LOK AWAAS YATRA

हर आवास प्रकृति के पास

UNDERSTANDING RURAL HABITAT

LESSONS IN SUSTAINABILITY

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basin South Asia

ABOUT THE DOCUMENT

From September 2009 to December 2010, the **basin**-*South Asia* platform organised, Lok Awaas Yatra- a series of learning journeys across North, South, East, West and Central regions of India with the intention of building a deeper understanding of good practices in eco-habitat development in rural India. Over 420 people travelled on 14 trails in the five regions visiting over 60 habitat initiatives led by Panchayats, Civil Society Organisations and state social housing programmes. The journeys brought together Yatris (co-travellers) from different walks of life; Panchayat members, district government officials, village artisans, NGOs, professionals and students. Each journey or regional Yatra comprised of three trails (except in the North where there were two). Over five days, the Yatris visited three to five grassroots initiatives with focus on the different aspects of rural habitat such as:

- Energy and resource efficient construction technologies
- Water, sanitation and renewable solutions for Rural habitat development
- Habitat based livelihood generation
- Social housing delivery
- Disaster safe construction
- Models for financing rural habitat

The Lok Awaas Yatra revealed the enormous potential of rural India in promoting eco - friendly habitat development. It has highlighted the need for technical resource centers, local enterprise based solutions for making habitat goods and services available at scale and the need to invest in institutional measures at village and district levels for converging action and funds to respond to housing and habitat needs in a contextually relevant manner.

This document is a compendium of the lessons from the projects visited and an analysis of the cross cutting systemic measures that appear critical for replication of good practice in habitat development at scale. It discusses the environmental social and economic sustainability issues and management systems related to rural habitat initiatives on ground. It highlights elements that are transferable from one region to another and supporting institutional frameworks that are required for replication of good practices.

The document is targeted at grassroots habitat practitioners as well as policy makers engaged in planning and designing supporting institutional mechanisms for rural habitat development. Students and academia may use this document to further their knowledge and identify specific areas that require more in-depth study and research. Agencies interested in funding sustainable human settlement development may find areas of interest herein that they could support through their resources.

The document is structured region wise. Each section covers habitat development initiatives in a particular region within a framework of common thrusts related to specific regional concerns and the nature of habitat development processes adopted. The analysis is followed by a 'Compendium of Case Studies' compiled during the five Yatras. This captures essential information on each initiative visited in relation to the local need, environmental, technical, social and institutional innovations as well as challenges faced. Other visitors to the same projects may bring new or different perspectives to the table.

The information on each case study is derived from open source material available in the public domain and field observations of the yatris. The projects visited are not the only ones in terms of eco-habitat innovations. They were selected on the basis of criteria, such as available secondary documents, referrals, availability of project proponents to share experiences and logistics of travel given the tight Yatra schedules and limited financial resources. This round of the Lok Awaas Yatra has brought together a huge wealth of learning as well as relationships for taking the eco-habitat inspiration forward. **basin**-*South Asia* and its members remain committed to continued efforts in this direction.

CONTRIBUTORS

The document 'Understanding Rural Habitat-Lessons in Sustainability', an analysed compendium of case studies of good practices in eco habitat is an outcome of five Lok Awaas Yatras held in central, north, east, west and south of India. We take immense pleasure in thanking all the individuals and organisations that were involved in contributing to the Yatra in many ways and in developing this book. Although the list of the contributors is long and we have tried to mention all of them in this document, we do apologise for omissions if any.

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GLOSSARY

Adhyaksha: chairperson
Anganwadi: government sponsored child-care and mother-care center in India. It caters to children in the 0-6 age group.
ApnaGhar: 'own house' (project of Development Alternatives in Bundelkhand)
Basties: settlements
Chulas: cook stoves
Ghantagadi: literally a vehicle with an alarm system for collection of wastes
Gram Panchayat: local self-governments at the village level in India
Guna: name of a conical roofing tile promoted by Centre for Science for Villages, Wardha
Jal Tara: a water filter developed by Development Alternatives that uses slow sand filtration technique, to provide clean and safe drinking water.
JalKal: a campaign for clean water
Khaprail: country made roofing tile
Kuchha: temporary, of less durable quality
Lakhs: ten lakhs amount to one million units
MahilaSamiti: association or committee of women
Nirmal Gram: status and an award conferred by Government of India on those villages that are 'open defecation free'.
Panchayati Raj: system of democratic and decentralised governance in India
Pucca: permanent, of durable quality
Samiti: Association or committee. In the context of rural development in India, Panchayat Samiti is a local government body at the village level.
Sarpanch: elected head of a village level statutory institution of local self-government called the gram panchayat
Shramdaan: voluntary work usually involving physical effort as part of community service.
Swajaldhara: national level a programme of the Government of India for drinking water.
Yatra: journey
Yatris: travelers

CONTENT

INTRODUCTION

INTRODUCTION

Rural India, home to more than 800 million people, faces serious challenges with respect to fulfilling habitation needs of its residents. Millions of villagers across the country still live without basic amenities such as shelter, clean drinking water, electricity and sanitation. The 12th Five Year Plan starting in the year 2012 has placed the current rural housing shortage at 40 million houses. Over 60 per cent of the rural population lives without basic amenities of safe drinking water, sanitation, clean cooking and waste management systems. In addition the condition of habitat infrastructure of roads, public buildings, schools, etc., needs much more to be done. Furthermore, the quality of the habitat infrastructure and housing with respect to disaster resilience, environment and social response is grossly inadequate.

The Indira Awaas Yojna, the flagship scheme of the Government of India, has since the past three decades attempted to address the housing needs of the poorest. In addition many state governments have initiated state level housing programmes and complementary programmes for drinking water, sanitation, rural roads, public infrastructure and are trying to address the gap of housing and habitat infrastructure development in rural areas.

In order to meet the huge gap, in the business as usual scenario, the energy intensive construction sector, which is already one of the largest contributors of greenhouse gas emissions in India can play havoc with our natural environment. We are also not leveraging the tremendous potential of job creation and social integration that habitat development offers. Other than a few state government housing programmes, systemic measures to integrate environmental, social and economic concerns of rural habitat development are absent. Housing and infrastructure programmes are largely unlinked with an integrated approach for resource-efficient technologies, skill development, service delivery, enterprise creation, disaster safety and climate sensitive planning and construction systems.

The silver lining to this dark cloud is that the housing and habitat sector has a huge potential to mitigate climate change effects if environment friendly construction practices are adopted on a large scale to create skills, green jobs and spur growth in rural areas. In order to address the above concerns, **basin**-*South Asia* presented a proposal to the Government of India for a National Rural Housing and Habitat Policy for India, in 2007. This proposal was developed through extensive consultations over 24 months across the country with stakeholders from different walks of life and from village panchayats, district governments and national level players, (http://www.devalt.org/taranet/upload/docliberary/basinsadocuments/Final%20Policy%20Proposal.pdf). This proposal and its development process galvanised thought towards an integrated and systemic approach for rural habitat development that is reflected in the XII Plan document of the Government of India. The recommendations in the XII plan indicate that habitat planning should be integrated within village planning processes, capacity development for skills in construction should be linked with housing and infrastructure development, housing finance should be made more accessible for all, housing delivery should be linked to local entrepreneurial processes and the use of energy and resource efficient technologies should be prioritised.

To introduce practitioners to the policy recommendations, and to capture best practices from the ground, **basin**–*South Asia* initiated a unique concept of Lok Awaas Yatra from September 2009 to December 2010. The Lok Awaas Yatra, a journey for sustainable habitat development was designed as a series of five exposure visits by a mixed group of panchayat representatives, district rural engineers, village artisans, civil society practitioners and academicians across 50 districts of the north, south, east, west and central regions of India.

The first *Yatra* covered Marathawada, Vidarbha and Bundelkhand regions in Central region. The second *Yatra* traversed the western part of the country, in Saurashtra and Kutch in Gujarat and Rajasthan. The third set of trails covered Bihar, Odisha and Sundarban in West Bengal. The fourth *Yatra* went to the northern states of Himachal Pradesh and Uttarakhand. The fifth and the final *Yatra* covered the southern states of Tamil Nadu, Andhra Pradesh and Kerala.

Each *Yatra* covered three trails with 30 *Yatris* per trail who travelled over five days to different housing initiatives in a region learning about best practices in:

- Energy and resource efficient construction technologies
- Water, sanitation and renewable solutions for rural habitat development
- Habitat based livelihood generation
- Social housing delivery
- Disaster safe construction
- Models for financing rural habitat development

Yatris visited three to five habitat initiatives per trail, conducted intensive discussions with village families, artisans, government programme functionaries and civil societies engaged with the projects on the ground. They debated on the environmental social and economic sustainability issues and management systems related to the projects on ground and discussed what elements were transferable to other regions - supporting institutional frameworks that would be required for replication of good practices. Each *Yatra* culminated in a state level seminar where the *Yatris* shared their experiences with state government functionaries.

This document is a compendium of the lessons from the projects visited and an analysis of the cross cutting systemic measures that appear critical for replication of good practice in habitat development at scale. The Lok Awaas Yatra has revealed the enormous potential of rural India in promoting ecofriendly habitat development. It has highlighted the need for technical resource centers, local enterprise based solutions for making habitat goods and services available at scale and the need to invest in institutional measures at panchayat and district levels for converging action and funds to respond to housing and habitat needs in a contextually relevant manner.

