

# Towards a Bamboo Design Build School in Kerala, India.



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## **Introduction:**

Kerala, one of the smallest states in India, is facing unprecedented spurt in housing activities. The state government is aiming at wiping out the housing deficit by 2020 AD. One of the main challenges is an acute shortage of artisans in traditional housing sector. Being a resource rich state, there is a huge potential for bamboo related technologies.

## 1 Shelter Situation Analysis

### 1.1.1 Basic General data

#### **Geography and Administration**

Kerala is a small state, tucked away in the south west corner of India. It represents only 1.18 percent of the total area of India but has 3.34% of the total population of the country. It is separated from the rest of the peninsula by natural geographic boundaries.



Kerala may be divided into three geographical regions (1) high land (2) mid land (3) low land. The high lands slope down from the Western Ghats, which rise to an average height of 900m, with a number of peaks over 1,800 m in height. This is the

area of major plantations like tea, coffee, rubber, cardamom and other species. The mid land lies between the mountains and the low lands. It is made up of undulating hills and valleys. This is an area of intensive cultivation - cashew, coconut, areca nut, cassava, banana, rice, ginger, pepper, sugarcane and vegetables of different varieties are grown in this area.( Source: Wikipedia,19.9.2010)

### **Demography and Health**

The Total Fertility Rate of the State is 1.7. The Infant Mortality Rate is 12 and Maternal Mortality Ratio is 95 (SRS 2004 - 2006) which are lower than the National average. The Sex Ratio in the State is 1058 (as compared to 933 for the country). Comparative figures of major health and demographic indicators are as follows:

### **Economy**

Service industry dominates the Kerala economy. Kerala leads many other Indian states and territories in terms of per capita GDP (37,372 INR States of India by size of economy) and economic productivity and Kerala's Human Development Index is the best in India.

## **1.2 Shelter Related Fact and Figures**

### **Access to Shelter**

In general quantitative and qualitative terms, the housing situation in Kerala is better than in the rest of the country. According to the Census statistics, in 2001 while 51.8 per cent of households lived in permanent houses and 30 per cent in semi permanent houses at the all India level, the corresponding figures in Kerala were 68 per cent and 21.6 per cent respectively. The Housing Census of 2001 indicates that on an average a house in Kerala had three rooms as against the all India average of two rooms. At the aggregate level, the mismatch between the households and occupied residential houses in 2001 was 63,000 units only – or less than one per cent of the housing stock in the State.

### **1.2 Housing Policy**

Need for a Housing and Habitat Policy emerges from the growing requirements of shelter and related infrastructure. These requirements are growing in the context of rapid pace of urbanization, movement from rural to urban centres in search of livelihood, mis-

match between demand and supply of sites and services at affordable cost and inability of most new and poorer urban settlers to access formal land markets in urban areas due to high costs and their own lower incomes, leading to a non-sustainable situation. The challenge is to promote sustainable and inclusive development of habitat in the state, with a view to ensure equitable supply of land, shelter and services at affordable prices for all groups in rural and urban areas, with special focus on the needs of the poor, marginalized and disadvantaged.

### **1.3 Housing Problem**

The housing problem in the state affects the really poor and needy. Paucity of purchasing power, poverty, lack of security of tenure for land, speculative land market, inflexible housing finance system, inappropriate planning and building regulations, lack of awareness about appropriate building materials and construction technologies and problems with the institutional framework are barriers in providing adequate support for the poor. It is estimated that numerical shortage of housing in 2001 was only 63 thousand units. But the number of dilapidated houses was 538,000. With rate of growth of family formation remaining constant another 400,000 houses may be required to accommodate newly formed households. It is estimated that there is a demand for 1 million houses in urban and rural areas needing investment of the order of Rs. 280,000 million covering the needs of all groups. Nearly 460000 houses are needed for the very poor under EWS in urban and rural areas, around 140000 for EWS above poverty line, 200000 for low income group, 150000 for middle income group and 500000 for high income group families ( Interim census report 2007, Govt of India).

### **Basic Services**

Housing provision is linked with other programmes such as sanitation, potable drinking water and waste disposal etc. Given the scale of housing investment in the public and private and public sectors and expenditure on social security and support programmes it is not difficult to raise the amount under the scheme for Basic services for urban poor and the scheme for rural water supply. 80% of the families in Kerala have free access to potable water and 86.4% of the house holds have a toilet (Interim census report).

