based on the use of modern factory produced materials. Ordinary people are not familiar with modern technology and so, exploitative tendencies, especially of a long chain of intermediaries and agents, are growing in the housing sector. Owner builders at present are looking for materials suitable for popular technologies. But the need of the time is to develop appropriate technologies suitable for use of indigenous building materials. To make local materials acceptable to the people, their durability should be improved and be given an elegant appearance without violating the basic tenets of AT. Who will take such technologies to the construction sites? Can we expect the amorphous group of outliers of the mainstream tendencies of housing development, who are supposed to be the real beneficiaries of AT, to raise it as a political demand? Who will take the lead to alter the decision making process in favor of the sustained development of the poor?

The overlooking of socio-cultural and environmental factors in the housing programmes, poor accessibility to resources, improper awareness on building process, and innovative technological options, and insufficient basic services are identified as the main problems in LIG/EWS households in Kerala.

Policy measures for achieving socio-cultural sustainability in housing in Kerala ought to describe the importance of stimulating participatory housing through the involvement of the community and support of households and promotion of vernacular housing concepts instead of rigid designs. Economic sustainability of housing programmes and policies can be guaranteed by improving the strategies for empowering LIG/EWS households in the different activities of the building process, like the production of building materials and skilled labour training; integration of the housing schemes for the EWS with poverty alleviation programmes; ensuring accessibility to resources such as land tenure, supplementary loans, building materials, and labour; and accessibility to credit services can be improved by promoting micro-finance institutions and by flexibility in loan services depending on the needs of the household.

Recommendations for Implementation

The evaluation of public housing schemes in Kerala urges the need for efficient and effective implementation strategies, suitable for the socio-economic and cultural specifications of the state. This section proposes some recommendations for the practical implementation of sustainable-affordable housing in Kerala.

Integrated Approach

The evaluation of public housing schemes in Kerala identifies the integration of the four aspects of sustainability as the crucial element for sustainable-affordable housing. The invol vement of all stake holders in the building process including beneficiary households, the local community, non-governmental organisations, and the local government can strengthen the integration of these aspects. Therefore, the overall process requires the support from a strong network of different stakeholders and institutions to achieve its objectives.

Formulation of Support Mechanism

The findings of this research strongly argue in favor of formulating a support mechanism ("Housing Support Organizations" similar to that of People's Housing Process of South Africa) for capacity building and for enabling people to address their own housing needs. Inaccessibility to resources (including land, finance and technology) is one of the main obstacles for the poor households in Kerala in achieving their shelter needs. Hence the enabling strategies should merge with sustainable solutions to overcome this. Support mechanisms in the form of "Housing Support Organisations" can help the households in securing subsidies, obtaining land ownership and accessing technical, financial, logistic and administrative support related to housing activities.

Ensuring the Affordability of Households

Ensuring consistent income by empowerment or facilitating income-generating activities should be considered as the initial step for sustainable-affordable

housing. The principle of micro financing as developed by the Grameen Bank (Bangladesh) is a fruitful solution for achieving economic sustainability in housing.

Ensuring the Technological Sustainability

The present Building Centers or other technology organisations could probably act in a role to ensure the sustainability of the building process. Enabling the households in the building activities, production and supply of building materials, arranging skilled labour, and dissemination of technological innovations should be their prime concern. All beneficiary households should be given a preliminary awareness and basic know-how on the building process. Further, extensive training should be given for interested households on different activities related to the building process such as building material production and other construction activities. These Centers should also be made responsible for popularising and improving the innovative technological alternatives (CEEF technology) according to the requirements of the locality and making it feasible to the public. Locally available waste materials from agricultural and industrial processes, which are less energy intensive and require unskilled labour. Should be identified and promoted. For example, the field burning arrangements developed in this research can be popularised through these organisations by enabling the households in the production process and making them aware on the advantages.

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