The *Yatra* is a dynamic process. Since 2011, **basin**-*South Asia* and its partners have been working with the governments at state and national level in India to transfer lessons, inform policy making and contribute to practice improvement. The learning and awareness mechanism of the *Yatra* has been found to be very useful in understanding development action on ground and linking with policy development processes.

1.0 CENTRAL REGION

INTEGRATED APPROACH TO RURAL DEVELOPMENT

Emerging from poor developmental conditions, a number of holistic development efforts in the central region were targeted to improve the socio-economic situation of the people to reduce their vulnerability to the geo-climatic setting. Addressing water scarcity at first, initiatives percolated to other developmental efforts such as empowerment of women, capacity upgradation of the communities and sanitation.

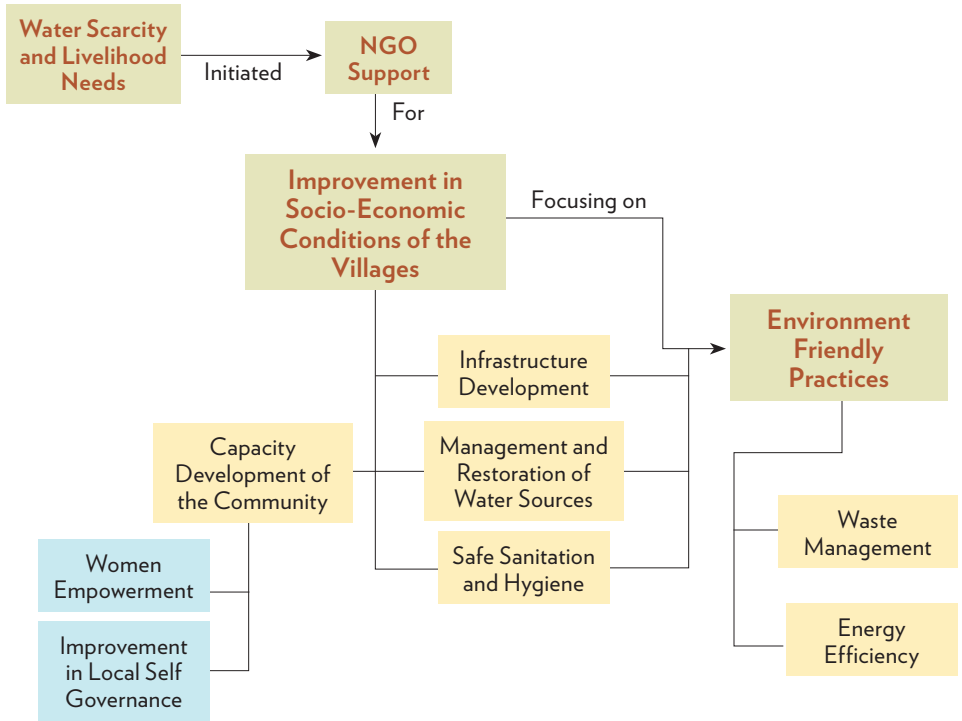
Bahirgaon is a small village, with a population of little over 2000, located in the Aurangabad district of Maharashtra. Agriculture is the base of the local economy. In the 1970s Bahirgaon used to be strewn with solid waste and overflowing unkempt drains with open defecation being common. Today, the village landscape has changed to such an extent that it is a model of integrated development with water management, sanitation, housing and public infrastructure all addressed by an empowered village government.

The Lok Awaas Yatra covered this and many such villages in its journey through Bundelkhand, Vidharbha and Marathwada regions of Madhya Pradesh, Uttar Pradesh and Maharashtra, respectively. The semi-arid areas of Bundelkhand in Uttar Pradesh and Madhya Pradesh is probably one of the most poverty prone regions in India. The rural populace face acute water crisis and land degradation which lead to reduced agricultural productivity and hence migration into cities. Added to these are problems of extreme lack of sanitation facilities coupled with practice of open defecation. The status of education and health care facilities is also low, leading to a lack of well-being of the population. Access to adequate housing by the poor has been limited to government schemes and options for construction by the poor as well as the affluent are constrained by the lack of knowledge and appreciation of resource efficient and cost effective technologies, lack of adequate skills and financing options. Such issues initiated a number of holistic village development efforts in order to improve the socio-economic conditions of the people through ecofriendly practices. The *Yatra* explored these projects and understood the process of development in these regions. (Fig 1).

Improving the socio-economic conditions of the villages has been one of the driving forces for development in the central region of the *Yatra*. The entry point for many of the development initiatives was through the provision of water which in turn percolated to other efforts such as empowerment of women, capacity development of the communities, sanitation and so on. In some areas, the provision of energy and eco-construction along with entrepreneurial approaches to housing and infrastructure construction led to an integrated approach, but across all the cases, water management and addressing the water crisis was the major focus.

Hivre Bazaar, a village in the Nagar Taluka of Ahmednagar district of Maharashtra provides an ideal example of integrated development in the central region. Its condition in the 1970s was similar to the other villages in the region, characterised by acute water crisis leading to crop failure, thriving malpractices and people migrating to towns and other villages. By the end of the 1980s, influenced by the work of activists like Anna Hazare and Baba Amte in the vicinity, the village Panchayat led by Popat Rao Pawar started an Integrated Development Programme with watershed development at its core. The programme was to be

Fig 1: Thematic Analysis for the Central Region



led through community participation in the form of *shramdaan* (voluntary labour), in order to promote social cohesion within the community as well as a sense of responsibility towards appropriate use of local resources.

Based on the emergent theme of improving socio-economic conditions, the following sub-sections will cover the process and the innovative features seen in the central region.

WATER FOR ALL AND ALWAYS

Considering the extreme water crisis the region faces, in terms of management of water resources, one of the obvious choices was rain water harvesting. At the Center for Science for Villages, Wardha (CSV), the use of rainwater harvesting was demonstrated for recharging groundwater as well as for household use. Roof rain water is collected and used for recharging the groundwater via PVC down-take pipes. Water collected during the first rainfall of the season is allowed to overflow through a controlable valve. Subsequent rain water is filtered by an in-built sieve. The filtered water is then directly sent to the bore-well placed at a depth of about 250 ft. A section of the plumbing incorporates a weekly flushing away mechanism for dirt, leaves, etc. that gets collected over the time.

In Gopalpura village of Jhansi district in Uttar Pradesh, the need for water security initiated the 'Water for All and Always' project. Across ten villages of Uttar Pradesh and Madhya Pradesh water availability was enhanced and its management improved. At Gopalpura, the *Yatris* discovered that prior to the Initiative two out of three hand pumps were operational in a village of 52 households. Scarcity and contamination of potable water was a daily struggle. With the Initiative in place the villagers were trained to test their water quality using simple testing kits and discussions linking water quality and health created awareness about sanitation too. In addition, Development Alternatives facilitated capacity building for water harvesting which led to construction of check dams and storage systems increasing water availability. The initial response of the village community towards the project was not positive; people did not trust the proposal. However, Malkhan Singh, the *sarpanch*, supported the project against all odds and mobilised the community. A committee Samagrya Jal Vikas Samiti

(SJVS) was formed, as a representative and technical body of the village, where the role of women in decision making was also significant. This Committee ensured community participation for various decisions regarding water management and infrastructure. Through people's participation the problems/conflicts related to money collection and water supply were identified and prioritised. An amount of Rs 500 was initially collected from every household which resulted in piped water supply to street level stand-posts from a common bore well and the creation of a storage system. Eventually, a structure for the water supply and management was designed with a strong documentation base comprising of maps, records etc.

The management of water resources would be incomplete without the application of a safe sanitation and hygiene model. Awareness drives were conducted in several cases to inform people on how to maintain hygiene besides the construction of toilets. In the construction of toilets, the twin-pit system was used, which was suitable for the soil conditions and made judicious use of water resulting in resource efficiency. The model followed by CSV, Wardha covered all aspects of sanitation - management of human and animal waste, agricultural solid waste as well as rain water harvesting.

The costs of toilet construction was found to be a limiting factor in Bundelkhand. The project leveraged the limited funds available under the public scheme of total sanitation campaign and substantiated with people's own savings including the project support for constructing toilets and conducting awareness campaigns on hygiene. Capacity building of the community, the empowerment of women through group formation and improvement of local governance figured high on the list of the development agencies working in the region.

The acute water crisis in the central Indian region increased the vulnerability of women too as provision of water is seen as the responsibility of women, for which they have to travel long distances and carry water back to their households. The focus on addressing water scarcity thus had a direct effect on decreasing the vulnerabilities of the women. For instance, in Karvanji ,Osmanabad, the availability of piped water has released women from the drudgery of water collection and reduced the loss of productive hours. The involvement of women in the Jal Swarajya Samiti and SHGs has further resulted in women empowerment.

The Watershed Development Programme at Hivre Bazaar Village in Maharashtra was based both on material and lifestyle changing interventions wherein trenches were built, trees planted and structures built for water percolation and conservation along with building of sanitation infrastructure and waste management, use of renewable energy, and lastly setting up of education and health care facilities. Altogether these interventions have revitalised agriculture as well as people's livelihoods. These developments have led to a beneficial wave of reverse migration from the city back to the village; about 60 families who had migrated in search of livelihood have already returned to their village.

As part of the rehabilitation initiatives after the Marathwada earthquake in Karvanji, the most important need identified by the people was access to safe, piped water supply, and the solution was found through the Jal Swarajya Scheme of the Government of Maharashtra through which a piped water distribution system was laid out complete with an overhead tank and underground water pump. A major part of the initiative was community participation through which a fund has been set up for maintenance of the system.