## **Contemporary crisis**

Market forces dominate the housing scenario in the State. Quality building materials and modern structural design options are available at competitive rates and comparatively affordable housing finance is available from commercial banks and housing finance institutions, to all those who can provide collateral security. Though the people living on the margins of mainstream development cannot afford modern building materials and technology, they are either unaware or do not have access to traditional materials and construction methodology. There is also the problem of new consumer preferences and of the perception that traditional material and methods may not be sturdy. Homeless people or those with out adequate housing aspire to get houses built with modern materials and to scales they cannot afford. Financial assistance provided under the public housing schemes is inadequate to satisfy their requirements. With the limited funds that they receive from housing schemes, these people make plans for constructing larger houses, which require larger investment. Public housing schemes in the present form, therefore, need some realistic change.

### **1.4 Actors in Shelter Delivery and their Roles**

1. Central Government:- Formulation of centrally sponsored housing programs, basic guidelines for housing
2. Kerala State Government:- Housing policy, Margin free markets for building materials, Housing statistics, training
3. Local Self Government Institutions – Municipalities and Panchayats :- Formulation of local housing schemes for the community, training.
4. Parastatals and Public agencies:- Public and rental housing, construction agency for public buildings
5. Housing Finance Institutions (HFIs):- Disbursement of loan to the needy
6. Private, Cooperative and Community sector agencies :- training building private houses etc.,
7. Research, Standardization and Technology Transfer organisations :- Basic research work for local building materials.

## **1.5 Shelter Design**

### **Size of houses**

70% of the total houses in Kerala have a plinth area of less than 600 sq ft. Only 5% of the population lives in big houses measuring above 2000 sqft. The rest of the population mostly lives in houses with areas around 1000 sq ft.

### **Family size**

The majority of the households are relatively small consisting of father, mother, and two children. The average family size is 4.3 persons. About two-thirds of the households have four members or less.

### **Housing quality**

The quality of individual houses is assessed primarily on the basis of materials used for their structure, residential space, facilities and amenities, and present condition. As far as individual households are concerned, house quality reflects economic and social status. The quality of houses in a region, on the other hand, is an indication of the economic status, social attitudes, and economic relations that exist there. Political ideology of the government, its institutions, rules, and priorities often reflect in the housing situation of a country. However, in a modern society, since every member strives to improve social status, the richer sections break out of the rural social milieu by accepting urban lifestyles. Modern and urban styles of living are found among the inhabitants of the study region.

## **2. Organization**

HABITAT TECHNOLOGY GROUP has established itself as the largest non governmental



organization promoting cost-effective building technology and 'green architecture' in India today. Habitat employs more than 400 professionals including architects and engineers, besides providing indirect

employment to over 35 000 workers. With its headquarters in Kerala, Habitat's field of

activity is spread out over a large part of the country and has 'responding centre in ten states in addition to 4 overseas offices. Apart from houses for individuals, the institution is engaged in a broad spectrum of constructional work throughout the length and breadth of the country that includes townships, large institutional campuses, schools, hospitals, public offices, commercial complexes and tourist resorts. Habitat has also been involved in the designing and undertaking of several development projects and has played a key role in the decentralization process in the state.

Habitat has been in the architectural foray in the country for over 23 years now. Its history is studded with numerous achievements in a wide range of architectural pursuits. This includes pioneering rehabilitative housing for tribal's, fishermen, and disaster affected population. For Tsunami Rehabilitation, Habitat took an international lead in designing major housing projects in Sri Lanka , Maldives etc.

Habitat has been in the forefront in providing employment to women. 'Women empowerment' has been a guiding principle for the organization right from its inception. The organization has started a production unit for building materials such as concrete doorframes and window frames, entirely run and managed by women workers. The organization is also planning to give training in electrical wiring, plumbing etc for destitute women and make them economically independent.

