TECHNOLOGY OPTIONS IN HOUSING FOR ECONOMICALLY WEAKER SECTIONS IN KERALA

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1. INTRODUCTION

The present study is concerned with technology options for low-budget houses in rural parts of Kerala. House to live in is one of the basic needs of man. Lack of housing facilities and poor quality housing are symbols of poverty and deprivation. The U N declaration of 1987 as the International Year of Shelter for Homeless prompted the governments of most countries to pay attention to the housing problem of the poor. The national and sub-national governments in India also planned and implemented several programmes to help the weak and needy. Though the strategy was to solve the problem by the year 2001, the available statistics indicate that the absolute number of houseless population did not decline substantially[1]. Every two out of five households in India live in extremely poor quality houses. However, the housing situation is not same across the states in the country. Kerala, compared to the rest of the states have achieved tremendous progress in this respect. State intervention in the housing sector, as part of its support and security strategy to help the poor, with several novel programmes and schemes has earned laurels. They are often projected as models to be emulated in the third world countries.

Despite the laurels and euphoria of successful social support and security strategy, problems of a minority, particularly those of who remain outside the mainstream tendencies of development remain unchanged. Huge amounts of money have been spent in the form of grant and subsidy to help the economically weaker section (EWS) to own habitable dwelling. But scientific studies on the suitability and acceptability of public housing schemes clearly indicate that partial financial assistance did not help the target groups to satisfy their housing needs. Unavailability of appropriate building technology, low-cost raw materials and poor beneficiary participation in the building process are reported to be the major constraining factors. It has been pointed out that (a) technology

[1] During the 10-year period from 1991, India's population grew by 21.3 per cent and the increase in houses during the period was 27.7 per cent. In terms of absolute numbers housing units increased from 19.5 crores in 1991 to 24.9 crores in 2001 (Census of India 2001).

is often unavailable (b) even if technology is available, it is neither affordable nor acceptable to the EWS and (c) local building technology institutions are not responsive to the specific needs of the (EWS)[2] In this context, it is imperative to have a clear understanding about the technology suitable to the specificities of Kerala for meaningful public intervention in the housing sector.

What is appropriate technology (AT)? How is appropriateness determined? What are the factors and forces that determine AT? Thinkers and experts concerned with satisfaction of basic human needs have been debating on these questions for the past three decades. Yet no consensus exists about the meaning and determinants of AT. One of the earlier thinkers on the subject Schumacher (1974) characterized AT as simple, small scale, low-cost and non-violent technology. This characterization was emanated from his view that unemployment is the major problem that haunts developing countries and AT serves the twin objectives of creation of employment opportunities and satisfying the basic needs of man. The focus of AT has undergone changes since then.

The inter-relationship between technology and wider socio-political, economic and environmental factors has gained attention during the past two decades. A new sensibility of development has emerged. The concept of sustainable development defined as 'a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and satisfy current human needs and aspirations without jeopardizing the future potential for satisfying these' (WCED 1987), has gained general acceptance. Sustainability has multiple dimensions – social, political, economic and environmental. Social dimension, the sustained satisfaction of human needs and aspiration is the primary concern of AT. Political, economic and environmental dimensions also dominate in the discussions of appropriate technology especially in the Third World context. Schumacher prescribed intermediate and appropriate technology, especially for developing countries. However, the issue of appropriate technology has conflicts at its core, conflicts among the interests of various stakeholders. These conflicts are explicit in the case of AT for

[2] An earlier study undertaken by the author clearly indicates that partial financial assistance in the present form is unsuitable to solve the housing problem of the weak and needy (Gopikuttan 2002).

housing. The purpose of the present exercise is to unravel these conflicts in the context of the housing problem of EWS in Kerala.

1.1. Problem in the Context

Unlike in the rest of the states of India, Kerala has achieved tremendous progress in the area of housing. The Housing Census, 2001 indicates that on the average a house is available for every three persons in Kerala. All individuals have at least one room each. The average growth of houses was 16 per cent as against the population growth of 9 per cent during the decade1991-2001. The annual average housing investment per household in rural Kerala during the five-year period 1993-98 was about Rs. 5500. In 1975-76, it was equivalent to about 10% of the total income of the rural households as against the all India proportion of 2.1%. According to the estimate of the NSSO, rural Kerala accounted for 10.7% of the household construction investment in rural India as a whole. Still the problems of the EWS remain unsolved. Despite the financial support of the government, households at the lowest ladder of socio-economic hierarchy failed to construct durable houses that are appreciating assets. This implicit marginalisation of the rural poor has its roots in the cultural history of Kerala.

The institutions and social customs that guided the traditional caste-based building process resisted the lower castes from constructing durable houses[3]. The caste-based traditional structure continued in existence till about the mid-twentieth century. In the hierarchical structure of the society the socio-economic position and caste of a household was well reflected in the quality and appearance of his house. "The quality and size of the buildings diminish as we go down the caste scale. The *Pulaya's* hut may be taken as the smallest unit of human accommodation" (Census of India, 1891). Houses of the lower castes were built by either self-help or mutual help labour. Skilled labour – artisans and craftsmen – did not have any role in the construction of houses belonging to the lower castes. The upper castes on the other hand constructed durable houses a few of which are marvellous architectural monuments. Services of artisans were employed to construct

[3] "The caste based hierarchical structure of the society had an overwhelming influence on the building process in its various dimensions, such as the type of buildings, composition of materials used in construction, nature of work, and relations among people involved in the building process" (Harilal & Andrews, 2000).

houses according to the rules of *Thachusasthram.* The artisans belonging to a relatively higher caste group had absolutely no role in the construction of houses belonging to the lower castes[4]. However, a host of factors that unleashed the state since the mid-nineteenth century transformed the caste-based building process into a market based modern capitalistic process. The housing boom experienced in the state since the mid-seventies paved the way for intermediation in different layers of modern construction process.

It is during this period that Architects, Engineers and others concerned with the construction of houses to EWS made attempts to propagate alternative building technologies and process. Laurie Baker, a British born architect who settled in Kerala, took the lead in this effort. Based on the principles suggested by Baker, alternative technology (AT) initiatives and institutions like *Nirmithi* and *Costford* came up in the eighties to save the poor from the exploitative tendencies of the intermediaries. The efforts of the AT institutions and agencies in the housing sector have attracted not only national attention, but also received international attention. They are projected as models to be emulated in the Third World countries to solve the housing problem of the poor.

The government also accorded the highest priority to providing housing to economically weaker sections. Several novel housing programmes and schemes focused on the poor have been launched and successfully implemented during this period. About 80% of the housing support provided by the state has gone to EWS. The subsidy provided to EWS houses has increased from Rs. 9000 in 1992 to Rs. 35000 per house in 1998 and again to Rs. 75000 in 2003 for a few specified categories. During the 9th Five-Year Plan period a total amount of about Rs. 1063 crores was mobilized from financial institutions for housing. Local self-government institutions gave financial support to the construction of 2,82,281 houses during 1997-2001. The District Panchayats of Thiruvananthapuram, Kollam and Thrissur formulated a Total Housing Programme with focus on EWS.

Public-supported houses are supposed to make use of locally available materials and cost-effective methods. AT institutions are expected to help construction of houses of

[4] The artisans had an absolute control over the building process. 'The handicraft moorings of production of buildings, the privileges positions of artisans, and such other unique features of the traditional mode of buildings in Kerala, had survived till recently; however in recent decades they have been, and are, fast disappearing. Building activity, type of buildings, materials used for construction, nature of people

EWS households. Despite the euphoria that exists in the public mind about successful AT strategies and initiatives, the housing problem of the poor and the needy remains unsolved. Apart from making small ripples in the thinking and attitudes of a few middle-income households, AT initiatives seem to have failed to evoke significant positive response among the poor. Though acceptable in principle to all sections of the population, building materials and technologies in vogue in the state are beyond the affordability of the EWS. It is in this context that the present study on the state of AT and the attitudes and preferences of the EWS is undertaken.

1.2. Objectives of the study

The main objective of the study is an assessment of the appropriateness of the major alternative building technology initiatives in the state with respect to the various dimensions of sustainability and conflicts that emerge in its prevailing socio-economic, political and environmental context. Following are the major specific objectives of the study:

(1) To document all popular alternative/appropriate building technologies (that are cost-effective, energy efficient and environment friendly) available with leading building technology institutions within and outside India.

(2) To assess the appropriateness of these technologies with respect to socio-economic, cultural conditions of the rural poor and the ecological and environmental specificities of different regions in Kerala.

(3) To understand the perceptions of the EWS (various ethnic, cultural and social groups) about the constraints and limitations in the adoption of appropriate technologies.

1.3. Research design

An understanding of the cost-effective, energy-efficient and environment-friendly building technologies developed within and outside India is necessary to gain conceptual clarity about AT. A discussion of the conflicts and challenges that various institutions and

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involved in the industry, and the relations they enter into while engaging in production, have all undergone drastic changes over the past few decades' (Harilal and Andrews 2000).

individuals face in the propagation of the AT in Kerala is expected to suggest feasible technology options for the poor and the needy in the State.

1.4. Data and method

Data for the study are drawn from both secondary and primary sources. Secondary sources include both published and unpublished materials and information such as government publications, report and other publications of premier building technology institutions as well as unpublished official documents and statistics. Primary data are collected through participatory methods and household surveys.

1.5. Chapter scheme

An overview of the debates on the concept of appropriate technology in general and those in the specific context of house building is discussed in chapter II. Chapter III presents a brief history of appropriate technology initiatives in Kerala. The next chapter is based on primary data drawn from focus group discussions and household surveys about the application of AT in the Total Housing Programme of Kollam District. The major challenges and conflicts that the AT faces in the present-day Kerala context are discussed in chapter IV. The summary of the discussion and the conclusions drawn there from are presented in the final chapter.

CHAPTER II

2. Conceptualisation and an Overview of Appropriate House Building Technologies

Technical change is generally evolutionary and is based on knowledge, experience and skills of both innovators and end-users. 'The generation of new technological knowledge and the introduction of new technologies can be viewed as the cause and the consequence of punctuated economic growth and increasing returns' (Arrow, 2000). A country's technical progress results from a combination of research, invention, development and innovation[5]. Innovation and the resultant technical progress are, therefore not by-products of an autonomous development process; rather, they constitute products of deliberate efforts to change the modes and relations of production. Such changes are often found to be double-edged; a change may often be for the better but improvements are achieved at a cost (Stoneman 1983). Benefits may not reach all. Even positive changes need not necessarily provide satisfaction of the basic human needs of all. Persons concerned with fulfilment of basic human needs have therefore thought of alternative, appropriate technologies.

Following Schumacher in the early 1970s several experts characterized AT as the set of technologies, which make optimum use of abundant factors available to a country (Singer 1977, Robinson 1979, Stewart 1987). They considered factor endowments the most important determinant of a country's AT. The developing countries are characterised by scarcity of capital and abundant labour supply. Hence the technology suggested for the less developed countries was essentially labour intensive in nature.

The primary focus of AT has undergone remarkable changes during the past two decades due to change in 'development thinking'. Three areas of change are of particular note for AT. They are (a) the emphasis on process and dynamics, (b) recognition of the

[5] Research and invention are the activities that create knowledge and development and innovation are the activities that apply new knowledge to production. The spread of new knowledge depends on its rate of adoption and diffusion and this involves the issues of individual motivation, the willingness to assimilate new ideas and to break with custom and tradition (Thirlwall 1999).

need for participation and (c) concern for sustainability. They emphasize that the technologists and their end-users of AT must have certain level of technological capability, knowledge and resources for effective decision-making. Secondly, participation of end users in the implementation of AT is essential. Thirdly the sustainable development goal should not be violated (Andrew Scott, 1996).