WASTE MANAGEMENT

Waste management initiatives seen in the central region constituted of a number of initiatives ranging from recycling organic waste, reusing waste water to innovative technologies for the conversion of waste into useful resources. Waste management across the cases has focussed on preventing environmental pollution and resulted in efficient utilisation of wastes. Instances of bio-waste management as well as effective utilisation of industrial wastes were seen and it was observed that project and village community were effectively linking economic and health benefits with waste management practices.

In Bornadiwadi, Osmanabad organic waste of the village was collected at common pits, which was then composted for further use. Waste water from the households was directed into soak pits, which helped in recharging groundwater levels. Solid waste from sanitation units was also used efficiently by composting it for further use.

Almost all the waste generated in villages can be converted into manure, by integrating different units, as seen at the CSV campus. Human waste can

be converted into useful manure (a toilet is not just a necessary hygienic device, but also a converter of human waste into manure) and waste water can be systematically reused - preventing many forms of contamination and health problems.

Many rural areas suffer the negative environmental impacts of indutrialisation. Stone crushing generates huge amounts of dust that is harmful to human and environmental health. Power plants generate fly-ash - a health hazard and environmental scourge. In Bundlekhand useful conversion of stone dust into building materials such as roofing tiles, paving blocks and other pre-fabricated elements has provided a livelihood opportunity to small entrepreneurs in the villages around Orchha. The TARA Nirman Kendra provides pre-fabricated materials using stone dust and also provides technical guidance to other enterprises.

At Khaparkheda, Nagpur, village based women's enterprise has profitably used fly ash to make bricks. Fly ash becomes a hazardous waste when it is dumped in open fields and lagoons. Using coal fly ash for building materials conserves energy by reducing the demand for typical materials such as lime, cement, clay, sand, limestone and gravel which are energy intensive with regard to mining and production. Every ton of fly ash reused in cement product means 0.85 ton of carbon dioxide emission reduction, which is the amount of carbon released into the atmosphere for every ton of cement produced. The brick enterprise has provided a sustainable livelihood for the women's group and made a new affordable construction material available to the community.

RESOURCE AND ENERGY EFFICIENCY IN CONSTRUCTION

Augmentation of technological options for construction using energy and resource efficiency as the principle featured high on the list of development activities in the central region. This included introduction and promotion of construction techniques and also of renewable energy and efficient fuels for lighting space heating and cooling. Both in Wardha and in Bundelkhand, use of natural resources such as earth, bamboo, local bricks was seen in private as well as in social housing interventions.

The vertical shaft brick kiln popularly known as the eco-kiln at Datia, the micro-concrete roofing tiles and pre-fabricated planks and joists, rat-trap bond walls in Bundelkhand; the integrated soil brick and *Guna* tile roof in Wardha and the fly-ash bricks in Nagpur were highlights in the Yatra. More than just the demonstration of technology, the Yatris were impressed by the scale of application and production at the village industry scale trough the building center and small entrepreneurs and large numbers of skilled artisans practicing and promoting the technologies. The houses constructed with eco-materials and techniques are not only resource efficient, use material resources judiciously and have low embodied energy; but also provide lower cost construction options to the village community. Skilled masons have ensured high quality construction that is no longer looked down upon. The houses constructed in rat trap bond walls and local stone roofs in Bundelkhand demonstrated a reduction in the carbon footprint by 30 per cent and a cost reduction by 20 per cent from the conventional '*pucca*' houses. (Table 1.)

CAPACITY DEVELOPMENT AND LIVELIHOODS LINKED TO HABITAT

Capacity development of the community and the need to increase livelihood options has been a route taken by the development efforts in the central region with many of the training and capacity building efforts linked with construction of houses and community infrastructure. Some stand alone livelihood options were also set up to reduce dependency on agriculture.

In Mador, a village in the Tikamgarh district of Madhya Pradesh, for instance, the project was driven by capacity development for construction as well as linked to livelihood supports for ensuring credit worthiness of families accessing housing loans for construction. This was initiated through the concept of '*Apna Ghar*' or

BAHIRGAON, AURANGABAD

In Bahirgaon, a village in Aurangabad District in Maharashtra, waste management initiatives are exceptional with the treatment of solid wastes to be used as vermi-compost and for energy use in the biogas plants. Community participation in the village is significant, and facilities have been laid out even for those people who cannot afford individual tiolets, and do not have space to house their animals.

'my own home' where house construction was linked to local artisans skill development and housing credit. The provision of housing finance in the form of part grant and part loan was another innovative feature. Out of the total Rs 39,000, two-thirds were given as grant by a government scheme while one-third was people's own contribution – through loans as well as in the form of labour. The community was linked with poultry based enterprise for livelihood generation, this provided a steady source of income that enabled them to repay the loans. The capacity building of artisans by the way of training for construction of houses with energy and resource efficient technologies led to:

- Awareness of latest techniques and methods of construction.
- Improved and enhanced skills of masons.

RAMPURA, JHANSI

Village Rampura, 17 kms from Jhansi in the Bundelkhand region, is the first village to get a community-based solar power plant (CSPP) in the country. The power is distributed through a local mini grid; the power in the first stage was used for lighting, fans and entertainment and educational purposes (TV, radio). However, the capacity of the plants can help the electricity to improve existing, or establish new, income-generating activities (flour mill, water pumping and distribution, sewing machine, cash crop drying, etc). The villagers pay for the electricity at a tariff based on what villagers currently pay for different sources of energy, such as kerosene and diesel. The revenues generated, cover operational and maintenance costs, as well as the replacement of batteries and other components.

Table 1: Eco Technology Options Observed in the Central Region

MCR Roofing tiles	MCR roof is as strong as a *pucca* roof. As the tiles are wider in size, therefore fewer tiles are required for the structure. These tiles can replace expensive options like reinforced cement concrete (RCC), since they are made up of concrete and wire mesh, less amount of cement is required. If broken, the required pieces can be changed instead of changing the entire roof.
Roofing Alternatives	A conical tile which is a tapered burnt clay tumbler forms a unit for roof construction. The tiles are laid in the profile of a reverse catenary arch, forming a load bearing vault and joined together by locking one conical tile into another. The formwork for the arch comprises fabricated MS trusses over which bamboo poles are fixed as support along the length of the vault. After laying the conical tiles for the entire roof, the formwork is removed in 24 hours. The roof is finished with a cement concrete layer and topped with broken china mosaic tiles, which act as both waterproofing and a heat reflective skin for the roof.
RCC door and window frames	The pre-cast RCC door and window frames installed in house, these are preferred over the traditional wooden frames for their strength and durability. The wood of the other frames disintegrates easily whereas these frames provide stability.
Eco-brick technology	The vertical shaft brick kiln popularly known as the eco-kiln at Datia uses an innovative vertical mechanism for firing bricks. It reduces fuel consumption by 50 per cent and carbon emissions by 40 per cent as compared with the conventional fixed chimney kilns. It indicates tremendous potential in carbon footprint reduction in buildings.
Rat trap bond	The rat trap bond used in the walls is a specific type of bond in which bricks are laid in such a way that voids are formed in the walls. The bond requires less number of bricks due to void formation, thereby reducing energy consumption. This type of bond helps in insulation, as the heat gets trapped in the voids and keeps the inner wall of the house cool, maintaining an ambient temperature, both in winters and summers.
Infill construction technique	Infill construction technique using manually moulded earth blocks with a burnt tile on the wall's exterior face to resist deterioration by water. The earth blocks are un-stabilised for affordability and make good use of the local black cotton soil which is expansive in nature.
Stone slabs and pre stressed beams	The stone slabs and pre-stressed beam laid on the roofing system provides the flexibility to add more floors to the house. This also allows modification and customisation.
Twin pit toilet system	The twin pit toilet system involves two pits; main and auxiliary. Once the main pit gets filled up, the waste is diverted into the auxiliary pit, where it gets converted into manure.

"I don't have to ask for money from my husband any longer. On the contrary, at times I earn more than him and contribute and save for the household expenses. The fact that this is our own company and we are not anyone's employees is overwhelming."