### **Mission**

- Conservation of heritage buildings – Habitat is also involved in the conservation of the innumerable heritage buildings in Kerala
- Empowerment of women in the shelter sector-Habitat is making efforts to educate and train women in the field of building construction
- Networking among partners in struggle
- Information dissemination on cost effective shelter solution
- Capacity building for workers and professionals in the shelter sector using extensive training programs
- Research and development in appropriate technologies and materials
- Production of alternate building materials
- Environmental concerns related to habitat development
- Creative shelter solutions for specific needs

### **3. Shelter Problem**

#### **Deficit of professionals and artisans in social and traditional housing.**



There is a huge deficit of skill sets at all levels in the construction sector in Kerala today. It extends from the level of architects down to the level of artisans. The crisis is getting aggravated in the background of several social housing schemes getting implemented in the state with the help of

the central government Kerala is witnessing a sudden spurt in the housing sector. The real estate sector in the state is better organized and they have a captive labour resource base. The migrant artisans and artisans coming from the northern states do not have the motivation nor the skills to fill in the gaps. Hence the quality of workmanship is being heavily compromised. Kerala was once known for the artistry in masonry and carpentry work. There are several factors that contribute to the on temporary crisis.

#### **MIGRATION OF SKILLED PROFESSIONALS TO MIDDLE-EAST**

It is estimated that there are at least 0.5 million Keralites working in the shelter sector in the Middle East countries, main destinations being Oman and Qatar. The main reason is better financial opportunities. This has resulted in a huge drain of human resources from the state.

#### **GENDER ISSUES**

Women are yet to be mainstreamed in the sector. Mostly they work as unskilled labourers. Currently, they are being paid lesser wages also. Elsewhere on all social fronts, they are leading but it is yet to reach construction sector. If they are trained and motivated, they could form a good resource base.

#### **ATTITUDINAL PROBLEMS**

The advances made in the social housing are still being viewed with suspicion even by a section in the government. [fiscal incentives are made mandatory. There will be benefits for the personnel working in the sector.

## **UNORGANISED LABOUR SECTOR**

Although Kerala is known for militant trade unionism. Workers in the construction sector are yet to be organised properly. This has resulted in poor wages and lack of provision of basic amenities to the workers class.

## **BROKEN LINEAGES IN THE TRADITION**

In Kerala, workers for different categories of work belonged to particular communities. For instance, all the carpenters came from one caste division among the Hindu community. The equations are changing fast due to advances in educational facilities. This has also created a shortage of skilled workers.

How do we bring back to our streets the Indian identities they once had? In India, not only does each state have its own architectural language, but within it, in each district, the elements of the built environment grew out of locally available materials and in response to regional climates. Naturally, therefore, there is great diversity and richness in our architectural history. And so, I've been fascinated for many years with this question: how do we bring back to our streets the Indian identities they once had. The loss of Indian-ness in our built environments may partly be due to the passage of time. Kerala is rich in bamboo resources. From days immemorial, bamboo was used extensively for residential constructions in Kerala. Some bamboo structures built in the last century still remain as a bearing testimony to the structural properties of bamboo. Habitat is committed to promote traditional idioms in architecture. Thereby promoting local materials and technologies. The organization has already demonstrated the versatility of bamboo architecture through various buildings constructed along the length of the state. This has created a revival of interest in bamboo related architecture.

## **4. Proposal for Change and Improvement**



### **A BAMBOO DESIGN-BUILD SCHOOL**

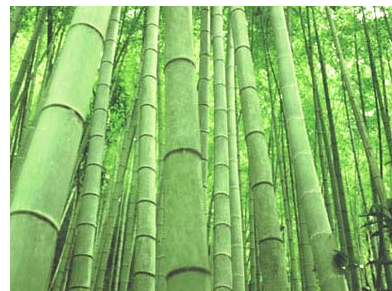
Bamboo has a long and well established tradition for being used as a construction material throughout the tropical and sub-tropical regions of the world. With the rising global concern, bamboo is a critical resource as it is very efficient in sequestering carbon and helps in reduction of Green House



gas emissions. In the modern context when forest cover is fast depleting and availability of wood is increasingly becoming scarce, the research and development undertaken in past few decades have established and amply demonstrated that bamboo could be a viable substitute of wood and several other traditional materials for housing and building construction sector and several infrastructure works. Its use through industrial processing have shown a high potential for production of composite materials and components which are cost effective and can be successfully utilised for structural and non-structural applications in construction of housing and buildings. Main characteristic features, which make bamboo as a potential building material, are its high tensile strength and very good weight to strength ratio. Above all bamboo is renewable raw material resource from agro-forestry and if properly treated and industrially processed, components made by bamboo can have a reasonable life of 30 to 40 years. A number of small and medium sized demonstration structures have already been constructed during past few years. These have shown very good performance in different climates. In order to propagate use of bamboo in housing and building construction for wider application, awareness and confidence building amongst professionals and householders is required. This calls for organized actions on prototyping, demonstration, standardization aimed at improving acceptance levels and promoting appropriate construction practices.