The concept of appropriate technology at present has multiple dimensions: social, political, economic and environmental. Social and political dimensions dominate the discussions in less developed countries. Given the focus on the basic human needs, AT is expected to receive recognition only in societies that give priority to the cause of the underprivileged. The critical questions that influence AT initiatives in any country are: Who and for whom are the development goals determined? Who set the priorities? If the decision-makers give priority to demands of the middle and the high-income groups, AT may not get its due recognition. Public policies to promote AT also face several problems mainly due to conflicts with the interests of dominant groups. The gainers from AT are invariably the underprivileged and small local firms; the potential losers are bureaucrats, large-scale manufacturers, large farmers, foreign technology managements and machinery suppliers of advanced countries (Stewart 1987). In most cases the potential losers are powerful enough to thwart independent initiatives in the field of AT.

Most developed countries have almost entirely satisfied the basic minimum needs of most of their population; hence their technology is oriented towards other objectives. In developing countries in which income levels are relatively low and income distribution highly skewed, the upper income groups have privileged access to scarce resources, is that the products in demand will be similar to those produced in developed countries. The upper income groups model their consumption pattern on those of developed countries through the demonstration effect. The low-income groups aspire to emulate the patterns of their next higher income neighbours. Popular technologies to produce those goods and services in great market demand need not then be appropriate to the relative factor endowments of the poor countries.

Reddy (1979) argued that AT institutions in developing countries are modelled on the pattern of their counterparts in developed countries and that a paradigm entirely

different from that applicable to the developed countries is therefore needed for generation of AT in developing countries. The pre-requisites are (a) establishment of a clear-cut mechanism to alter the decision-making process so that the AT institutions respond to basic human needs; (b) identification of personnel involved in the generation of AT capable of absorbing and/or generating new preference guidelines and paradigms essential for the development of AT; and (c) determination among technology institutions and their staff in the developing world not to emulate or model their programmes on the pattern of those of the counterpart institutions in the western world. Emmanuel (1982) took however, a diametrically opposite position. He held the view that a technology appropriate to the underdeveloped countries would be an underdeveloped technology, that is to say, one that freezes and perpetuates underdevelopment.

Technology that ignores the basic premises of (a) satisfaction of basic human needs (b) self-reliance through participation and control of resources and (c) harmony with environment, cannot be considered appropriate. Market forces do not provide incentive for innovative activity to develop appropriate technology. Strong political pressure for public action and public support is necessary to promote AT. Though the decisions regarding the use of AT are taken at the micro level, they are strongly influenced by several external factors. Reddy (1979) convincingly argue that AT consists of three elements – **economic, social and environmental**. The relative importance attached to each element may not be the same across the countries/societies. In fact, what constitutes an AT depends in a complex way on social goals and institutional constraints (Dasgupta 1979).

Economic elements dominate the decision regarding choice of technology in free enterprise economies. 'The role of relative prices and of the institutional context that characterises each economic system also influences the choice of technology' (Antonelli 2003). Technology responds to social wants, which are in turn modified and transformed by technology through a casual chain, or rather casual spiral. The institution(s) responsible for the generation of technology – the educational, scientific and technological institutions - do not necessarily respond to all social wants. There is a process of filtering these wants. It is operated by the decision-makers and is influenced by various forces – political, social and economic. In free-market economies, only wants,

which are backed up by purchasing power, become articulated as demands upon the R & D institutions (Reddy 1979). Generally market prices of resources do not provide incentive for innovative activity to develop AT. Therefore, the role of State and the quality of decision-makers are important in the promotion of AT.

It is essential that an appropriate technology shall be an efficient technology, and at the same time one, which fully reflects the abundance or scarcity of particular resources in the society. For example, in a labour abundant society labour intensive technologies are considered to be the most appropriate. The structural characteristics of economic systems at large and specifically the structure of relative prices, as determined by the endowment of basic inputs and the dynamics of industries and sectors, play a vital role in providing incentive for innovation of appropriate technologies. Similarly, the degree of market economy development at a given period of time, measured in terms of whether or not there exist markets for individual products and markets for the factors of production; how far products are commercialised and standardised; how effectively the rules governing market transactions are set and adhered to, also exert influence on the development of appropriate technologies for the economy[6].

Social and institutional context of a society plays a vital role in the decisions regarding its choice of technology. The decision regarding the choice of materials and technology works within a certain institutional and cultural context that shapes the life-styles of people. Choices are part of a life-style and not merely a technical activity. Life-styles may not be static. Unless the materials and technologies take into account of the dynamics of changing life-styles the end users of technologies may refuse to accept and adapt them. Attitudinal issues are also important in a fast changing world, where societal norms and symbols are continually put in question. Social sustainability of is therefore an important dimension that should be reckoned with.

[6] The gain of an economy from the development of its market economy arise in at least the following three ways: (i) gains from product specialisation and occupational specialisation both of which lead to the increased productivity of the existing factors of production of the economy; (ii) economies in the information costs for market transactions and (iii) gains from an increased willingness to work under pressure of greater market competition (Joan Robinson, 1960; Coase, 1937; Leibenstein, 1966).

It is also important that socially acceptable and economically viable technologies should not violate the principles of sustainability. 'Defining sustainability is not easy. But recent definitions have focused explicitly on three pillars of sustainability: economic, environmental and social……The thinking about social sustainability is not yet advanced as for the other two pillars….One concrete approach to thinking about sustainability and intergenerational well-being is to ensure the flow of consumption does not decline overtime (World Development Report 2003). Environmental sustainability has added significance in the AT of less developed counties (LDCs). For, the LDCs environmental degradation means a direct cut into the livelihood systems on which majority of the population depend (Narayanan, 2003).

The question of appropriateness of AT, therefore consists of three elements – economic, social and environmental. More specifically, factor endowments, factor prices, income distribution, development goals of the country in question, priorities of the decision makers, life-styles, popular paradigms and technical capability of the people, command over the resources and participation of the end users and harmony with the nature and also the long term sustainability are some of the major determinants of appropriate technology. Though the decisions regarding the use of AT is taken at the micro level, they are strongly influenced by the external environment it takes place. Political economy of a country and its public policies can surely influence technology decisions by influencing the external environment. Government policies are therefore critical to the success or failure of AT initiatives. Thus, the AT for housing also should not violate the three basic principles of economic viability, social acceptance and sustainability.

2.1. Appropriate Technology for housing

Right from the dawn of civilisations, houses of the rich and the powerful have remained architectural monuments. Architecture as an art form at present has transgressed geographical boundaries and grown into international architecture[7]. The use

[7] As civilizations flourished different styles of architecture came into being in different parts of the world. They were the monuments of the art and culture in each region. The civilization that flourished in Persia

of steel and concrete has revolutionalised the building construction processes and methods all over the world resulting in a uniformity and precision unknown earlier. Richer sections all over the world construct permanent houses that are not only a store of value but also an appreciating asset. Economically weaker sections use, on the other hand, locally available non-durable materials to construct dwellings that become continuous liabilities for them. Appropriate technology in housing sector is suggested to alter this situation. The UN has taken several initiatives to develop AT (UNIDO 1980). One major step suggested in this direction was to promote national R&D programmes of developing countries.

Important objectives of such R&D programmes are: (a) developing suitable building materials from locally available raw materials; (b) improving the durability of traditional building materials by making suitable modifications in the composition of raw materials or by modifying manufacturing process; (c) evolving new construction technologies; and (d) developing new building technologies to improve the speed and reduce the cost of construction. The concern of AT is to supply materials for the basic structure[8] to build structurally durable and functionally adequate houses at a cost the poor sections will be able to bear (UNIDO 1980).

Poor people in the rural parts of developing countries like India use a wide variety of house construction patterns. But none of these patterns is found to be able to solve the problem of obtaining durability at low cost. For instance, (a) the traditional thatched roof often looks beautiful but it is non-durable. Thatch gives cool interior, but it needs annual replacement. A tile roof is durable but it needs costly timber. Modern ferro-cement shells and other new concrete systems of roofing absorb and retain lot of heat from the sun. Joints also leak from constant expansion; (b) corrugated iron sheets corrode after a few years and transmit the sun's radiation into the house and often make extra expense

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and Mesopotamia produced architectural monuments different from Egyptian architecture. The Greek, Roman and Gothic styles were different. But at present architecture has grown into international architecture.

[8] Building materials can generally be classified into three categories: materials for the basic structure; protective and decorative finishes; and fixtures and fittings. The poor sections spend the entire resources on materials for basic structure that is for the walls and roof. The richer sections on the other hand, spend five times the costs to structure on fixtures and fittings and the associated services (J.P.M. Parry 1980).

necessary for installing ceilings (c). Asbestos-cement-sheet roofing is expensive and a health risk is involved with asbestos dust (Parry 1980).

Brick is the most popular wall material. The semi-mechanised brickworks developed by the Central Building Research Institute (CBRI), Roorkee, India, is popular. Sand-lime bricks, lime-cilica cellular concrete and the like are also extensively used in the Federal Republic of Germany, Poland and Russia. While such bricks may be ideal in many parts of West and South-East Asis, the capital cost of technology is very high.

Bamboo and poor quality wood are extensively used in developing countries for all of the basic components, as well as fittings and fixtures, of dwelling structures constructed by the low-income sections of the population. However, because of their organic origin, bamboo and wood deteriorate quickly, entailing constant repair of dwellings constructed with them. Though there are specialised techniques for improving the durability of bamboo and wood, they are not available to the rural poor at affordable costs.

The primary objective of appropriate building technology is to provide durable houses at minimal affordable costs. The proponents of AT argued that the poorer sections of the community are to be helped to build structurally durable and functionally adequate houses at a cost they will be able to bear. The materials should be such as are available locally and that do not require much specialised skill in their use. The basic purpose of such a strategy is to enable the poor and the needy people to own dwellings that would serve as a store of value and an appreciating asset. That in turn would relieve them from continual maintenance and eventual replacement of their non-durable dwellings. Durable houses become capital assets. AT for the production of durable building materials in the developing countries has thus an important social dimension or redistributive implication[9].

[9] Production of capital and skill light AT building materials are expected to provide employment, income, assets and livelihood security to the participant households. At the same time construction technologies are expected to improve the strength, durability and functional utility of houses at affordable costs.

2.2. Survey of building materials and technology[10]

R & D efforts to innovate alternative materials of roof, walls and binders have been made in the premier building research institutions and laboratories across the world during the past three decades. Besides the research in several countries abroad, a number of R and D institutions in India have also been carrying out research on building materials and techniques. Most important among them are: (a) Central Building Research Institute (CBRI), Roorkee; (b) Structural Engineering Research Centre (SERC), Madras and Roorkee; (c) Cement Research Institute of India, New Delhi, (d) National Environmental Engineering Research Institute, Nagpur; (e) Central Road Research Institute, New Delhi; (f) Regional Laboratory (RRL), Jorhat; (g) Indian Plywood Industries Research Institute, Banglore and (h) Forest Research Institute Dehradun).

In India promotion of the production and application of alternative building and construction materials have been sustained by a national scheme of incentives and government assistance. The government provided systematic extension and technical support to the extensive use of such materials. Several organisations and entrepreneurs were encouraged to take up production of such materials through financial and fiscal incentives. As a result a large number of materials and techniques have been evolved overtime. A brief account of the cost-effective and environment friendly building materials developed in the premier building technology institutions in India and abroad are summarised in the Tables 2:1, 2:2, and 2:3.