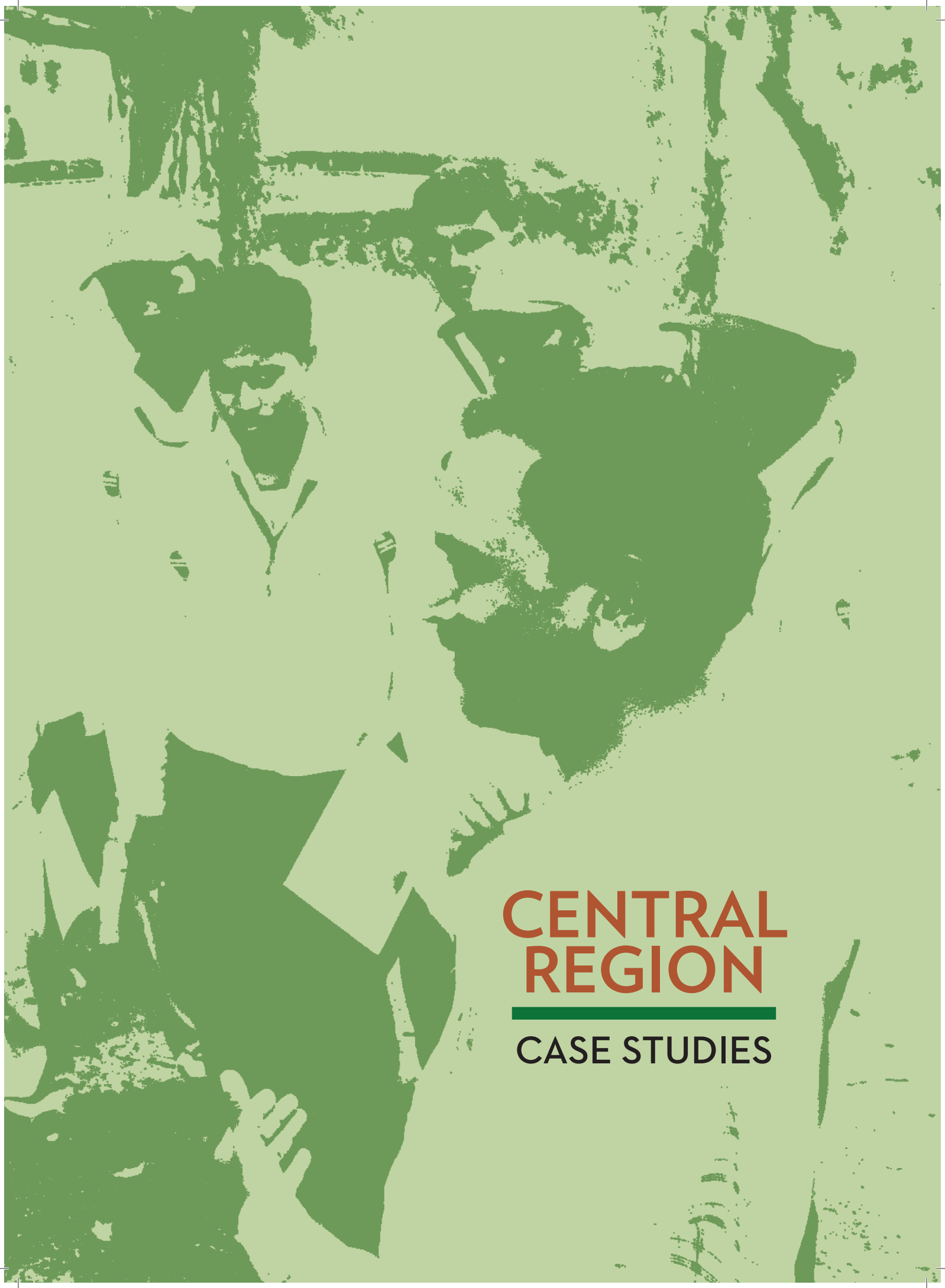
– Shubhangi Ji, Panchatantrika

Increased the livelihood potential due to increased job opportunities for the masons as well as the house-owners. Repayment of loans has led to circulation of money; others are given loan with the same money, thereby leading to social development. This project has motivated the village community to work for the development of the village. The quality of life has improved with the transformation of their habitat. The holistic development of a village community prioritises involvement of women and backward classes of the community. In Mador, it was observed that the management of the poultry farms was entrusted to women.

At Khaparkheda, Nagpur too it was observed that women's collective came together to set-up an enterprise to produce flyash bricks, giving them a source of income and position in an otherwise male dominated building construction industry.

The overall theme in the *Yatra* was towards conservation and judicious use of local resources with a focus on integrated development. The idea behind the processes was not only to develop villages but to build the capacities of the community to own the processes. In this regard many of the organisations in the area have painstakingly built the awareness of the people regarding available government schemes and the alternate methodologies that could be employed to address the developmental concerns. The introduction of energy and resource efficient technologies was backed with skill development and livelihood creation in the construction sector; water, sanitation and village infrastructure interventions were supported by community management models and resource centres such as Centre for Science for villagers and TARAgram provided continued support services.

The desperation to get out of the poverty stricken conditions coupled with facilitatory supports of resource agencies acted as a catalyst for the villagers to take action. In the cases where village local governments took charge comprehensive and sustainable change was seen. Key drivers have been the availability of drinking water, economic potential of environment friendly construction and community engagement, especially that of women.



CENTRAL REGION

CASE STUDIES

1.0

KEYWORDS: holistic development, total sanitation, seed capital, Sant Gadgebaba Gram Swachhata Abhiyan, social equity, self regulatory mechanism, panchayat action.

BAHIRGAON, AURANGABAD DISTRICT

SUMMARY

Bahirgaon is a small village with a population of little over 2000 located in the Aurangabad district in Maharashtra with agriculture as the base of the local economy. Bahirgaon, like many other villages of India, used to be strewn with solid waste and overflowing unkempt drains. Open defecation was a common practice in the village.

Owing to the decision taken by the Gram Panchayat to establish Bahirgaon as an 'Open Defecation Free Village' (ODFV), seed capital for village development was awarded by the government of Maharashtra under the Sant Gadgebaba Gram Swachhata Abhiyan (SGGSA). Over a period of 6 years the village established systems for taking care of water treatment and supply, waste management, electricity and other services in an environment friendly and sustainable manner.

The Panchayat has ensured strong community participation in the projects, having as major objective to make community development a universal concern. The Panchayat was thus able to reach the most vulnerable and marginalised groups by giving them priority in development interventions. The village has also established a regulatory mechanism at community level like rewards or punishments for violating the cleanliness norms. Other achievements in village development include introduction of improved irrigation techniques such as sprinkler and drip irrigation, the construction of a check dam, a sewage treatment plant, animal shed, solid waste management, door to door piped water supply, solar street lights, community building, a common wash area and a concrete village road.

Different institutions were involved in the project: the government at the state and district Panchayat level with the proposed schemes, the Gram Panchayat in gaining access to government funds, and the State Bank of India, which adopted Bahirgaon in 1986, giving the opportunity to the villagers for opening 'no frills' account and doing small transactions.

Six years after the first initiative, Bahirgaon stands as an outstanding example of Panchayat-led community participation in successive development activities that enhance quality of life for all.

CONTEXT

Bahirgaon is a village in Kannad taluka of Aurangabad district of Maharashtra, inhabited by a total of 352 households and a population of 2000 people.

Need: The village was a base ground for overflowing drains and solid waste strewn all around. Everyone practiced open defecation, thus making the village a breeding ground for various diseases. Women faced even worse situation as they too had to go out to defecate in the open. There was absence of any proper water supply system; women had to travel kilometers of distance to access water. Disparity was observed among the various social groups of the community. Unemployment prevailed in the village leading to the migration of people to other rural and urban areas in search of livelihood opportunities. All these circumstances called for an action to be taken to reverse the ongoing trend of lagging behind.

Scale: The initiative covered the entire village. An integrated village development programme was envisaged through community participation and good leadership.

Objectives: Following were the objectives of the integrated development programme:

- To develop Bahirgaon as a model village.
- To turn it into an open defection free village and win the award of seed capital for village development from the government under the Sant Gadgebaba Gram Swachhta Abhiyan.
- To provide safe sanitation and water facilities to the community in order to promote well-being and improve the quality of life.
- To wipe out social disparities among the various sections.
- To create livelihood opportunities that would generate high income and thus prevent migration.

SIGNIFICANT HIGHLIGHTS

Technology: Use of drip irrigation in fields has resulted

in increased yield and reduced wastage of water. Solar energy is being tapped for running street lights, heater, *chulhas* in order to save energy and promote alternate sources of energy.

Institution: A 'Sant Gadgebaba Samiti' has been formed in the village to lead the implementation on ground and handle all the issues related to sanitation.

Social: As a result of several initiatives, reduction in gender vulnerability is observed. Women own houses now and their names are prominently displayed at the entrance. Women are also involved in SHGs and generate income through dairy farming. Creation of community structures like community toilets, community wash areas etc. have helped in enhancing the community relationships and social cohesion.

ENERGY, RESOURCES AND ENVIRONMENT

Waste management in the village is done in such a way that it does not pollute the environment and results in efficient utilisation of those wastes. Water management is done in such a way that it helps in retaining the groundwater levels and reduces wastage.

CHALLENGES AND RESPONSE

Strategies: Some of the strategies that were adopted by the Village Samiti were-

- Community mobilisation and their contribution to the village development.
- Leveraging resources from the government under various schemes.
- Motivating the community to develop and participate in the development process.
- Introducing transparency, accountability and quality improvement in Panchayat's work.
- Giving due attention to the backward and traditionally marginalised groups so as to remove the barrier of caste structure in the village.
- Encouraging contribution and utilisation of assets by the community.

Process: Panchayat led integrated village development was the trigger source of the physical and social transformation of Bahirgaon. The development process dates back to the early 60's, when it became the sole village in Maharashtra to have abolished untouchability. The development process has been climbing a ladder since then where more and more development is taking place at an increasing rate. The village panchayat initiated various activities that had to be undertaken to make Bahirgaon a model village. Shri Ram Rao Patil, the first sarpanch of Bahirgaon was basically the key person for all this development process as he was the person who initiated the thought of village development and high economic status for the people. He left the trail of the development thought, which was then taken on by a group of progressive thinkers from the village who actually took forward the thoughts of the visionary Shri Patil.

Earlier people had great difficulty in using a toilet due to their habit to go out in the open. But self-regulatory mechanisms have motivated the community to avail the existing facility and have instilled safe hygiene and sanitation habits in them. It was not easy to continue on this path of development; it has only been made possible by the initiatives taken by the group of thinkers and participatory processes which involved putting one's heart and soul into the development process.