### **RESOURCE AVAILABILITY**

In Kerala total stock of thorny bamboo (*Bambusa bambos*) in the forests has been estimated as 2.63 million tonnes. A study conducted in 1993-94 revealed that homesteads produced 0.107 million tonnes of bamboos. Bamboo and reeds extracted from forests were estimated as 0.146 and 0.088



million tonnes, respectively during 1997-98. Total availability of bamboo and reeds both from forests and homesteads accounts for 0.314 million tones during 1993-94, which is about 64 per cent of the total requirement (0.49 million tonnes) in the State.

### **OBJECTIVES**

The school aims at sustainable development and utilization of bamboo resources in the State through scientific management and stakeholders' participation. More specifically, the project aims at: Protection and conservation of biodiversity

- Promotion of bamboo based building technologies for utilizing the available resources at a sustainable level.
- To develop a database on structural properties of bamboo based buildings
- To develop a workforce of architects, engineers, artisans in bamboo based building technologies
- To cater as a resource center for technologies related to bamboo
- Enhancing employment opportunity and livelihood security of the bamboo dependents at all levels through assured supply of raw materials and establishment of appropriate institutions,
- Use of bamboo for environmental protection, greening up of degraded lands and other diversified activities such as watershed protection and river banks and as geotex in construction of roads and bridges,
- Gathering information through literature on bamboo in general and its use in construction and treatment process to enhance the property to develop a data base,
- Create awareness and enhance the capacity of stakeholders of bamboo resources such as artisans, engineers, planners, policy makers and • Disseminate the message of bamboo conservation and encourage the cultivation of bamboos in the homesteads and other available land for increasing the resource base.

## **APPROACH AND METHODOLOGY:**

### **Database creation:**

The available literatures on bamboo will be perused in the virtual library and visits will also be made to libraries of prominent research institutions in the country such as Kerala Forest Research Institute, Peechi, Tropical Botanic Garden and Research Institute, Trivandrum, North Eastern Hill University Library, Shillong etc. This information will be appropriately organized to develop a database and prepare a book on bamboo and its potentials in building constructions.

### **Enhancing the capacity of artisans, engineers, planners and awareness among policy makers:**

This will be achieved through organized training programmes, workshops and seminars. Training will be provided to selected artisans, masons, engineers and other construction

laborers for three months. They will be provided with necessary training materials (books, booklets, handbook, etc in local language), tools and workspace so that both theoretical knowledge and hands-on-training will be endured. Necessary awareness materials such as leaflets, booklets, pamphlets, documentary films, etc will be prepared and provided.

**Disseminate the message of bamboo conservation and encourage the cultivation of bamboos in the homesteads and other available land for increasing the resource base:**

Along with the dissemination of knowledge on bamboo as a resource and its potentials for using in construction, with the help of local institutions such as Kudumbasree, Self Help Groups, Vana Samrakshana Samithis and NGOs, measures will also be taken to encourage planting of the species in available home gardens and public lands. This would not only increase the resource base, but provide alternate income for the people and their meaningful contribution towards combating climate change through carbon sequestration.

**FINANCIAL VIABILITY**

The initial investments for the land and building are being met from the capital funds of Habitat technology group. The land for the proposed project has already been purchased and it measures around 6000m<sup>2</sup>. The power connection is available and the ground water table is not low. The site is only 6 kms from the city centre and is well connected. The first phase of the complex will have training halls, seminar room, faculty room, office, pantry, store etc. A large work shed along with stacking sheds for bamboo are also being planned. This building will be built entirely in bamboo. The group has been working on the project for quite some time and supports are being offered from many institutions.