[10] This section is based on the work done by Smt. Renu Dineshnath who originally began the research on Technology options in rural housing. She left the project unfinished after collecting information on alternative building materials and their production procedure. Tables 2.1, 2.2 and 2.3 are extracted from a partial draft report she submitted to the KRPLLD, CDS, Thiruvananthapuram in November 2001.

Table 2.1

Roofing Alternatives developed in Premier R & D institutions

Sl No	Material	Inputs
1	Composite T-beam Roof	Pre-cast tile panels, pre-cast concrete or ferro-cement or cuddapah slabs
2	Ribbed Slab	Pre-cast tile panels, pre-cast concrete or ferro-cement or cuddapah slabs
3	Modified Filler Slab Roof	Mangalore tiles, reinforced concrete
4	Hourdi Tile Roof	Similar to filler slab roof. The filler material here is hourdi or baliyapatanam tile
5	Micro Concrete Roofing (MCR) tiles	MCR is a sloping roof tile made up on cement fine aggregate and colouring pigments mixed in water
6	Un-Reinforced Pyramidal Roof	Bricks, cement, sand, stone aggregate and reinforcing steel
7	Coconut Shell Panel System	Coconut shells, cement, sand, stone, mild steel bars
8	Brick Funicular Shells	Bricks, cement mortar
9	Precast RC Filler Slab	Mixer, moulds for blocks and shuttering and vibrator for slabs; fly ash, cement, lime, steel and aggregates
10	Precast Thin Ribbed Slab	Moulds, shuttering panels, mixers, vibrators, cement and aggregates
11	Precast Concrete Panel System	Moulds, vibrators, cement, sand, stone, aggregate and reinforcing steel
12	Precast RC Plank and Joist	Moulds, light hoisting equipment, cement, aggregate and steel reinforcement
13	Prefab Brick Panel System	Burnt clay bricks, cement, sand, coarse aggregate and reinforcing steel
14	Fire Retardant for Thatch Roofing	Bamboo, non-erodable mud plaster (bitumen + kerosent + mud) and thatch material
15	Madras Terrace Roofing	Burnt bricks, lime mortar, concrete and madras tiles
16	Jack Arch Roofing	Bricks, cement concrete and steel

Table. 2.2

Alternative Wall Materials

Sl. No	Materials	Inputs
1	Stabilised Mud Blocks	Clay, sand and any stabilising agent (cement mortar, lime mortar, soil-cement mortar, lime-pozzolana mortar or mud mortar)
2	Building Blocks from Laterite soils (Latoblocks)	Laterite soil is mixed with a binder and moulded into blocks in a press
3	Clay-Fly Ash Bricks	Clay and fly ash are mixed and bricks are moulded and fired in the usual way
4	Sand –Lime Bricks	Siliceous sand and hydrated lime are mixed and moulded under pressure

Table. 2.3

Alternative materials for Mortars and Plasters

Sl No	Material	Inputs
1	Stabilised mud mortars and soil-based plasters	Cementations binder could be made up of mud, lime, cement or combinations of them. Lime pozzolana cements could also be used.
2	Rice Husk Hydraulic Pozzolana	Rice husk, clay and lime
3	Non-erodable mud plaster	Sand-base mud and ordinary soil, wheat or paddy straw
4	Multi-Blend Cement	Cement clinker, flyash, blast furnace slag and low grade gypsum

Alternatives for doors and windows and finish

- Ferro cement products
- Coir – cement board
- Fibrous Gypsum plaster board
- Coir – cashew nut shell liquid board
- Coconut husk particle board
- Glass reinforced gypsum composite
- Polycoir

House building boom in Kerala since the mid-seventies in the past century provided ample opportunities to experiment with alternative building materials and methods. Let us now turn to the history of AT initiatives in Kerala.

CHAPTER III

3. Appropriate Technology Initiatives in Kerala

The focus of appropriate building technology in Kerala was on the use of energy efficient local materials with labour intensive methods to achieve the twin objectives of employment generation and asset creation. That in turn was expected to provide livelihood security to the end users. Laurie Baker made pioneering efforts in the field of AT in housing. He produced innumerable designs each of which has a unique identity. Baker designed and constructed a vide variety of buildings ranging from two-room small residential houses to marvellous architectural monuments like Centre for Development Studies buildings at Thiruvanthapuram. His philosophy is that 'the so-called modern house is often merely fashionable but foolish, simply because it is expensive and does not take into account the locally available inexpensive materials or the local climatic conditions or the actual needs of the occupants' (Baker, 1993a; 1993b; 1993c; 1999). Economy in space utilisation, consideration to the functional utility of the dweller, natural and serene appearance, use of local resources and cost efficiency of 'Baker model' houses attracted the attention of several young engineers and architects. Later they became disciples of Baker and unleashed a wave of new AT initiatives in the state of Kerala during the period since early eighties.

A large number of institutions and individuals imbibed the spirit and deeds of Baker and worked to propagate AT in housing. Nirmithi Kendra and Centre of Science and Technology (COSTFORD) are the two premier institutions that came up in the mid 1980s primarily to propagate alternative an appropriate building technologies. The main objective of these institutions or movements was to minimize the use of costly materials such as cement and steel and to promote the use of cost effective, local and environment friendly materials. Choice of building materials and technology were guided by the twin objectives of employment generation and asset creation that ensure livelihood security to the poor and needy. The basic presumption at the beginning was that capital is scarce and

labour is abundant and hence labour is relatively cheap. It was also assumed that indigenous materials are available at relatively low prices, if not free.

In this chapter we attempt to explore the extent to which the AT institutions succeeded in achieving the stated objectives. The basic purpose is not to evaluate the performance of the two AT majors in detail, but to understand the processes and methods they employed for propagating AT in the housing sector; the challenges and conflicts that they faced in the process; whether they succeeded in helping the poor to construct structurally durable and functionally adequate houses without sacrificing the basic criteria of economic viability, social acceptability and sustainability; what are the perceptions of various stakeholders including practitioners and end users; and also to understand the present plight of AT initiatives. Since these institutions have been working in a dynamic economic, socio-cultural and political context which altered the life-styles, attitudes and preferences of the people, my remarks and observations about the success or failure of the AT initiatives should not be construed as remarks on the performance of the institutions.

The people of Kerala viewed emergence and growth of the AT majors (Nirmithi Kendra and COSTFORD) in the mid-eighties of the past century with high expectations. At one stage they have grown far beyond the narrow confines of small 'organisations' and became mass movements with popular participation. But the euphoria did not last long. The mainstream tendencies of housing development did not like the interventions of the AT institutions. High degree of market penetration in all walks of life, changed life styles and attitudinal shifts altered the preference pattern of the people to whom AT was proposed. When a host of factors – economic, cultural and political – acted against the declared objectives of AT institutions, they were forced to concede the evil designs modern tendencies of building construction for their existence. The cases of Nirmithi Kendra and COSTFORD are taken up separately in this chapter.

3.1. Nirmithi Kendra

Nirmithi Kendra (Building Centre) (NK) was started in Kollam town in 1986 at the initiative of Shri C.V Ananda Bose, then Collector of Kollam District. It was started as an organisation to bring the fruits of research from lab to land by exposing the local builders – the masons and carpenters at the village level – to the innovations in housing techniques. Rural masons and carpenters, school dropouts, unemployed matriculates and a cross section of rural youth were trained in low-cost housing techniques. Campaign through publicity and training were the means employed for the propagation of alternative technologies. Low cost houses built with alternative materials and methods with the supervision of experts from NBO, SERC, CBRI, HUDCO and other research institutions attracted the attention of policy makers of the State and Central governments. The central government launched a major national network of building centres on the lines of Nirmithi[11] in 1988. Soon afterwards NKs were established in all the fourteen districts of the state and Kerala State Nirmithi Kendra (KESNIK) the apex institution was entrusted with the task of coordinating the activities of the NKs.

The organisational structure of the NK was in the form of a charitable society. Registered under the Charitable Societies Act, NK met their financial needs by tying up various training, employment generation and rural development schemes with programmes for production of building materials and construction of low-cost houses. Agencies and institutions like HUDCO and CAPART provided liberal financial support. NKs organised training programmes for various actors involved in housing, provided consultancy and guidance for the use of cost efficient and environment friendly (CEEF) technology and materials and promoted research in the area of low cost building materials and appropriate technology.

[11] The ministry of urban development stated, "The extension of relevant low-cost building technologies to the grass roots level is a new and difficult area. The Nirmithi Kendra at Quilon in Kerala State has demonstrated that one of the effective methods is of training local artisans in handling these technologies. Spurred by the success of the Quilon experiment, the Government of India has decided to launch a national programme of setting up of a network of building centers in all the districts of the country". Letter No.

Training programmes of the NKs were very effective. Large number of youngsters – both men and women were given training for building material production and building construction. Masons and carpenters working with conventional materials and methods were also given training in new methods of building construction. The trained youths were encouraged to form themselves into the Nirmithi Rural Housing Corps or *Nirmithi Upakendras* to undertake building construction using low cost materials and techniques. NKs provided technical and managerial assistance to the *Upakendras.*

NKs produced standardised building materials like soil-stabilised pressed blocks, funicular shells, L–panels or Ascu treated timber and other new and innovative materials on a mass scale and sold them at fair price to house builders. Standard size country burnt bricks were manufactured in the Kendras and made available to prospective builders at reasonable price. Hollow bricks produced in the Kendras got wide acceptance, especially by the middle and higher income groups. Through up-gradation of local skills and new techniques, cutting of laterite stone in several parts of Kerala was made easy. NKs popularised the use of funicular shells for roof and substitutes for timber like ferro-cement rafters, ridges, joists, ferro-cement doors and window frames were manufactured and sold at fair prices.

Public buildings constructed by the NKs helped to remove the general misconception that low-cost buildings are meant only for the poor. Nirmithi Kendra has constructed several prestigious buildings like office building for Cochin University, hospitals, school buildings, T.V relay stations, village offices, hostels etc throughout Kerala. Several private buildings, both residential and non-residential buildings were constructed at less than the prevailing market rates.

Construction of houses for economically weaker sections was one of the priority areas of NKs. Besides the use of low-cost materials and alternative technologies, active participation and involvement of prospective owners was sought in the construction of

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16012/7/87-H dated 12-8-1988 of the Secretary to Govt of India, Ministsry of Urban Development addressed to the Government of Kerala.

EWS houses. The NKs enjoyed enormous public support. Since the national network of Nirmithi Kendra started functioning, each Kendra got an initial grant of Rs. 2 lakh from Central government through HUDCO in 1988 and state government allotted grant and free land not less than 1.5 acres. Another assistance the Kendras got was through the priority for housing and allied activities using alternative techniques and materials by departments implementing self-employment programmes. State Government, local self-governments -Corporation, Municipalities and Panchayats, and development authorities entrusted construction works to NKs.

It is claimed that Nirmithi construction style is an amalgamation of traditional architecture with the necessary frills of 20th century living. Nirmithi claims that CEEF technology yields an average of 30 % reduction in construction cost for all types of buildings. KESNIK was the pioneer and trendsetter in the field of house building with savings in cost. Cost Effective Environment Friendly (CEEF) technology of the Nirmithi was adjudged as the Global Best Practice in that genre by the United Nations Centre for Human Settlement (UNCHS) at the Habitat II conference at Istanbul, Turkey in June 1996.