Impacts: The village is hundred per cent open defecation free. People are now using the toilets and have instilled in them good hygiene and safe sanitation practices. Rewards and punishments for those abiding by the rules and those breaking them have further added on to the impact. Manure for the fields from the wastes is yielding good results in terms of agricultural productivity and it is also generating income for the households. Out-migration has stopped; infact, its happening the other way round now where people from outside are coming to settle down in the village owing to the livelihood generation opportunities there. Bahirgaon has been successful in setting itself as a role model for other villages. Use of

new technologies in farming has led on to better yields and less wastage of water. The development process has reached such a level that instead of going to the market to sell agricultural products, the market now approaches them. All the initiatives involved an equal participation from the women which has resulted in the reduced gender vulnerability and increased women empowerment.

SANITATION

- Under the Sant Gadgebaba Swachta Abhiyan, a competitive scheme, funds were given to the village to volunteer itself to introduce hygienic sanitation practices and free itself from open defecation. Bahirgaon was successful and won the award against many villages and thus achieved the applaudable task of becoming 100 per cent open defecation free.
- Rewards and punishments at the community level for abiding by and adopting the cleanliness norms have been adopted and followed.
- Strong promotion and initiation from the gram Panchayat was important for achieving this level. For this the Panchayat leaders' households were the first to implement, demonstrate and use the sanitation units.
- The award money was utilised for the village infrastructure development, which resulted in the creation of community toilets, common wash areas, check dam, community animal sheds and crematorium, were some of the contributions of the Panchayat.

WATER MANAGEMENT

- Water resource management has also played a very important role in the development of the village.
- To manage the water needs in the village, a check-dam was constructed on the Shivna river in the year 03-04 under the Shivkaleen Pani Sadhonok Yojna (SPSY), in which government provided 90 per cent of the capital investment and 10 per cent by the village.
- Participatory involvement and support by the community led to the completion of the check-dam, which now takes care of the water needs of the village.
- Water from this check dam is then transferred to 2 wells, then to the 2 water storage tanks and then to the individual taps. The funding for this network from the check dam to the taps was approximately 11 lakhs, which got completed in 10 years. A person has been employed to look into the maintenance of the well and the check dam.
- The water in the well and tank is treated with bleaching powder.
- There are some 7-8 hand pumps in the village.
- Community taps have also been installed in the village under the Swajal Dhara Scheme, in which government invested 90 per cent capital and 10 per cent by the village.
- Water harvesting is done in every household.
- Farms have resorted to new techniques of irrigation like drip and sprinkler irrigation that reduces wastage of water
- Future plans to provide 24 hours water supply under the Apna Pani Yojna are being worked out.

WASTE MANAGEMENT

Water waste

- All the waste water of the village is collected at a common sewage treatment plant from where they are diverted towards the fields.

Solid wastes

- Waste collection procedure consists of a *ghanta gadi* which collects wastes from all the households.
- Organic wastes collected from the households is then dumped in common pits and composted for further use.
- Wastes from the community animal shed undergoes vermi composting, which is then used as a manure for the fields.
- Wastes from the leach pit are also used for composting to be used as manure.

ENERGY

- Earlier waste from the animal shed was used in biogas plants which could be used as a fuel in the kitchen.
- But now as other options are available, LPG is used by almost 80 per cent of the households.
- Use of solar street lights.
- Solar *chulas* and solar water heaters are also promoted and used.
- Electricity - Rs. 4000 month expenditure.

INFRASTRUCTURE

- Tax collected from the villagers - Rs. 500 (Rs. 250 house tax and Rs. 250 water tax)
- Community structures developed like community washing areas which has its own water tank, community animal sheds for those people who don't have space to house their animals, flour mill, community toilets (separate for men and women) for those people who can't afford individual toilets at their home and even community kitchens to be used for marriage and other occasional purposes.
- Primary health care centres, *anganwadi* and primary and secondary schools.

2.0

KEYWORDS: community process, water and sanitation, Nirmal Gram, 100 per cent open defecation free, watershed development, water harvesting and recharge, renewable energy, participatory development.

BORNADIWADI VILLAGE TOTAL SANITATION PROJECT

SUMMARY

Bornadiwadi is located in Osmanabad district of Maharashtra. The village has successfully undertaken integrated village development programmes. NGOs like Kranti Jyoti and Swayam Shikhsha Prayog created awareness among the villagers about different issues and government schemes. The villagers then started a comprehensive village development programme which included water and sanitation programmes, water conservation and recharge, use of renewable energy, women empowerment and setting up SHGs. All the programmes were supported only by the state and central government schemes. The village is now entirely free from open defecation as people use low cost toilets costing Rs. 800-1500. The village also has solar powered streetlights. Watershed management has led to increased agricultural productivity.

CONTEXT

Bornadiwadi is a small village in the Osmanabad district of Maharashtra.

Need: Open defecation was a common practice in the village with land strewn over with solid wastes that polluted the ground and became breeding grounds for various diseases. A need was felt to reverse this situation making Bornadiwadi an open defecation free village.

Scale: The village is inhabited by about 115 families and has a population of around 750 – 800 people. The entire village and all the households were covered under the initiative.

Objectives: With the overall aim of making Bornadiwadi an open defecating free village, the objectives of the initiative were:

- To promote safe hygiene and sanitation practices in the village and accelerate the sanitation coverage through construction of toilets for all.
- To motivate communities and Panchayati Raj Institutions for promoting sustainable sanitation infrastructure and practices through awareness creation and health education in the village.
- To promote water conservation techniques.
- To bring about an improvement in general quality of the village.

SIGNIFICANT HIGHLIGHTS

Technology: Leach pit toilets have been constructed in all the houses. The advantage of such toilets is that all the water content in the excreta gets absorbed by the ground and solid content gets decomposed into manure over a period of time. This manure can be either used in the fields or sold in the market against cash.

Institution: This is a community-led initiative with Gram Panchayat taking charge of the implementation of the total sanitation campaign in the village in order to make the village open defecation free. The community played an important role in the success of the initiative as hundred per cent participation was essential for declaring the village open defecation free. Once the households understood and accepted the importance of ODF zones, they got toilets constructed in their premises and devised their own systems and mechanisms to ensure that not even a single person goes out in the open to defecate.

Social: Owing to its open defecation free state, improvement in the health status of people in general and reduction in gender vulnerability can be seen.

ENERGY, RESOURCES AND ENVIRONMENT

The choice of technology for toilet construction facilitated the conversion of waste (faeces) into wealth (manure), which could be used in the fields to enhance productivity. The water conservation programme that was undertaken led to the recharge and maintenance of the groundwater resources. The alternate sources of energy like solar street lights have been explored to meet the power requirements of the village.

CHALLENGES AND RESPONSE

Strategies: The success of the initiative can be attributed to the strategy of linking every family with sanitation unit and develop rules and regulations for

maintaining ODF practice.

Process: To promote safe sanitation and hygiene practices in the community, Total Sanitation Campaign (TSC), a scheme promoted by government of India, was initiated by the Gram Panchayat. The focus was not merely on the toilet construction but promoting safe sanitation and eradicating open defecation. The CO of the village was the key person who laid the foundation stone for the sanitation awareness. He took up the task of creating awareness among the people and making them understand how important it is to have a sanitation unit in the home and using it. NGOs like Kranti Jyoti and Swayam Shiksha Prayog also put in their contribution of creating awareness about the total sanitation campaign and its benefits. A nominal subsidy of Rs. 600 in the form of award was given to the BPL rural households on the construction of toilets. The rest of the amount was contributed by the families as the toilet costs about Rs.2500. The rest of the community also put in their own contribution and got the toilets constructed. This development brought many awards to the village at the district, zonal and state level. It also won the Yashwant Gram Puraskar (YGP) and was presented with prize money of 23 lakhs, which was then used for various other development activities in the village like water conservation programmes, drainage systems, cemented roads, use of renewable energy and developing other infrastructure.

It was initially difficult to make the village people understand the merits of using a toilet and demerits of going out in the open. But the continued efforts made by the CO, Panchayat members and the local NGOs helped in overcoming this impossible task. Moreover, punishments and rewards for people breaking and abiding by the rules showed the desired results.

After attaining the status of 'open defecation free' village, steps were taken in the direction of proper waste management, like all the organic waste of the village was collected at common pits which was then composted for further use. The waste water from the households was directed into soak pits, which helped in recharging groundwater levels. Solid waste from sanitation units was also used efficiently by composting it for further use.

There is no dearth of water resources in the village now. It has 4 bore wells, 1 jet pump and a hand pump to meet the daily requirements of the village. The Jal Swarajya Yojana (JSY) was also implemented in Bornadiwadi to meet the daily needs of water.

Other infrastructure works like construction of panchayat house, *pucca* roads, water tanks, community toilets, and renovation of historical water recharging structure called Shiva kalin Pani bharan (SKPB) have also been taken up by the village.

Impacts: Total Sanitation Campaign has helped Bornadiwadi in obtaining a high seat in hygiene and sanitation and it now proudly projects itself as an 'Open Defecation Free' village. The community makes full use of the sanitation units, which has promoted their well being and enhanced their quality of life. Watershed development programme under the village integrated development programme has not only helped in water conservation and recharge but also resulted in increasing agricultural productivity thus enhancing rural livelihoods. The village is also tapping renewable sources of energy (solar street lights) thus contributing to the environment. Efficient usage of waste has led to the income generation for the villagers and also availability of organic manure for the fields.