No.		Item	Rate	Unit	Amount
1	Shed	1No.	Rs.200,000	Rs./Unit	Rs.200,000.
2	Chain Pulley	2Nos.	Rs. 50,000	Rs./Unit	Rs.100,000.
3	Concreteweights 250Kgs	30Nos.	Rs. 2,500	Rs./Unit	Rs. 75,000.
4	M.S.Tripods	2Nos.	Rs. 50,000	Rs./Unit	Rs.100,000.
5	Salary	Engineer 1No.	Rs. 15,000	12Months	Rs. 180,000.
6	Salary	Sr. Artisan	Rs.6,000	12Months	Rs. 72,000.
7	Salary	Helper 1No.	Rs.4,000	12Months	Rs. 48,000.
<b>Sub Total</b>					<b>7,75,000.00</b>

**BAMBOO STORAGE SHED**

Sl. No.		Item	Rate	Unit	Amount
1	Bamboo Storage shed	1No.	Rs.50,000	Rs./Unit	Rs.50,000.00
2	Work shed	1Nos.	Rs.150,000	Rs./Unit	Rs.150,000.00
<b>Sub Total</b>					<b>Rs.200,000.00</b>

**WORKSHOP EQUIPMENTS**

Sl. No.		Item	Rate	Unit	Amount
1	Work tables, power drills, bench, grinder etc.				Rs.200,000.00
2	Cross cutter Bamboo outer – knot	1No	50,000	Rs./Unit	Rs.50,000.00
3	Remover Hydraulic splitter	1No	50,000	Rs./Unit	Rs.50,000.00
4	Radial slats	1No	150,000	Rs./Unit	Rs.150,000.00
5	Belt sander	1No	30,000	Rs./Unit	Rs. 30,000.00
<b>Sub Total</b>					<b>Rs.480,000.00</b>

**RAW MATERIALS**

No.		Item	Rate	Unit	Amount
1	Bamboo	1500no	200	Rs./No.	Rs.300,000.00
2	Steel Rods	1000mt	45	Rs./Mt	Rs.45,000.00
3	Nuts & Washers	50 Kgs	100	Rs./Kg	Rs.5,000.00
4	Boric Acid	300Kgs	80	Rs./Kg	Rs.24,000.00
5	Borax	500Kgs	80	Rs./Kg	Rs.40,000.00
6	Casurina Poles	100Kgs	50	Rs./No.	Rs.5,000.00
<b>Sub Total</b>					<b>419,000.00</b>

**TRAINING PROGRAMS**

3 Batches Hands on training program for 10 artisans each for 3Months (@Rs.4,000/-trinee for a month) – 10 x Rs.4,000 x 3 x 3	Rs.360,000.00
3 Batches Hands on training program for Architects & Engineers 10 Participants each for 4Days (accommodation + food +training materials )	Rs.160,000.00
Awareness programme / seminar / 1Exhibition at Trivandrum	Rs. 50,000.00
Salaries – 1Architect, 3Sr.Artisans, 2 Jr.Artisans, 1Helper	Rs.564,000.00
<b>Sub Total</b>	<b>Rs.11,34,000.00</b>

## STUDY TRIPS & NETWORKING

Visit to organization / fields in North Eastern states of India (For field experience & networking) 3 participants for 15days	Rs.30,000.00
Visit to China / Indonesia (INBAR – International network for bamboo and rattan) (For field experience & networking) 2 participants	Rs.200,000.00
<b>Sub Total</b>	<b>Rs.230,000.00</b>

## DOCUMENTATION

Video film on the process	Rs.50,000.00
A comprehensive guide on how to build bamboo house (including printing & stationery 1000 copies)	Rs.150,000.00
<b>Sub Total</b>	<b>Rs.200,000.00</b>
<b>GRAND TOTAL</b>	<b>Rs.34,38,000.00</b>
<b>(Approx: 3.48 million Indian rupees or 75,000 US dollars only)</b>	

This budget is prepared only for the activities for the first year. Additional funds will be needed to complete the construction of the main academic block and for further activities of the school. A few funders like National Bank for Rural Development, Centre for environment and sciences, Housing and urban development corporation, etc, have been contacted and they have expressed their willingness for partial funding. Govt of Kerala has included this project in the plan document for the state.

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