Nirmithi as an institution in the field of appropriate building technology claims to have imparted the major functions like: (a) generation and propagation of innovative ideas in housing; (b) clearing house of information and data bank on housing which would bring the fruits of research from lab to land; (c) production centre to prefabricate standardised housing materials; (d) training house to impart skills to local workmen in innovative housing techniques and create a cadre of trained workers in all the blocks in the district; (e) nodal agency to serve as a catalyst in the field of housing ensuring horizontal co-ordination in implementation of housing programmes; (f) chain of retail outlets for low cost housing materials and (g) R & D extension institution and consultant in the field of housing.

With a view to understand the present functions and performance of KESNIK, regional, rural and sub-centres and also District Nirmithi Kendras (DNKs), we visited selected offices in April/May 2002 and conduced focus group discussions and semi-

structured interviews with various stakeholders. KESNIK has 10 regional centres and four panchayat centres. There are DNKs in all the fourteen districts. Building materials are being produced in 8 out of the 10 KESNIK centres[12] but none of them now undertakes the construction of EWS houses. They undertake contract work of government buildings and provide consultancy services to private buildings at a fee[13]. Their main role has now been shifted from that of champions of appropriate technology for the benefit of the poor to that of contractors and intermediation agencies to the middle and high-income groups.

KESNIK at present do not have any direct link with other R&D institutions. It is reported that R&D institutions are not willing to share their innovative products, methods and technology free of cost. However a few training programmes on Masonary, Carpentry (training to use machines or mechanised production), Horticulture (landscaping), Terracotta (pottery for decorative purposes and other clay products), and Bamboo crafts (shades, flower vessels, light shades etc.) were conducted in the recent years. Nirmithi stopped the practice of periodic training of its staff mainly due to the paucity of funds from government and public agencies. KESNIK now conducts courses

[12] Building materials like hollow bricks, door and window frames, ferro-cement water tanks and cement jallies are being produced in 8 centres (TVM (2), ADUR, Chetikulangara, Palghat, Muttom, Kottayam, and EKM). CBRI technology is being used for the production of hollow bricks. There are four wood processing units – TVM (2) (Vatiyoorkavu and Barten Hill), Palghat and Kottayam. Terracotta as floor material is produced in only one centre that is vattiyoorkavu in TVM. These materials are produced as per ISI standards and hence the average selling price (except for door and window frames) is relatively higher. Since there is no demand for mud products KESNIK is not producing any products based on mud and mud technology. Officials at the state office said that they experience great difficulty in getting trained workers both for on-the-site construction and also for the production of building materials. Moreover KESNIK at present do not have enough funds to train new workers. Financial achievement of KESNIK and its sub-centres for the past three years is given below.

Table: Financial Achievement of KESNIK during 1998-2001

Year	Financial achievement (in Rs. lakh)
1998-1999	66.97
1999-2000	49.67
2000-2001	40.99

Source: Office records of KESNIK

[13] KESNIK follows a differential fee structure. Fifteen percent of the estimated cost is charged as fees for buildings the full responsibility of the project from paper work to the finish is undertaken by the Kendra. For consultancy and occasional guidance a differential rate ranging from 2.5 to 4.0 per cent of the estimated cost is charged depending upon the size of the building measured in terms of plinth area.

on interior decoration (six months programme) and Diploma in Habitat Technology (one year course for diploma holders) for which there is market demand for its own survival.

3.2. District Nirmithi Kendras (DNKs)

DNKs at Thrissur, Kannore and Thiruvananthapuram are rated as the best among the district Kendra's in the state. Among them the **Thrissur Kendra** was adjudged the best building centre in India more than once. The Kendra was started with four basic objectives; (a) construction of building using cost effective technology, (b) guidance to cost-effective building construction, (c) training on various aspects of low-cost building inputs and construction techniques and (d) production and sales of alternative building inputs. The Kendra registered under charitable societies act has 13 members on its governing body. Collector of Thrissur District is its chairman and Revenue Divisional Officer its member secretary. Besides the Project Manager[14] there are 11 regular staff at the centre. There are three production centres under the Kendra. Major products are hollow bricks, concrete door and window frames, pre-cast thin lintels, Ferro-cement slabs etc. These products are sold at fair prices to the public. The Kendra trained several engineers and workers in the use of cost effective technology.

The Project Manager claimed that the Kendra has succeeded in developing a new building philosophy and popularised alternative building inputs and technologies among all socio-economic class of people in the district. The approach was to combine traditional architectural style, eco-friendliness, energy conservation and design parameters without compromising on pleasing aesthetic appearance. General technology adopted are; (a) R. R Masonry in mud mortar, (b) Brick masonry in rat trap bond, Flemish bond, hollow concrete block masonry and brick masonry using stabilised mud blocks, (c) cost effective concrete doors and window frames, PVC doors and windows, (f) roofing with filler slabs, funicular shells and (g) flooring with brick bats. The alternative materials and technology reported to have achieved a cost reduction up to 30 percent compared to conventional construction.

[14] Project Manager Mr. Surendran is a young and dynamic engineering graduate. He is really committed in the cause of cost effective building inputs and technology. He is a resource person with several prestigious technology and architecture institutions in the country.

Since its inception the Thrissur DNK constructed more than 300 low-cost houses for EWS households in different parts of the district. It has given technical guidance to 35 MIG and high income group houses. Service charge at the rate of 5 per cent of the total estimated cost of construction was charged from the house owners for the preparation of plan and estimate and periodic consultation. The project manager reported that they abandoned the construction of low-cost small houses for low-income households because of several social and economic reasons, which we will take up in the next chapter. Since the launching of the ninth five-year plan the business turnover of the DNK has increased several folds mainly due to the works entrusted by the local self-governments (see Table 3.1). They also got the contract of several major works allotted under the MLA's and MP's Local Area Development funds. At present the Kendra has total assets worth Rs. 63.00 lakhs (and liabilities worth Rs. 20.18 lakhs). Major source of income is the margin from public works.

Table. 3.1 Business Turnover of Thrissur DNK since 1992-93

Year	Turnover (in Rs. Lakhs)
1992-93	9.35
1993-94	51.22
1994-95	51.88
1995-96	52.40
1996-97	151.76
1997-98	271.06
1998-99	377.64
1999-2000	342.41
2000-2001	276.46
2001-2002	288.16

(Source: Office records of Thrissur DNK)

DNK project Manager said that their freedom to use appropriate technology and cost effective materials are limited by the bureaucratic controls, which insists on PWD norms, schedules and rates. He also said that the options of the DNK are limited because of the fact that its very survival depends on public works. Moreover, since there is no provision for periodic maintenance and repair of office and school buildings constructed by the NKs, the likelihood of raising doubts about the quality of the work is relatively

high compared to the conventional PWD constructions[15]. The government and the line departments consider DNK only as a contractor or agency for intermediation under its control. In this context the project manager raised apprehensions about the long-term sustainability of DNKs as alternative technology institutions. However, he is optimistic about the future of CEEF technology and he believes that it will get acceptance in the future, if not at present.

Kannur DNK is also one of the best Kendras in the state. The structure and organisation of the centre is not different from that of Thrissur DNK. Initially the government of Kerala provided Rs. 25,000 for infrastructure development and HUDCO sanctioned Rs. 2 lakhs for various training programmes. In 1998 DNK Kannur received a government grant of Rs. 8.5 lakhs through HUDCO for specific training programmes. Office of the Kendra is situated in Tellecherry town. The Kendra has a three-acre plot and buildings at Pattuvam in Thaliparamba Taluk, about 30 kms from the main office at Tellecherry, which is used as a training centre for stakeholders and production centre of building materials. Since its inception in 1988, the DNK undertook the construction of 259 buildings including 66 private and 42 EWS houses.

Like the Thrissur DNK the Kannur DNK also have abandoned the construction of small low-cost houses. Earlier the Kendra had constructed 10 small low-cost houses under an EWS housing scheme in Chellora panchayat and another 32 low-cost houses in Chathiroor mala in Ayyankunnu panchayat (near Irutty) in 1991 and 1992. A housing guidance centre was started in 1992 as a separate wing of the Kendra to provide consultancy services to prospective owner builders. Private construction was completely stopped after the initial five years[16]. The very survival of the Kendra at present depends on the profit margins from contract work (public works). These works are executed at less than 10 per cent of PWD rates (exclusive of contractor's profit).

[15] State's PWD has provision for periodic repair and maintenance of its buildings, but that is not provided for buildings constructed by the AT institutions.

[16] The governing body of the Kendra resolved not to take up private construction because of several complaints about delay in execution of work and litigation in various consumer forums.

The Kannur Kendra stopped production of all building materials since 2001 mainly due to economic reasons. Paucity of funds forced the centre to stop its training programmes also. The project manager said that the Kendra do not have sufficient works to provide full time employment to all skilled workers trained under various schemes. However, the annual turnover of the Kendra has increased several folds since 1997-98 primarily due to contract works under the decentralised plan of the local self-governments and MLA and MP local development programmes (see Table. 3.2). Now the centre has capital assets worth Rs. 68 lakhs[17], which includes cash deposit of Rs. 8.5 lakhs, a lorry, two cars and equipments for production of building materials. It is alleged that the district authorities are treating the DNK as a low-profile contractor to undertake public construction. Bureaucracy does not permit to experiment with the use of alternative technologies and methods. The DNK is forced to abide by the rules and norms laid down by the PWD, which is guided by the 'conventional modern' materials and methods.

Table 3.2: Annual Turnover of Kannur DNK since 1988

Year	Turnover (Rs in lakhs)
1988-89	2.03
1989-90	11.73
1992-93	5.7
1993-94	32.12
1994-95	35.05
1995-96	44.6
1996-97	66.29
1997-98	29.32
1998-99	179.01
1999-2000	171.74
2000-2001	106.85

Source: Office records

Semi-structured interview with the project manager of the DNK revealed that construction of scattered small 'garden-houses' using CEEF technology has turned out to be economically unviable for several reasons like high transportation costs of materials for houses in difficult terrains. The costs involved in regular supervision and monitoring, which is indispensable to ensure efficiency and quality standards, are also high. He

[17] Official cars that the District Collector and Sub-Collector are using at present are properties of DNK. Expenditure for the periodic maintenance and repair of the vehicles are met from the income of the Kendra.

opined that cost saving methods and CEEF technology yields the desired results only from standardised mass housing programmes or cluster housing programmes.

To understand how well the DNK is functioning in the southern part of the state we visited the Thiruvananthapuram and conducted focus group discussions and semi-structured interviews with various stakeholders. The **Thiruvananthapuram DNK** had staff strength of 14 and it undertook construction of more than 400 government buildings, schools, hospitals wards, and revenue/village offices. Consultancy services were provided to about 40 MIG houses. Several EWS houses were constructed on a turnkey basis[18]. Since its inception in 1988 the Thiruvananthapuram DNK trained 12 batches of masons and constructed a building at Aakkulam as a part of the training programme. But at present the training programme has been discontinued due to non-availability of grant from government. Like other DNKs the Thiruvananthapuram Kendra also survive with own funds generated from fees and margins obtained from contract construction works, both government and private. The NK staffs, since they are underpaid, are a dissatisfied lot. They are waiting for nearest opportunity to leave the organisation.

We could not find any substantial differences in the performance of DNKs located in different geographical regions. They are working under similar conditions and are facing problems that are common to all. Majority of engineers, architects and other staff members working with Nirmithi are not satisfied with the present working environment. They are not getting the desired public support. In fact most of them are looking for opportunities to leave the institution at the earliest. Focus group discussion with end users also revealed that they are not satisfied with the quality and functional utility of CEEF technology houses[19].