TOTAL SANITATION CAMPAIGN (TSC)

TSC was initiated in 1999 by the Government of India as a comprehensive programme to promote safe sanitation in rural areas and to eradicate the practice of rural defecation. It is a demand driven and people centered campaign. The programme follows a principle of `low to no subsidy` where a nominal subsidy in the form of incentive is given to rural poor households for construction of toilets. To foster the endeavor for eradicating open defecation, the GoI has launched `Nirmal Gram Puraskar' to recognise the efforts in term of cash awards for fully covered PRIs and other individuals or institutions who have contributed significantly in ensuring full sanitation coverage in their village. The main objectives of the TSC are as follows:

- To bring about an improvement in the general quality of life in the rural areas;

b. To accelerate sanitation coverage in rural areas to access to toilets to all by 2012;

- To motivate communities and Panchayati Raj Institutions promoting sustainable sanitation facilities through awareness creation and health education in rural areas;
- To cover schools and *anganwadis* with sanitations facilities and promote hygiene education and sanitary habits among students.

3.0

KEYWORDS: renewable energy, appropriate construction technology, sanitation, waste management, industries, watershed development, forest resource management, research and training, water harvesting and recharge, carbon efficient green technology, non- conventional energy, micro-enterprises.

CENTRE OF SCIENCE FOR VILLAGES

SUMMARY

Centre of Science for Villages (CSV) was set up in 1977 Act as a technology transfer centre for reviving the rural economy. CSV works to salvage traditional sciences through appropriate technology transfer and introduction of practical and innovative scientific products for rural areas that benefit both the people and the environment. It was established in 1995 as an independent training centre.

The two campuses of CSV (Kumarappapuram and Dattapur) in Wardha showcase a wide variety of alternate technologies for rural scenario both through models as well as practical application in their own facilities. At these locations, CSV also provides training to artisans, SHGs, micro-entrepreneurs and development practitioners on alternate technologies. Key areas of work of CSV are:

- Ecological Housing - low carbon building technologies (mud houses and bamboo houses)
- Total sanitation - solutions for home sanitation, school sanitation, sewerage management
- Solid Waste management – vermi-composting
- Water management - water recycling, low cost water filter, rain water harvesting
- Renewable energy – improved cook stove, new biogas technology
- Rural industries – banana fibre paper technology, pottery, honey collection, agricultural tools, and micro enterprises
- Forest resource management
- Biotechnology

CSV also has a demonstrative sanitation park that demonstrates a range of sanitation technologies including biogas. The campuses also demonstrate rainwater collection and recharge units, technology and buildings showcasing their housing technology. The Dattapur campus has the production and research facility. Technologies for rural industries and micro enterprises are showcased here.

CONTEXT

Origin: CSV was founded in 1977 by Dr. Devendra Kumar. Dr. Kumar sought guidance from Indira Gandhi, Vinobha Bave, J.C.Kumarappa and others in reviving the rural economy. During 1987-1989, he was appointed as the Vice-Chancellor of the Gandhigram Institute in Dindukal. Dr. Kumar passed away in 1999.

Vision: The primary goal of the centre has always been to 'improve life conditions in the rural areas of India'. The techniques developed by the CSV range from mud housing technology to various methods of energy production and food growing. CSV actively works in the areas of hygiene promotion and development of local alternate industries.

These techniques are primarily based on locally available materials. They are simple to use, cost-effective and environment-safe. Training to villagers is provided in parallel, so that they can pass their skills and experience to others. This favours the creation of a local know-how that can be used to create jobs, trades, etc.

This is in agreement with the Gandhian philosophy that envisioned villages as self-sufficient units. The use of these "appropriate technologies" brings freedom for villagers and helps them to live life with dignity.

Strategies - Business Verticals: The CSV is primarily supported by the funds raised for the research and implementation done for the government agencies. It is in some cases funded by the Wardha Development Association, based out of France. The building centre of CSV is also partially supported by the Housing and Urban Development Corporation (HUDCO). CSV Wardha is accessible by road and rail services. It has two campuses both on the state highway connecting Nagpur and Wardha. Both the campuses lie outside the main town of Wardha.

Outreach; CSV has undertaken demonstration projects all over India.

Stakeholders Involved: The target groups of CSV include: rural populace, local NGOs for

the demonstration of technologies, government organisations. Wardha Development Association, France is one of the partner organisations with CSV. The clients among others are HUDCO, Department of Sciemce and Technology (DST), Group of Ministers (GoM) , Council for Advancement of People's Action and Rural Technology (CAPART), private individuals and NGOs.

SIGNIFICANT HIGHLIGHTS

Technology

Wardha house model: Mud building technology is ecofriendly and cost effective as compared to the conventional building practices like RCC or burnt bricks; the material being locally available and embodied energy being lower than other building materials. The CSV mud house allies local availability of mud with the resistance and thermal properties of locally produced terra-cotta. The innovative walling system combines sun-dried mud blocks with lining terra-cotta tiles integrated into the block, aiming to protect the wall from rain and moisture, thus increasing the life span of the wall.

The Wardha House Model consists of conventional stone foundation, with a frame structure of brick columns and RCC beams. The infill wall material consists of walling system of mud blocks in mud mortar as described above. The conical tile roof rests on the RCC beams supported by the brick columns. The usual span of these roofs is 12 feet and can be multiplied over larger lengths. Greater stability and efficient structural design have also been achieved by laying the RCC beams in an arch profile thereby creating double curvature. The inside surfaces of the walls are coated with mud plaster with minimum stabilisation. The overall earthy appearance has a unique aesthetic charm. The cost of a house varies from Rs. 300-550/sq.ft. A 200 sq.ft house can be completed in 3 weeks with 2 masons and 4 labourers.

The roofing system is based on a self-bearing structure achieved by a catenary vault in tapering terra-cotta tumblers. This structure doesn't require any under structure thus preventing deforestation. The tumblers which compose the vault can be produced locally. Insulation is optimal owing to the air chambers created by the tumblers and also due to insulating properties of the materials used both for the roofing and walling systems. Each component of this building system is studied in order to reduce the environmental impact of these houses and give maximum comfort to the users without having to rely on subsidiary cooling systems.

Following are the innovations in house construction materials and techniques:

Design criteria: reducing cost of construction, particularly walling and roofing, making the best use of locally available material, tapping existing skill sets, consuming low energy, climatically responsive and disturbing the environment to the least possible extent.

Traditionally, half-cut locally burnt conical tiles (*kavelu*) were laid adjacent to each other to form the roof on an under structure of bamboo mat, bamboo purlins and wooden rafters. This was not durable and would break in case of sudden load, specifically of the monkeys in the region. As a result, both maintenance cost and time required would be high. Therefore, the practice has been rapidly replaced by conventional roofs like RCC. This had a dual adverse impact on both livelihood of local potters and also the prevalence of high energy consuming construction which would not always guarantee durability. Additionally, the monetary cost of construction has also increased.

Roof: A conical tile which is a tapered burnt clay tumbler forms a unit for roof construction. The tiles are laid in the profile of a reverse catenary arch, forming a load bearing vault and joined together by locking one conical tile into another. The formwork for the arch comprises of fabricated MS trusses over which bamboo poles are fixed as support along the length of the vault. After laying the conical tiles for the entire roof, the formwork is removed in 24 hours. The roof is finished with a cement concrete layer and topped with broken china mosaic tiles which act as both waterproofing and a heat reflective skin for the roof. The roofing alternative affords the following benefits:

- No under structure needed especially wooden rafters which are expensive.
- Livelihood generation for local potters.

- Appropriate for weather extremes of hot and dry climate - the conical tile has an air cavity and the broken china skin reduces heat ingress.
- Cost effective – Rs. 65 per square feet till 12 feet span which is around 75 per cent of conventional option.
- Durable, stable and monkey proof – load carrying capacity of 1500 kg per sq.m.
- Wall – Infill construction technique using manually moulded earth blocks with a burnt tile on the wall's exterior face to resist deterioration by water. The earth blocks are unstabilised for affordability and make good use of the local black cotton soil which is expansive in nature. Production is on-site. The blocks cost Rs. 3 per piece, including Rs. 2 for the tile, 50 paisa for soil and 50 paisa for labour. The block size is 9"x9"x4". The volume of blocks is equal to 3 bricks.

CSV bamboo house: Bamboo that can be grown locally has an enormous potential in ecofriendly and cost effective housing projects. The Bamboo Crete House promoted by CSV is based on the prototype proposed at National Institute of Rural Development (NIRD). The entire structure is made out of bamboo culms, except for the foundations. Foundations are neither heavy nor deep due to the light bamboo structure, reducing the required quantity of building materials. Few concrete blocks are used at the plinth level for anchoring the bamboo structure and some cement is used for the cement mortar finishing of the walls. The roofing system is entirely obtained from bamboo culms and boards.

Bamboo is a fast renewable resource, thus the use of bamboo which is grown locally has a positive environmental impact, preventing both the deforestation and the use of building material with high rates of embodied energy.

Rain water harvesting and recharge: Besides these practices, it is shown on-campus and in the surrounding areas, how rainwater harvesting can be used for recharging the groundwater table, as well as for household use in scarcity periods. Roof water is collected and is used for recharging the groundwater. This is done via PVC down-take pipes. Water collected during the first rainfall of the season is allowed to overflow through controllable valve. Subsequent rain water is filtered by an in-built sieve. The filtered water is then directly sent to the bore-well. A section of the plumbing incorporates flushing away mechanism for dirt, leaves, etc. that get collected over the time. This flushing is done once in a week. Depth of the bore-well is about 250 feet.

Sanitation model: Covering all the aspects of sanitation, from management of human waste, animal waste, agricultural solid waste as well as rain water harvesting, CSV campus represents an ideal set up of practices aiming at improving the living conditions for humans and preserving the environment as well.

A toilet is not just a necessary hygienic device, but also a converter of human waste into manure. Almost all the waste in the villages can be converted into manure, if one thinks of integration of different units as seen in CSV campus. Human waste can be converted into manure; waste water can be systematically reused at village level, thus preventing many forms of contamination and health problems.

Sanitation - household level: The overall approach favours individual toilets over the community toilets because of the social inhibitions connected with maintaining and cleaning somebody else's waste. The following range of 10 sanitation options were demonstrated through sanitation-park in the campus.

Treatment systems: Leach-pit/ infiltration pit is the most commonly adopted system out of the various options. This comprises typically of two pits, sized 3' x 3' x 3', which are used alternately. An option of two pits with a common wall was also introduced in addition to pits separated by 1 metre, which would need at least a space of 10' x 10' at the household level. Also, a twin-pit model with a modified inspection chamber and a deep slope reduces the distance between the toilet and pits by eliminating the pipe run between the two. Reinforced brick panels have also been used as covers for leach pits.

A septic tank of size 7' x 4' x 3' (depth) connected to a single leach pit was another option. From the point of view of suitability and water consumption, the leach pit is considered a better option than the septic tank, which if not constructed with technical accuracy, can frequently be in-effective due to improper sizing and over-flow. In addition, the soak-pit poses a threat of groundwater contamination. An Ecosan model was demonstrated in which urine is separated at source and can be re-used as fertiliser with 10 per cent dilution.

In *anganwadi* model toilet was downsized to the scale of children. The model was developed for sanitation in schools which uses discarded glazed ceramic tiles to fashion a pan. The toilet design also allows opening the toilet by an adult standing outside, in case needed. Ownership and comfort level of a child using the toilet is an important design achievement.

Toilet pan: An alternative deep pan of 40 degree slope

(as compared to conventional 20 degree) and a glazed surface needs only about 2 litres of water for flushing. Also, the conventional water seal is replaced by a flap seal made with GI which also puts off back-flow and odour.

Superstructure: The following options were demonstrated –

- In-situ ferrocement construction, 1.5" thick with a slight four sided slope in the roof.
- Half brick thick masonry with a single 6 mm bar reinforcement after every two courses to address settlement of superstructure on unstable black cotton soil. The roof comprised of two precast brick panels.
- Bamboo panels sandwiched with cement mortar.

Gray water recycling: Spilled Water Recycling around Hand Pumps: In order to re-use the water, commonly spilled during collecting water from hand-pumps, the original design is modified and level of the hand pump platform is raised. Spilled water is then directed to twin sedimentation chambers connected to a final collection chamber (for water to be re-used) and a soak pit for occasional de-silting of the sedimentation chamber.

For recycling the household water from bathing and cleaning, a pit of 3'x3'x3' is connected to the bathroom and filled with graded rocks/ boulders to facilitate percolation. This also enables use of the pit space and safety in case of anyone crossing over the pit.

Energy Models

Renewable energies: Improved *Chulhas* based on Agro-waste (Bio-residue Gasifier Stove): using agro-waste prevents deforestation (it saves more than 300 kg equivalent fuel wood per year). This chulha has higher thermal efficiency of 40 to 50 per cent as compared to traditional ones. It also eliminates indoor air pollution, thus preventing several diseases related to the smoke inhaled by the persons who stay around open *chulhas* several hours a day.

Solar energy: promotion of basic solar equipments like solar cookers, solar PV street lights, solar PV lantern and solar water heater. Most of the possible uses of solar energy at the village level are shown in the campus.

New Biogas Technology: the innovative Balaji model plant can use any biodegradable material. The gas obtained is pure (unwanted sulphur compounds (H_2S, SO_2) are absorbed by a desulfuriser). The plant doesn't require daily water addition and it gets completely submerged in the ground.

The number of waterproofing companies is India is almost 200 as compared to just 20-30 cement companies. This breaks the myth of cement roofs being waterproof.

Non-Habitat Based Innovation

Rural industries: Another objective of CSV is the promotion of rural industries through several actions. The following rural industries are being promoted:

Hand-made paper industries: a project to be implemented for promoting small scale industries while using agro-waste and weeds for producing several kinds of paper and boards.

Banana fibre paper technology: CSV has developed a process of making paper and hard boards at a village level using stem of the banana plant. The banana hard board serves as a substitute for wood; it can be used for partition boards, acoustic boards, and roofing panels, etc. The product is being commercially marketed. Under CSV's technical guidance, two small scale units have been established at Gandhigram in Tamil Nadu and Mojri in Maharashtra.

Rural pottery: CSV has tried to revitalise this sector of craft industry by introducing new consumer items in their production. The sheetal pot is a traditional terra-cotta refrigerator in which a small pot is put in a larger pot and the entire structure is covered with a lid. The cavity so formed is filled with water. The inner pot acts as a container for food, which keeps cool due to the evaporation of water from the outer surface (cooling effect). The fabrication of this traditional refrigerator

If 100 per cent sanitation is achieved in South Asia, then there will be no water left for flushing these toilets. We need to rethink about the current water intensive sanitation systems.

has been improved by making it more resistant and introducing different designs. Other promoted terra-cotta articles are roofing tiles, flooring tiles, wall tiles, irrigation pipes, emitters for drip irrigation, biogas burner, etc.

Honey collection: CSV is working on open air wild bees Apis Dorsata (rock bee) and Apis Florea (small bee) in order to substitute the traditional methods of burning, smoking and squeesing the hive that leads to the massive destruction of the honey bee colonies. 25000 honey hunters have already been trained in non-destructive techniques of honey collection.

Improved steel bullock: The carrying capacity of the improved steel cart is more than double the capacity of a wooden cart.

Micro Enterprises: The other micro enterprises promoted by CSV include: food processing of natural food stuff, introduced amongst women SHG for preservation, product diversification and value addition; medicinal and aromatic herb processing, introduced amongst farmers and women SHGs; natural dyeing, extensive work is being carried out to use plant species from the forests for natural dying and to promote such micro-enterprises; herbal cosmetics; bio technologies like Spirulina; and organic farming.

DELIVERY MECHANISM

Business Model: CSV acts as a research and technology promotion centre. They have their own team of highly experienced personnel who execute the Wardha house model and the sanitation model in the project areas. Local labour is employed in every project. The USP of the CSV team is that each member is a specialist in every technology; it promotes decentralisation of expertise.

DEEN BANDHU BIOGAS MODEL (DBBM)

- Input – cattle refuse can also be connected to a household toilet.
- Output – gas + slurry (fertiliser for agriculture)
- A biogas plant with the capacity of 3 cu.m is sufficient for a family of 6-7 persons and costs Rs. 12,000 (1 cu.m of refuse is generated by 1 cattle).

BALAJI BIOGAS MODEL

- Batch type biogas plant.
- Capacity is 10 cu.m.
- Need to fill in the plant with 20 tonnes of cow dung once in 6 – 8 months.
- 6.5 cu.m of gas is generated every day. 1 cu.m produces 1.5 KWh.
- Electricity is generated by an alternator powered by FIAT car engine which runs using biogas as the fuel.
- 10kW electricity is produced by this biogas model.
- De-sulphur box is used to reduce the smell of biogas.

CHALLENGES AND RESPONSES

The primary hurdle that the model faces is the acceptance of the technology. This is primarily due to the perception that mud construction has in rural psyche. Mud houses are considered kutcha and non-durable and have a backward image attached to them.

CSV as a policy undertakes complete house construction and not just roof/wall construction to ensure quality control.

CSV has faced immense problems in getting the technology approved for the government projects as the technology has still not been included in the Central Public Works Department (CPWD) rates list. Inspite of this the Wardha house model has been adopted by various government departments like NIRD, Education Department, Maharashtra, Forest Department, PWD, Police Department, CPWD.

They have undertaken training programmes in the past but do not have any ongoing programme.

4.0

KEYWORDS: community development process, Samagra Jal Vikas Samiti, water and sanitation, watershed development, water harvesting and recharge, forest resource management, participatory rural appraisal

GOPALPURA, JHANSI

SUMMARY

A collaborative effort by Development Alternatives and the Arghyam Foundation, the project in Gopalpura is a significant step towards finding appropriate solutions in meeting the qualitative and quantitative requirements of basic services like water and sanitation in rural Bundelkhand. Piped water with stand-posts, upgraded hand pumps, water troughs for animals, household latrines, and village road with drainage, field bunding measures and plantation have been taken up through people's participation in decision making and management. Equal access to safe water has been ensured to all the households through setting up a piped water supply in the villages along with delivering of purification technology. An integrated resource management approach has been implemented through the institution of the Samagra Jal Vikas Samiti (SJVS), representing all the social groups in the village. This institution covers all the aspects of water supply and sanitation at village level, with participation of the whole community. A better management of the water resource through SJVS in the long run will ensure water supply for different purposes including agriculture and livestock demand, even in drought periods.

A holistic view on sanitation has been taken up including personal hygiene (Jal Kal Campaign), the introduction of toilets at household level, waste water disposal, solid waste disposal and storm water drainage. These measures contribute to preventing water logging and groundwater contamination, as well as serious diseases related to lack of hygiene and sanitation. This approach also changes the perception of waste products, which are actually considered as a resource (generation of manure and groundwater recharging through waste water).