All the policy decisions are taken by the governing body, which consists mainly government officials.

[18]Under the *Thanal* scheme of the Thiruvananthapuram District Panchayats, local self-governments, SC/ST department and Tribal department entrusted the construction responsibility of a few houses to the DNK Thiruvananthapuram. It constructed 30 houses for beneficiaries selected by the agencies and institutions like panchayats. The construction of a few others could not be completed in time for reasons beyond the control of DNK. But the failure of the *Thanal* scheme affected the public image of the DNK.

[19] We visited a few colonies and individual houses, which *Nirmithi* constructed in Kannur and Trichur districts to understand the views and perceptions of the resident households. All the residents complained about the leaking roof, low height, poor quality doors and window openings, small size of the

3.3. COSTFORD

Centre of Science and Technology for Rural Development (COSTFORD) is a non-governmental organization committed to propagate Laurie Baker's building technology. It was started in 1985 under the chairmanship of C. Achuta Menon, then chief minister of Kerala. Scientists, technologists, educationalists, professionals and social workers are its members. COSTFORD helped people, especially the rural poor to solve their felt needs by 'do-it-yourself' approach. Even though the NGO focussed on rural sanitation, renewable sources of energy, water management at the micro level and local level development in the first few years of its existence, its main activity has been rural and urban housing using cost effective techniques.

House to live in or shelter according to COSTFORD is a fundamental right. Provision for affordable shelter to the poor and weaker sections is indispensable to improve their living conditions. The NGO believes that 'application of appropriate and people friendly technologies adopting participatory, democratic, transparent and gender sensitive process' is imperative for achieving the goal of 'liveable and lovable houses to all'. Major research and development proposed for the purpose are: Identification and documentation of location specific vernacular architecture and building materials; innovations and improvements in traditional systems and materials for building construction; and development of cost and energy efficient techniques and materials for building construction. **Laurie Baker** is the guide and philosopher of COSTFORD.

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rooms, poor air circulation and too much heat during summer. A few of them renovated and extended their house when their income improved. For example, Raghavan (40) and his family of 5 is a resident of one of the Nirmithi houses Chellora colony in Kannur. He is a small-scale contractor. When his income position improved he purchased 10.5 cents of land and invested more than Rs. 25,000 to improve his house. In fact he made improvements twice since he occupied the house in 1990. Still he is not satisfied mainly because the small size of rooms and low height of the roof of the original house.

Opinion of Sukumaran (47), occupant of another house in the Nirmithi Colony is also not different – too small rooms, leaking roof, poor air circulation, low height etc. His family consists of wife and three grown up children. He is also planning to renovate/improve the house with financial support from panchayat. None of the households we visited expressed satisfaction about CEEF technology houses.

Baker believes that in India there is no such thing as traditional Indian architecture. Every district has its own traditions and by trial and error, over thousands of years, people have learned how to use and to cope with, all the many factors which are involved in Architecture – the site, the topography and geology, the climate and vegetation, the available local materials – the religious and cultural patterns of living and the main local occupations. Unsatisfactory items have long since been discarded and alternatives have been tried until a satisfactory solution has been found. It seems foolish, therefore to abandon the tested findings of centuries of 'science and technology'. Given the resource constraints and the dynamic nature of the society, what Baker suggests for the poor in Kerala is 'a core house designed both in plan and sections so that as and when extensions are to be added, roofs, doors, windows etc are in the right places. The original unit must also be carefully placed on the plot so that there is space for extension on all sides and byelaws, that is, distance form boundaries, are not broken' (Baker 1993, 1999).

At present COSTFORD is a big organisation with its main office at Thrissur and several sub-centres in different parts of Kerala and one in Haryana. More than 240 full time activists, 360 part-time science and technology personnel and 20 consultants in various fields of specialisation are working with the NGO. The main centre at Thrissur did tremendous works especially in the field of EWS houses since its inception in 1985. On an experimental basis 48 mud houses in Malakkapara, a Tribal area in south-eastern part of Thrissur District bordering Idukki district and Tamil Nadu Sate, were constructed for Tribals in 1988-89. During that period another 105 houses were constructed for Tribals in Attappady area. Besides thousands of government and CAPART sponsored EWS houses, several non-residential houses were also constructed by the NGO throughout the length and breadth of Kerala and also in other states in India. Non-residential buildings includes construction for several prestigious institutions like head office building of *Lalitha Kala* Academy at Thrissur, SACON office building at Coimbatore, and several District panchayat and Block panchayat offices.

Discussions with architects and engineers revealed that major proportion of the low-cost small houses were constructed for EWS households selected by the providers

(sponsor institutions and agencies). Participation of beneficiaries were not expected either in the planning or execution stage. The programme managers now admit that government scheme houses without the participation of beneficiaries was a total failure. The recent *Thanal* scheme[20] implemented by the Thiruvananthapuram district panchayat is a typical case in point. Since its inception the Thiruvananthapuram centre constructed more than 150 government buildings, 50 high-income, 400 middle-income and 750 low-income group and EWS residential houses. All the LIG and EWS houses were sponsored by the State. Though the houses are structurally strong, cost effective and aesthetically appealing the low-income households are sceptical about the strength and quality of the houses. They raise complaints about space, facilities and conveniences within the house. We could not find any difference in the perceptions of the poor across the south, middle and northern parts of the state[21].

The Kannur centre since its inception constructed 114 private MIG and LIG houses, 18 non-residential buildings and 18 government sponsored EWS houses[22]. Project Engineer, who co-ordinates the activities of the centre said that poor people, especially EWS, do not like technologies using filler slab roof. MIG households also demand modern houses with cost effectiveness appearance. They spend more money for fittings, fixtures and finishes. Therefore, they try to avoid COSTFORD after the

[20] *Thana*l was an ambitious scheme implemented by the Thiruvananthapuram District Panchayat to solve the housing problem within a stipulated time-frame. A massive programme combining public housing schemes of the line departments, financial institutions and appropriate technology institutions like Nirmithi and Costford was planned. But the programme failed to yield the desired results.

[21] Remani Vadasseri and her family with three members are residing in a 'colony house' near Thrisoor town constructed by COSTFORD more than fifteen years back. Finding that the house is too small to accommodate the family members, she extended the house with a small loan sanctioned for housing improvement and also with financial support of relatives. Now the walls are plastered and painted, fixed windows instead of Jallies and doors with wooden frames and glass and wooden shutters. The house at present is more than double the size of what it was fifteen years back. But still Remani, the head of the household complained about roof leak, inadequate space, and poor light and air circulation. Despite her poor means, she nourishes the hope for constructing a modern RCC house with all facilities.

Focus group discussion with the colony residents revealed that five out of twenty households sold their COSTFORD houses and moved to independent garden houses. It is also understood that a few other households are also waiting for pattayams from the government to sell and move to better houses in other locations. Those who have purchased the houses made several improvements and modifications so that the very appearance of the houses has changed. It indicates that the houses have become capital assets with appreciating value.

completion of structure. Those EWS households who got financial assistance through local bodies under the decentralised planning[23] programme also did not like to use the CEEF technologies proposed by the centre. Because of these and other factors the COSTFORD stopped the construction of low-cost small houses especially for with its own initiative.

Programmes that COSTFORD initiated with the support of local bodies and agencies like HUDCO also failed to yield the desired results. The Thrisoor District Panchayat formulated an ambitious plan to solve housing problem of the poor. COSTFORD took the lead with its technical and organisational support and HUDCO provided the necessary financial support in terms of loans. Though the project was planned and implemented with massive public and institutional support, very few houses could be constructed even after three years of its launching in 1999. (A brief account of the Total Housing Scheme is given in the appendix to this chapter). In fact the Total Housing Project has created several problems to the COSTFORD. That has affected positive image and good will of the organisation among the rural poor.

Hundreds of office buildings, schools, college and university buildings and thousands of residential buildings throughout the length and breadth of Kerala is a testimony of the successful intervention strategies of scores of organizations like Nirmithi, COSTFORD, Habitat and initiatives of concerned engineers and architects. The case of Nirmithi and COSTFORD taken up for detailed scrutiny for the reason that they were the pioneers, trend setters and mass movements of national and international repute in the area of appropriate building technologies. The present plight of other initiatives is not different from those of the pioneers. The entire alternative movements started with construction of low-budget houses for the rural and urban poor. And now, after

[22] Though the centre does not have regular workers, on-the-site training was given to the participating workers.

[23] The project coordinator of the Kannore center said that under the decentralised planning programme the beneficiaries have the freedom to plan and execute the work. So several beneficiaries planed for big and expensive houses and left the house unfinished after availing of one or two instalments from the concerned agencies. Left to them, the poor households do not like CEEF technology. They prefer conventional materials and modern technology.

successful intervention in about two decades all the agencies and individuals stopped construction of low-budget small houses using CEEF technology. Why did it happen in a state where the public sector gives top most priority to EWS houses? What are the challenges and conflicts that AT initiatives faces? Before taking up these and other related questions let us now examine a recent experiment in Kollam district.

Appendix – I

Total Housing Scheme - Thrisoor District (Swabhiman Parpida Samithi)

Thrisoor District Panchayat formulated a project under the peoples campaign for the 9th plan to provide financial and technical support to solve the housing problem of all within a stipulated time frame. The programme was to enable all families below poverty line in the district to have affordable shelters within the next five years. It formulated as a joint collaborative venture of District Panchayat, Block Panchayat and Grama Panchayats and envisaged an innovative credit mechanism by forming self-help groups of beneficiaries and establishing thrift and savings. The project was financed by HUDCO. COSTFORD provided technical consultancy for the construction of houses and facilitated for the formation of self-help groups. A society namely Thrissur Swabhiman Parpida Samithi has been registered for the implementation of the project with District Panchayat President as the Chairman and COSTFORD director as the Chief Executive. Major purpose was to facilitate all houseless families below poverty line to own liveable, lovable and affordable houses within a span of three years starting from 1999-2000.

As a first step 60000 deserving beneficiary households were identified through a comprehensive survey 60000 beneficiaries were identified. They were grouped into three categories (i) those with at least two cents of land and no house; (ii) those with no land and houses and (iii) those with houses that can be made liveable after some repair and renovation. Then, on the basis of their economic condition the beneficiaries were grouped into (a) very poor (with family income below Rs.12000) and (b) poor (with annual family income between Rs.12001 and Rs.24000). Houses for the first category were provided with full subsidy under various schemes like Indira Awas Yojna, Scheduled Caste housing under SCA to SCP, Scheduled Tribe housing under TSP, Fishermen housing scheme and Mythry housing schemes of the Kerala State Housing Board. The second category was assistance under loan-linked schemes. The local self-governments agreed to bear the cost of partial financial subsidy. HUDCO has agreed to provide loan for 50000 families. In the first year 22000 families were selected for assistance (very poor 7000 and poor 15000). However, actual assistance was given to less than 13000 households. The programme was

launched in the scheduled time, ie, in the year 1999. Even after completion of three years in 2002, full payment (third instalment) was given to 2059 families only.

Appendix Table 1: Beneficiary households by instalments given up to 31st December 2002

Item	Number of houses
Total number of houses taken up in the first phase	12605
First instalment given	9690
Second instalment given	5758
Third instalment given	2059

Source: Office Records of COSTFORD, Thrissur

Appendix Table 2: Financial details of the scheme

Sl. No.	Item	Amount (Rs)
1	Loan amount received from HUDCO	10,75,00,000
2	Deposits received from local self-governments	12,57,40,751
	Total receipts	23,32,40,751
3	Deposit in HUDCO	2,74,78,000
4	Amount paid to the local self-governments	20,50,72,600
5	Interest payments to HUDCO	29,78,940
	Total payments	23,55,29,540

Source: Office Records of COSTFORD, Thrissur

With a view to ensure optimum utilisation of the funds, financial assistance was given in the name of women member of the family and participation of women was ensured in all stages of work. COSTFORD took the lead in organising self-help groups and promoted thrift and savings through these groups. Information, education and communication campaign was conducted through out the district. Multi technician groups under the leadership of COSTFORD imparted training and the trained persons were employed in the construction sites. Organising committees and monitoring committees at various levels effectively monitored the programme. In addition to the construction responsibilities 21 micro-enterprises were sanctioned in the first year for the production of building materials.

Despite several achievements, the programme failed to yield the desired results. Organisers of the programme claimed that the project made the following achievements: (a) It is proved hat poor is 'bankable'; (b) If a favourable environment is created the rural and urban poor will come forward to construct houses; (c) It has become a people's programme with government support; (d) Strategic alliance could be fostered with all stakeholders; (e) Financial institutions were also involved in the effort; (f) Cost effective methods of construction has received wider acceptance; and (g) It has provided employment opportunities and empowered women. But the challenges that the programme faced belittled the achievements. Major challenges that the organisers had to face were the 'provider' thinking among the people's representatives, the delay in getting loan amount and the resistance to change. Changed life-styles, attitudes and preferences of people have created problems. Despite the several achievements, the organisers at present have lost their confidence and are not sure that they can complete the project in the near future.

CHAPTER IV

3. Application of AT in the Total Housing Programme of Kollam District Panchayat

Local Self Governments (LSG) in the State since the beginning of Ninth Five Year Plan have initiated several programmes and schemes to provide housing and basic amenities to EWS. 'Thiruvananthapuram, Kollam, Thrisur and Ernakulam districts have formulated a massive housing programme to construct houses to all houseless families in a phased manner with institutional finance. The Total Housing Programme (THP) in Thiruvananthapuram district started in 1999-2000 targeted to construct 29872 houses in the first phase. Unit cost of a house was Rs. 35000 of which loan assistance was Rs. 30000. Total estimated cost of the project was Rs. 8961.6 lakhs which was financed by Kerala State Co-operative Bank. It is claimed that by March 2002, 25011 houses have been completed and transferred and 4861 are under construction. In Kollam district, the target was to construct 25000 houses with HUDCO's assistance and the total project cost was Rs. 8750 lakhs. Projected started in 2000-01 is completed and all the 25000 houses have been constructed and transferred to beneficiaries' (GOK 2002).

Having learned from secondary sources that Kollam district has successfully completed construction of the targeted EWS houses within the stipulated time frame, we decided to look into the processes and methods behind this achievement. It is understood that the strategy of the District Panchayat (DP) was to provide houses to all the 70000 houseless households[24] within a period of two years in two phases. In the first phase the target was to construct 25000 houses within one year. Grama Panchayats (GP) through Grama Sabhas selected the beneficiaries on the basis of well-defined poverty indices, measured in terms of marks assigned to each aspect of backwardness (or poverty).

The Total Housing Programme Kollam (THPK) envisaged to encourage the use of cost-effective and environment friendly materials and methods; and also to use locally available materials and techniques that need only moderate skill and training. Other

important objectives of the programme were: (i) to encourage local people to produce cost-effective building materials and to train people for that purpose; (ii) to ensure participation of women in building material production and construction process; (iii) to discourage luxury construction; and (iv) to co-ordinate the activities of housing agencies and Local Self Government (LSG) institutions in the Kollam district. The DP prepared detailed handbooks with the help of technical experts and AT institutions.

Training programmes for the production of low-cost building materials and skill up-gradation of semi-skilled construction workers were planned. It was expected to create additional employment of about 4 million person-days in one year. The programme managers hoped to bring about drastic changes in the popular perceptions about housing. They aimed at popularising a habitat literacy which give due recognition to the functional utility and not to the status and prestige values of houses. AT institutions were expected to provide the necessary technical support to achieve the goal. Six major agencies including the AT majors (COSTFORD, *Nirmithi Kendra*, Habitat Technology Group, Science and Technology Entrepreneuranial Development Activity Centre (STEDAC), Science and Technology Entrepreneuranial Development Project (STED) and Socio-Economic Unit Foundation) were given responsibility to organise training programmes. But none of them except the Habitat Technology Group actively participated in the THPK.

It is learned that neither the AT institutions nor the beneficiary households took alternative materials and CEEF technology seriously. With a view to understand why that has happened, we collected primary information from three sources: (a) focus group discussions with various stakeholders; (b) semi-structured interviews with people's representatives and implementing officers at the GP, BP and DP levels and (c) direct personal investigation in a few randomly selected beneficiary households. Office records at the DP indicate that HUDCO sanctioned Rs 8750 lakhs and the entire amount has been distributed to the 25000 beneficiary households (general category 15733 and SC/ST households 9267). Panchayat-wise details of houses allotted are given in Appendix II.

[24] The Kollam DP estimated that the number of houseless households at the time of planning the

Financial assistance[25] to the beneficiary households was provided in the form of grant of Rs. 35000 to construct houses costing not less than Rs. 44000. The THPK provided absolute freedom to the beneficiary households to choose materials and technology. The programme insisted only on two conditions: (i) materials selected must be durable and (ii) size of the houses must be with in the range of 20 to 40 sq: metre. It is learned that none of the houses completed in any GP employed CEEF technology. Nor the beneficiaries sought technical advice of the AT agencies. All the beneficiaries employed services of local artisans and constructed houses of their choice. Artisans who got training in AT also did not venture to use alternative materials and CEEF technology. A good number of beneficiary households planned for big houses and about one out of every two completed houses used conventional RCC for roof. Average cost of these houses, estimated using thump rule, was not less than Rs. One lakh. Wherever second hand building materials (doors, windows and wooden rafters) were available at reasonable rates, the beneficiary households opted for conventional type tile-roof houses.

In the absence of wide differences in building processes and technology, we selected only two out of the 69 GPs in the Kollam district for direct personal investigation and household survey. The selected GPs are: Thrikkadavoor in Anchalummood Block near Kollam town and Kulakkada near Kottarakkara in Vettikkavala Block. Field visits were made in the months of April/May 2003.

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programme of THS was 70000.

[25] LSGs in the district made an initial deposit of Rs. 10000 per house on the basis of which HUDCO sanctioned a loan of Rs. 35000 per house. The GP, Block Panchayat (BP) and DP shared the deposit amount and their respective shares were Rs. 7000, Rs. 1500 and Rs. 1500. HUDCO sanctioned the loan amount for a fixed term of 11 years at an annual average interest rate 10 per cent. The GP, BP and DP share

4.1. AT in Thrikkadavoor Panchayat

As per the panchayat office records there were about 10,000 houses in the Thrikkadavoor panchayat in 2003. The latest survey by the *Kudumbasree* units as a prelude to the preparation of the Tenth Five-Year Plan of the LSG indicated that about 1900 households did not have liveable houses. A total of 589 houses were provided to EWS households during the 9th plan period under various schemes. Year-wise break-up of the scheme houses is given in Table 4.1.

Table: 4.1 Year-wise break-up of houses provided to EWS households under various schemes during the Ninth Five-Year Plan period

Year	Houses provided		Total	Financial Assistance to House maintenance (SC)
	General	SC		
1997-98	31		31	25
1998-99	60		60	
1999-2000	114	135	249	
2000-01	175		175	34
2001-02	54	20	74	
Total	434	155	589	59

Source: Office records of Thrikkadavoor G P

Public sector assisted houses during the 9th Five-Year Plan detailed in Table 4.1 is inclusive of scheme houses under the THPK[26]. The Kollam DP deposited the HUDCO loan amount of Rs. 66,85,000 (@ Rs. 35000 for 191 houses) in bank accounts opened in the names of VEOs working with the GP. Annual interest burden of the GP amounted to Rs. 3,82,000 for 11 years from 2001-02. It is found that the panchayat spent more than

interest amount of Rs. 3500 per house and the respective shares are Rs. 2000, Rs. 750 and Rs. 750 each. The urban local bodies, on the other hand, have to bear the entire interest burden.

[26] We found discrepancy in the official data of DP and GP about the actual number of houses constructed under the THP. The DP data indicate that 191 houses allotted to the Thrikkadavoor GP have been constructed and occupied by the beneficiary households. But official statistics at the GP show that full amount was released only for 131 houses and the balance amount remain with the bank accounts opened in the names of implementing officers (VEOs). The beneficiaries could not claim full amount since the work was not completed. So, contrary to what is reported in the official statistics, it is found that about one-third of the houses remain incomplete due to various reasons.

Rs. 15 million for providing housing assistance to EWS households during the 9th Five-Year Plan period. Sources of funds and the category of households assisted are given in Table 4.2. About 45 percent of the finance was raised through loans. The share of State and Central government in the form of grant constitute more than 51 per cent of the total financial assistance.

Table: 4.2. Financial assistance to EWS housing in Thikkadavoor panchayat during the 9th Five-Year Plan period by sources.

Source of fund	Financial assistance (in Rupees)		
	General	S/C	Total
Plan fund	44,56,000	8,02,247	52,58,247
Central schemes	13,42,000	7,79,753	21,21,753
Block grant		5,35,500	5,35,500
Housing Board	9,30,000		9,30,000
HUDCO loan	27,37,000	33,07,500	60,44,500
Beneficiary share	6,20,000		6,20,000
Total	1,00,85,000	54,25,000	1,55,10,000

Source: Vikasana Report 2002, Thrikkadavoor Panchayat

Household survey (direct personal investigation) was conducted in 25 randomly selected houses from the list of beneficiaries to understand the building processes, material use and technology of construction[27]. It is learned that, like in other parts of the District, since the beneficiary households had the full freedom of choice, none of them used alternative materials and CEEF technology. Foundation materials of the entire sample were either Rubble or Stone transported from a distance of not less than 25 kms. About 60 per cent of the houses had RCC roof and the rest had tiled roof. Majority of the tile-roof houses used second-hand timber (timber drawn from demolished buildings). Wage labour was employed for skilled works while family labour supplemented to unskilled activities. The owner builders purchased building materials and employed

[27] Initially we planned for a detailed household survey with the help of survey schedules. An exhaustive survey schedule was prepared and pre-tested. But when it was realized that there exist practically very little differences in material use pattern, building processes and technology across the beneficiary households we decided to limit the survey to 25 randomly selected houses. Instead of structured questions, it is found that

services of workers of their choice. Though majority of houses remain 'unfinished', they had no complaints about strength, quality and functional utility. It is also noted that they did not have regrets about the non-use of low-cost building materials and CEEF technology.

Majority of the households, irrespective of their poor means, went for relatively big houses using modern building materials and conventional technology. Neither the age nor the education of head of the household seems to have influenced the choice of materials and technology. Caste of the household also did not seem to have influenced the choice of building technology. The house of Biju is a typical case in point. Biju (29), a small-scale self-employed person belongs to SC. He got financial assistance of Rs 35,000 under the THS. Though his known sources of income are meagre, Biju planned for house with modern materials – cement blocks for walls, RCC roof, good quality wooden doors and windows - and conventional technology. He borrowed from several sources including Tamil moneylenders and invested more than Rs. 1.5 lakhs. As per the office records of the GP Biju has completed the construction work and occupied the house for residential purpose. But, we discovered with dismay that the house owner has been residing with his parents[28] in the half finished house. Though Biju is in a debt trap, he and his parents are happy with the new modern house.

There are households who live in temporary sheds erected on new foundations due to their failure to raise additional funds for construction. Chandran and Bindu are typical examples. They managed somehow to complete foundation and basement and also to procure building materials (conventional) with the financial assistance and own funds. Unless they get additional funds, it is sure that they can't complete the construction work. But they are optimistic and are waiting for additional grants and loans.

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informal discussions were more useful. Hence the results analysed are based on observation and detailed discussions with the heads of households.

4.2. AT in Kulakkada Panchayat

Kulakkada is a typical mid-land panchayat, which lies about 7 kms north of Kottarakkara town. Geographical features and resource endowments (especially indigenous building materials) are not similar to that in Thrikkadavoor. Unlike in low-lying areas Rubble and, laterite stone quarries are available within the panchayat. But an astonishing similarity was observed in the material use pattern, building processes and technology of houses constructed under THPK in the two sample panchayats.

According to official data available with Kulakkada panchayat, there were 7877 houses in 2001and about 20 percent among them were huts. The panchayat had given top priority to EWS housing during the Ninth Five-Year period. A total amount of Rs. 14 million[29] was mobilised during the period to construct 458 new houses and to repair old and dilapidated units. New houses include 347 houses allotted in the first phase of THPK in the year 2000-01. Scheme-wise details of actual investment are given in Table: 4.3.

Table: 4.3. Actual housing assistance to EWS in Kulakkada GP during the ninth Five-Year Plan period.

Scheme	Amount in Rupees
Maithree housing scheme (of the State Housing Board)	6,00,000
Repair of houses constructed under One Lakh Housing Scheme	4,90,000
Total Housing Scheme - Plan fund	32,05,908
- Panchayat fund	2,27,184
- HUDCO loan through DP	61,25,000
Central Government Schemes	3,86,408
Special Housing Schemes for SC households	29,27,800
Total	1,39,62,300

Source: Vikasana Report 2002, Kulakkada Panchayat

[28] Biju's father Damodaran (62) also got a house in the late 1980s under the public housing scheme. He gave it to one of his daughters and now he and his wife Thankamma(60) are living with Biju, their elder son in the new house.

Total amount sanctioned under the THPK was deposited in two separate bank accounts opened in the names of VEOs, who are the implementing officers. Unlike in Thrikkadavoor, the VEOs convened meetings of beneficiaries and enlightened them the need for CEEF technology. Interested households were encouraged to participate in the Block level training programme for masons. Despite earnest efforts of the implementing officers, none of the beneficiaries used low-cost local materials and CEEF technology. Nor they consulted AT institutions for guidance.

Our inquiries in the panchayat in April/May 2003 revealed that construction work 276 houses (about 80 %) were completed and a few others were under different stages of construction. We selected a random sample of 35 units from the list of completed houses for a detailed household survey. Like in Thrikkadavoor, none of the beneficiary households neither used nor were willing to use CEEF technology for their house. It is understood that the beneficiary households had only imperfect information about alternative materials and CEEF technology. For them low-cost means low quality. They were not aware of market choices also. The owner-builders with their imperfect information and little funds purchase materials from intermediaries and agents according to the suggestions of local mason-contractors. Poor household often fail to seek scientific information, since it is costly. Nor do they have capability to understand information on AT. So they might have thought that it is 'better to be rationally ignorant' (Sen 2002), rather than knowing the technology that is not familiar.

It is learned that all the sample households contributed their family labour for house construction. About 60 percent of them constructed RCC roof and walls with conventional materials like brick, laterite stone or cement hollow blocks. Average investment of the sample houses was a little more than Rs. 1.5 lakhs. The proportion of the tile roof houses was about 40 per cent. Like in Thrikkadavoor panchayat, majority of the tile-roof houses used second-hand wood materials. Despite their poor means, fifty percent of THPK beneficiaries in Kulakkada borrowed from private parties including moneylenders from Tamil Nadu at high rates of interest. Construction work of none of the 'modern' houses we surveyed was complete. They looked like semi-finished houses.

[29] It was roughly more than one-half of the total plan fund of the state government allotted to the panchayat during the 9th plan period.

Still the occupants were 'happy' with the facilities and conveniences and nobody had doubts about quality and strength of structures.

The above results drawn from surveys in two sample panchayats are applicable to the entire Kollam district. EWS households in general had either imperfect or distorted information about CEEF technology. They were not ready to take risk with an unfamiliar technology. So energy intensive modern materials and conventional technologies are preferred. Local mason-contractors and agents of building materials promote the mainstream market trend. They are the opinion makers. It is difficult to force the poor to move away from the mainstream tendencies. So the THS failed to achieve its goal of alternate housing literacy and culture. The overwhelming mainstream construction tendencies influenced the THPK houses also.

Detailed discussions with stakeholders and household surveys in Kollam district revealed that the THPK, which is projected as a successful programme failed to achieve the basic tenets of AT. It totally failed to encourage the use of cost-effective and environment friendly materials and methods and also to use local materials and techniques that need only moderate skill and training. The THPK also failed to encourage local people to produce cost-effective building materials. Why that has happened? Who should be blamed for the poor acceptance and adaptability of AT? What are the challenges that AT faces? Let us now turn to these and related questions.

AppendixII

Total Housing Programme, Kollam

(Janakeeya Parpida Padhathi)

Sl. No	Name of Grama Panchayat	Number of Houses Allotted			
		General	SC	ST	Total
	I. OACHIRA BLOCK				
1	Oachira	85	16	0	101
2	Kulasekarapuram	55	0	0	55
3	Thazhava	165	140	0	305
4	Clappana	280	47	0	327
	Total	585	203	0	788
	II. KARUNAGAPALLY BLOCK				
5	Mynagapally	199	236	0	435
6	Alappadu	128	2	0	130
7	Karunagapally	362	118	0	480
8	Thodiyoor	161	179	0	340
	Total	850	535	0	1385
	III. SASTHAMCOTTA BLOCK				
9	Sasthamcotta	160	98	0	258
10	West Kallada	130	70	0	200
11	Sooranadu South	120	99	0	219
12	Poruvazhy	145	154	0	299
13	Kunnathoor	110	0	0	110
14	Sooranadu north	219	108	0	327
	Total	884	529	0	1413
	IV. VETTIKAVALA BLOCK				
15	Ummannoor	115	70	0	185

16	Vettikavala	185	94	0	229
17	Melila	50	80	0	130
18	Mylom	130	115	0	245
19	Kulakkada	226	121	0	347
20	Savithreswaram	145	153	0	298
	Total	801	633	0	1434
	V. PATHANAPURAM BLOCK				
21	Vilakkudy	185	44	0	229
22	Thalavoor	170	100	0	270
23	Piravanthoor	191	212	0	403
24	Pattazhy Vadakkekara	97	31	0	128
25	Pattzhy	130	125	0	255
26	Pathanapuram	200	0	0	200
	Total	973	512	0	1485
	VI. ANCHAL BLOCK				
27	Kulathoopuzha	174	226	44	444
28	Yeroor	298	171	0	469
29	Alayamon	83	79	0	162
30	Anchal	90	96	0	186
31	Edamulakkal	214	141	0	355
32	Karavalloor	80	90	0	170
33	Thenmala	115	15	0	130
34	Aryankavu	105	45	10	160
	Total	1159	863	54	2076
	VII. KOTTARAKARA BLO CK				
35	Veliyam	250	0	0	250
36	Pooyapally	420	200	0	620
37	Kareepra	165	90	0	255
38	Ezhukone	100	67	0	167

39	Neduvathoor	209	161	0	370
40	Kottarakara	161	68	0	229
	Total	1305	586	0	1891
	VIII. CHITTUMALA BLOCK				
41	Perinadu	260	96	0	356
42	Panayam	227	89	0	316
43	Kundra	139	46	0	185
44	East Kallada	89	46	0	135
45	Perayam	100	0	0	100
46	Munreo Island	70	37	0	107
	Total	885	314	0	1199
	IX. CHAVARA BLOCK				
47	Thekkumbhagom	90	20	0	110
48	Chavara	375	100	0	475
49	Thevalakara	302	72	0	374
50	Panmana	185	75	0	260
51	Neendakara	113	9	0	122
	Total	1065	276	0	1341
	X. ANCHALUMOODU BLOCK				
52	Thrikadavoor	107	84	0	191
53	Thrikaruva	182	50	0	232
	Total	289	134	0	423
	XI. MUKHATHALA BLOCK				
54	Mayyanadu	211	102	0	313
55	Thrikovilavattam	575	210	0	785
56	Kottamkara	267	115	0	382
57	Elampalloor	220	182	0	402
	Total	1273	611	0	1884
	XII. ITHIKARA BLOCK				

58	Poothakulam	185	100	0	285
59	Kalluvathukkal	316	244	0	560
60	Chathannoor	378	187	0	565
61	Aschanalloor	200	165	0	365
62	Nedumpana	210	220	0	430
	Total	1289	916	0	2205
	XIII. CHADAYAMANGALAM BLOCK				
63	Chithra	252	280	0	532
64	Kadakkal	190	185	0	375
65	Chadayamangalam	212	160	0	372
66	Ittiva	561	267	0	828
67	Velinalloor	875	160	0	1035
68	Elamadu	427	233	0	660
69	Nilamel	150	70	0	220
	Total	2667	1355	0	4022
	Grand total	14025	7467	54	21546

l No	Municipality/Corporation	General	SC	ST	Total
1	Kollam corporation	2036	473	0	2509
2	Punalur municipality	483	127	4	614
3	Paravoor municipality	240	91	0	331
	Total	2751	691	4	3454

CHAPTER V

5. Alternative Technology: Conflicts and Challenges

Universally accepted modern building technologies are those based on brick, cement, steel, timber and several other energy and capital-intensive materials and methods that are environmentally unsustainable. Styles of architecture prevailed in different parts of the world in the past were distinct as they reflected the region's culture and civilisation. For instance, the civilisations that flourished in Persia and Mesopotamia produced architectural monuments different from Egyptian architecture. Like in other art forms architecture and building technology underwent sea changes and transgressed geographical boundaries to grow into international architecture. The common use of steel and concrete has revolutionalised building construction all over the world resulting in a uniformity and precision unknown before.

India in general had a rich tradition in the art and culture of architecture (*Vastu*). Traditional Kerala architecture, which was guided by *vastu shastra's*, was an amalgam of styles in other parts of the country. The abundance of excellent varieties of timbers and stones influenced the styles of house building. The caste-based hierarchical social structure put strong restraints on the use of building materials and building process. Only the rich and the powerful were permitted to use durable materials and to employ the services of artisans for construction of houses. Houses of the lower castes were temporary constructions using *kutcha* materials. "The quality and size of the buildings diminish as we go down the caste scale. The *Pulaya's* hut may be taken to be the smallest unit of human accommodation" (Census of India 1891). The hierarchical social structure that moulded the caste-based identity of building types remained in tact for a long period ranging from pre-colonial period to about the mid-twentieth century. Widespread changes encompassing the entire spectrum of social structure has occurred since the early seventies. Housing boom in the State was a turning point in the history of material use pattern, building process and technology of construction. So we can identify three distinct

phases in the entire spectre of material use, construction process and technology: (i) period prior to building boom; (ii) boom period and (iii) after the boom.

Prior to the building boom that experienced in the State since the mid-1970s the contrast that existed in the quality of housing as between the upper and lower strata (determined primarily on the basis of caste) of society was enormous. While the house of the upper strata was elegant and brilliant, those of the poor were shabby and deplorable[30]. Only the rich and the powerful among the upper castes could afford the marvellous technologies and architecture of house construction. Houses of the poor class (basically lower castes) on the other hand, were *cadjan*-leaf-roofed and *cadjan*-leaf-walled huts. Most of those huts were constructed on a platform either of mud or rarely of laterite-stone about 2 feet height from the ground by self-help or mutual-help labour. Technology of construction of bwer castes houses was simple and did not enjoy services of artisans. "The *Pulaya* is his own architect" (Census of India 1891).

The caste based rigid material use pattern and construction process existed for a relatively long period. Various social reform movements, spread of education and commercialisation of the economy gradually tilted the social balance by the turn of the century. Social restrictions on the use of building materials and caste specifications on houses permitted to build, had declined. Though the caste restrictions underwent a radical transformation, the low and middle income groups in the society found it difficult to raise financial resources to fulfil their housing aspirations till the early 1970s. During that period a host of favourable circumstances appeared in the form of income windfalls, loan funds and lending institutions (Gopikuttan 1988). That in turn led on to a housing boom.

[30] The 1961 Census report on Housing and Establishments has given a comprehensive graphic description of housing condition of different classes of people of Kerala during the past and their evolution during the 20th century. Institutional and socio-political norms that prevailed in the country during the period up to early decades of the past century prevented the poor from owning permanent buildings. The feudal governments of that time with the connivance of feudal chieftains aided and abetted this constraint. The economy and society was weighted down by traditional values, relationship and institutions. The backward classes, with no scope to become intransigent acquiesced in their destiny and suppressed in their minds all hopes for betterment. Absence of desire for material progress was not confined however, to backward classes alone. The desire, wants and aspirations of the people were linked to the availability of resources in their own sources. This attitude was well reflected in their housing condition. In 1891, only 0.75 percent houses were roofed with durable materials like tiles. Even in 1941 only 12 percent of the total stock of houses was roofed with durable materials.

The building boom paved the way for several fundamental changes in the material use pattern and building processes. New materials and methods came into existence. It had its impacts on factor markets, materials markets, building processes and technology, on the economy in general. Sustained increases in the demand for housing had pushed up prices of factors of production and construction materials in a situation in which their domestic supply was relatively inelastic. On the labour front, falling supply of skilled labour due to exodus to Arab countries and soaring wage rates led to in-migration of labourers from neighbouring states. Into the place of traditional, locally available materials, factory produced modern type materials began to come into use. The emergence of unconventional materials and development of capitalist relations of production have changed the artisanal mode of building construction that lasted for a relatively long period (Harilal, 2000). Profit seeking intermediaries, agencies and contractors entered into the private house building sector to appropriate maximum returns. It is in this context that several initiatives for the propagation of alternative technologies came up to help the weak and the needy.

Kerala State Nirmithi Kendra, COSTFORD and several young engineers and architects took the lead to propagate alternative building materials and methods. Their CEEF technology was emanated from the characterisation Kerala economy as one with abundant supply of labour and indigenous building materials at relatively low rates. The focus of the AT and building process was to create maximum employment opportunities and to provide livelihood security to the poor by constructing houses that are assets. The AT majors received patronage of the government and public fund in the form of grants for pursuing their goals. All the alternative movements started with construction of low-budget houses for the rural and the urban poor. But paradoxically enough, after successful intervention for about two decades none of these agencies or individuals now ventures to construct low-budget CEEF technology houses. In fact the socio-economic context in which the AT was emanated however, had undergone unexpected changes especially since the early nineties. Hence the period since the early nineties may be categorised as a new phase in the history of AT institutions in the State.

Cement, steel, bricks and river-sand and their numerous variants are the generally acceptable basic materials for housing in the State. Internationally acceptable

building technologies are also available. Being a major economic activity that attracted heavy public and private investment[31], market forces take care of uninterrupted supply of modern inputs from local, national and international markets. The economically powerful and dominant classes who have command over scarce resources opt for energy-intensive modern materials for reasons of durability and aesthetic appeal. The environmental externalities of resource extraction are not reflected on their price. So the relative prices of modern materials are low compared to those of indigenous, traditional materials[32].

Available appropriate technology, materials and methods are labour-intensive in nature. The boom-induced demand for construction labour coincided by inelastic supply due to exodus of construction labour to the Middle East, pushed up wages not only in construction but also in all the related formal and informal sectors. Statistics indicate that wages of skilled construction workers increased by more than 22 times during the thirty-year period since 1970-71. Moreover, the capitalist development of the building industry and the emergence of intermediaries made it difficult for the unskilled and untrained private owners of small buildings to participate in the construction process. The age-old practice of self-help and mutual help labour was also found to be impracticable for two reasons. (a) The entire labour has become wage labour and free labour is not available. (b) Even if the owner builder manage to organise free labour, the participating workers may not have the necessary skill and training to take up specific tasks in the construction process. Therefore the potential builders are forced to depend on trained/skilled workers at the market rates, which are often beyond the means of the poor households. The

[31] Average annual investment in the housing sector of Kerala is far ahead of other states since the housing boom. For instance, the total investment in new buildings in rural Kerala during the one year period from July 1998 to June 1989 was estimated as Rs 647 crore. In the year 1993-98, the average annual housing investment per panchayat in rural areas was Rs 2.5 crore (Gopikuttan 2002).

[32] Enclosure and large-scale privatisation of common property and common access resources denied the rural poor access to sources of low-cost indigenous, traditional building materials like laterite stone, rubble, grass, mud and palm leaves. Earlier indigenous materials were available in plenty and the poor people had relatively free access to them. Supply of such materials is however, relatively inelastic. The enormous increase in demand for residential construction during the period of housing boom unleashed a growing scramble for the available limited supply mainly due to their new uses like scaffolding. Their prices began to look up. Owners of large holdings in which building materials existed in large quantities acquired monopolistic control over the market for them and demanded high prices. As a result the prices of indigenous materials have grown faster than the factory-produced materials like cement and steel.

changes in relative prices of factors affected the economic efficiency of AT and hence its economic viability is in doubt.

The political economy of the State was also not favourable to encourage research, invention and innovation of AT building materials. Available low-cost indigenous building materials are not durable. Technologies to increase the durability of indigenous materials are available with major research laboratories. But at present none of them are cost-effective. Capitalist mode of production and market prices of products AT building materials do not provide incentive for innovative activity to improve their strength and durability. In the absence of cost-efficient and durable indigenous/alternative materials modern materials are preferred. The AT institutions are not capable of inventions and innovations. For, they are not getting the necessary public support to upgrade their knowledge and capability. Hence they are forced to stick to the materials, technology and methods developed three decades ago. The mainstream construction lobby and manufactures of modern building materials exploit this situation and covertly work against the popularisation of AT.

So long as the activities and functions of the AT institutions were confined to the construction of EWS houses, they got enormous political and institutional support to train workers, produce building materials and to employ cost-efficient methods. Their impact on the mainstream building construction processes and tendencies in the State were negligible. But gradually when a few middle and high-income households also opted to employ CEEF technology, attitude of the ruling class underwent changes. The decision makers at the political and bureaucratic levels therefore, withdrew their support to the AT initiatives. The major R&D institutions also followed a closed-door approach for reasons of the patent regime. The attitude of a few practitioners was also not favourable to innovation. Many of them looked at the problem of AT in a narrow engineering/technological perspective[33]. The AT majors also failed to address the changes that have occurred in the socio-economic context in which the AT was developed three decades ago.

[33] Technologists often neglect the economic, social, political and cultural dimensions of technology and its adaptability. 'The introduction of new technologies is likely to affect the structure of the system, in terms of relative and absolute costs of production, factors and skilled labour' (Antonelli, 2003). It is a fact that technologists working with AT in Kerala neglected the economic, socio-political, cultural aspects.

Neither the market forces nor the AT institutions had the necessary incentive to improve the CEEF technology. Therefore, few elements of the CEEF technology (example, rat-trap bond walls) have become economically non-viable. The end-users are not convinced about their strength and durability. The AT institutions also failed to ensure the participation and involvement of the potential beneficiaries. Finding that the real beneficiaries of AT materials and methods are not keeping their sustained interest, the State and public institutions also withdrew their support. In the absence of public support it was difficult for the AT institutions to continue its intervention strategies in housing for EWS.

Cultural factors and attitudes of the people also worked against the popularisation of AT. Life-styles and preferences of the people underwent drastic changes since the past two decades. The 'Kerala Model' of development effectively removed social restrictions on the progress of building process, such as caste-based restrictions on occupational mobility and caste specifications on houses. Housing aspirations and expectations of all classes of people reached at its peak levels. Everybody nurture the hope for prosperity and economic improvement in the future. Therefore, the poor, despite their poor means aspire to construct durable, lovable and liveable houses with maximum space, functional utility and aesthetic appeal. For that they demand modern materials and popular technology. They look down upon the indigenous materials and methods for reasons of strength, durability and aesthetics. They do not want AT methods and materials. Deprived of support from those who are supposed to be the real beneficiaries of CEEF technology, the entire AT institutions and agencies are struggling for their survival.

The KESNIK has stopped constructions of small (EWS) houses and confined its work to consultancy services to private houses at a fee[34] and contract work for state PWD and local self-governments. KESNIK does not have funds to train new workers and its technical capacity has been shrivelled due to lack of access to information from R & D institutions. The plights of the DNKs are not different either. Barring a few government sponsored houses the COSTFORD also has withdrawn from the construction field of

[34] In case the responsibility of total project management from paper work to finish a fee amounting to 15% in changed from the client. For consultancy and occasional guidance a differential rate system depending on the size of the building is charged. The rates are 2.5% of the estimated cost for plinth area upto 50 sq.mt, 3.0%for area between 51 and100, 3.5% for 101 to 150 sq. mt. and 4% for area above 151 sq. ft

EWS houses. Surprisingly the beneficiaries of public housing schemes do not like the interference or technical advice of AT institutions. Several households who got houses under the Decentralized Plan Programme have avoided *Nirmithi* and COSTFORD, neglecting the directions of local bodies.

The government also considers AT institutions like *Nirmithi* as organisations for implementing its works. They survive with own funds generated from the contract works of local bodies and public works of MLA and MP Local Area Development Funds. *Nirmithi* and COSTFORD have been reduced to the role of local contractors. All the AT institutions and agencies including the two AT majors have almost shirked their responsibility to provide CEEF technology to the EWS housing. Unfortunately, it seems that the mainstream society is not concerned with the housing needs of those among the really poor sections who stay outside the modern tendencies of development.

CHAPTER VI

6. Summary and Conclusions

The AT 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? Having discussed the concept of AT in a dynamic framework, we came to the conclusion that it should satisfy three elements: economic viability, social acceptance and adaptability and sustainability. Appropriateness of a technology is assessed on the basis 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 mainstream Kerala society aspires to emulate the life styles in advanced countries; do not like the indigenous methods and materials. The rich and powerful have command over scarce materials. The purchase prices of these materials are not reflective of their real economic cost. Relative prices of indigenous materials are high. High labour cost has pushed up the relative cost of construction methods, which are labour intensive

in nature. The CEEF technology based on indigenous materials and labour intensive methods has therefore turned out to be costly compared to conventional technologies.

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 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 through out 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. 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 favour of the sustained development of the poor?

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