CONTEXT

Gopalpura is located in the Jhansi district, about 17 km from Jhansi.

Need: There was no hand pump in the village and households were dependent on dug wells as the common source of drinking water. During drought and periods of water stress, the structures like hand pumps and dug wells do not function due to the drying up of the water sources. The distance from the water source often required several hours of walk every day. Due to poor quality of drinking water, there was high prevalence of diseases such as diarrheal infections, cholera, typhoid, Hepatitis A, Gastro-enteritis, skin diseases and dental problems. This called for finding appropriate solutions for solving the water problems of the village.

Scale: Gopalpura covers a land area of about 400 ac (cultivated land=340 ac, wasteland=50 ac, hilly region=3 ac, residential=7 ac). The village has a population of about 321 people, out of which 183 are males, 138 are females. Development Alternatives (DA) initiated the project 'Water for All and for Always' in 2007, covering 52 households.

Objectives: The objectives of the project were as follows:

- To ensure equal access to safe water for all the households at a sustainable rate.
- To enable the community members to test the water quality by providing them knowledge, skill and technology and technical equipment.
- To introduce proven technology in the community that can be managed by the community itself.
- To bring about awareness about the health hazards caused by contaminated water.
- To manage all the issues related to water and sanitation, including social conflicts.
- To ensure hygiene and sanitation for all households.
- To prevent groundwater contamination through appropriate solid and waste water disposal practices.
- To prevent water logging through appropriate drainage system, thus preventing both water contamination and diseases.
- To encourage water harvesting for domestic use (through installation of tanks) in time of drought.

SIGNIFICANT HIGHLIGHTS

Technology

Water management: A system of tap stands has

been set up with one tap for every ten families. Rules are to be followed while fetching water, in order to guarantee equal access to water to all the households. The tap stands are connected to the water source (bore well) through a network of pipe lines. The various components of the water system include tap stands, bore well, pump house, piped line network, water meter. It is a comprehensive intervention to cater to different kinds of demands for water - domestic, irrigation, livelihood, ecological etc. Installations costs have been shared between the community and the project money.

Water harvesting: Watershed approach has been adopted in the village. Traditional rainwater harvesting techniques have been integrated into the watershed approach, introducing the roof water harvesting technology in the region. Artificial ponds for groundwater recharging and safe water disposal have been dug up. Once filled the water overflows and through a channel meets river Angoori in the vicinity.

Sanitation: The issue of sanitation has been taken up holistically though personal hygiene (Jal Kal Campaign) and construction of toilets (Ecosan and twin-pit latrine). Hand washing practices, bathing and cleaning behaviours were highlighted as part of Jal Kal Campaign. There is a system installed for the disposal of waste water from the houses. The houses are connected through channels to soakage pits located in the village, or in some areas to the drainage line which was constructed along with the cement concrete (CC) road. Storm water is drained out through the drains along the CC roads (however, non draining CC roads were preferred because of durability issue and also because of existing government programmes). The NADEP pits help in converting the solid waste into green manure.

Water Purification: The testing kit available with the community tests 14 parameters. On performing a pH test one can test the purity of water and judge whether it is suitable for drinking or not. Bio-sand filters have been installed for household use and Jal Tara filters for both community and household use.

Institution: Samagra Jal Vikas Samiti (SJVS) a representative and technical body, has been formed in the village. The committee ensures community participation and representation from all the social groups in the village. Therefore, the SJVS is able to manage issues related to water and sanitation, as well as other necessary works in the village. It ensures participation of the whole community in the construction and maintenance of necessary infrastructure, benefiting each and every household.

Participatory Rural Appraisal (PRA) has been used with a view to incorporate the knowledge and opinions of people in the planning and management of the project. PRA exercises motivated the people to actually assess their needs, plan, and look into implementation and leveraging resources. This has not only brought the community together at a large scale but also helped in capacity building and facilitating interaction amongst different communities

Social: Empowerment of women can be seen as an added outcome of PRA. They have gained respect in their society. Women have started participating in entrepreneurial activities as they no longer have to travel large distances to get water. Improved hygiene has resulted in reduction in health hazards and children of the village are much healthier than before. Conflict resolution, collective consultation amongst various caste groups has enhanced unity and released social tension. Due to adequate water resources, the village has gained respect amongst the neighbouring villages. Education on water borne diseases is being given to children at the school. They are also learning how to use the Tara Jal water testing kit as part of their curriculum. The time spent by women in fetching water has reduced considerably. This has allowed women to complete their household work on time.

Mahendra Pratap Singh, a farmer of Gopalpura village, feels that with less time and energy involved in fetching water for the household women now finish their household chores in time. This has reduced domestic friction and tension in the house considerably.

Malkhan Singh, a farmer of Gopalpura village recalls that earlier the water had to be brought from a distance of half a kilometre. Children were also involved in getting water. Now water is available near to the house and even though the children still bring water but they are able to take bath every day, wear clean clothes and are able to go to school on time.

Geeta Devi, Anganwadi Sahayika of Gopalpur village states that all her relatives visiting the village appreciate that the village now has water, electricity and road. This makes us feel proud.

ENERGY, RESOURCES AND ENVIRONMENT

The waste is being managed in such a way so as to generate manure for agricultural purposes. Technologies have been integrated into the watershed approach that include both the water conservation and water harvesting

measures directed to improve the groundwater table as well as make water available for agricultural purposes during non monsoon periods as well.

Roof water harvesting has the advantage of supplementing other sources of water supply. It lowers the cost of supplying water and taps high quality water which is safe and free from chemicals. The technology has been found to be useful in places where groundwater is scarce and/or contaminated and where population density is low and water is too hard and mineral laden, and also electricity supply is irregular affecting the ability of the household or the community to draw water.

CHALLENGES AND RESPONSE

Strategies: The following strategies have been adopted as part of project:

- PRA with a view to incorporate the knowledge and opinions of people in the planning and management of the project. PRA exercises motivated the people to actually assess their needs, plan, and look into the implementation and leveraging resources.
- Integrated Resource Management Approach to encourage a holistic understanding of water management.
- Setting up of SJVS for better management of the water resources in the long run. This will ensure water supply for different purposes including agriculture and livestock demand, even in drought periods.
- Women empowerment through involvement of women of the village in decision-making.
- Awareness creation about water borne diseases and health hazards.

Process: Two years back, under a water security programme 'Water for All and Always', 10 villages (five each in U.P. and M.P.) were visited to observe, gauge and record the prevailing conditions in terms of water availability and its management. One such village in Bundelkhand region was Gopalpura. At that time two out of three hand pumps were operational in a village of 52 households. The villagers were made aware of the importance of clean water and the ill effects which contaminated water can have. TARAgram (DA) assured availability of portable water in 19 days. They were also informed about the changes that can be brought about to ensure water availability. The initial response of the villagers towards the project was not very positive; people did not trust the proposal immediately. However, Malkhan Singh, the sarpanch, totally supported the project and against all odds got the community together. The SJVS was formed, as a representative and technical body of the village. The committee ensured community participation and through PRA various decisions regarding water management and infrastructure were made. The next step was the collection of fund from the community; an amount of Rs. 500 was initially collected from every household. A bore well was dug; as the load increased, the water quantity was not enough; subsequently another bore well was dug to meet the water shortage. Through PRA the problems/conflicts related to money collection, water supply etc. were identified and prioritised. The various categories were common problems, associated problems and problems related to a specific individual. Solutions were given according to the type of problem. The role of women in decision making was significant. Eventually a structure for the water supply and management was designed. A resource base (maps, records etc.) was created.

Impacts: The piped water supply system caters to the 60 households. There are 2 hand pumps, 7 stand posts with provision of 1 tap for 10 families. Water testing kits, and tara filters/ bio sand filters have been installed for water purification. CC roads have been laid out for the approach and main circulation network. Check dam has been constructed and drainage system has been laid out in the village.

Unresolved Issues

- Inadequate electricity to run the electric motors and pumps.
- Pollution not under control yet.
- According to Maharashtra government, there should be five different people at five different levels to check the water quality. More people need to learn the technique of water testing.
- The major challenge faced by the Piped Water Supply system is the irregularity with which electricity is available to the village. This is because the motor is electric operated and can only run when and for the duration power is supplied to the village.
- Habitat development is required to make it a ' Nirmal Gaon'.
- Irregular payments for water from various households.

5.0

KEYWORDS: community development process, Pradhan Mantri Adarsh Gaon Yojana, water and sanitation, water harvesting and recharge, renewable energy, social institutions, afforestation, participatory development.

HIVRE BAZAAR, AHMEDNAGAR DISTRICT

SUMMARY

Hivre Bazaar is a village located in Nagar Taluka of Ahmednagar district which faced acute water crises and land degradation during the 1970s. The village had a history of drought as the traditional water storage and recharge structures degraded over time. Lack of water management led to reduced agricultural productivity and, as a consequence, to massive migration towards the cities.

By the end of the 1980s, influenced by the work of visionaries like Anna Hazare and Baba Amte in the vicinity, the village Panchayat led by Popat Rao Pawar started an Integrated Development Programme with watershed development at its core. This programme was to be led through community participation in the form of *shramdaan* (voluntary labour), in order to promote social cohesion within the community as well as a sense of responsibility towards appropriate use of local resources. The Watershed Development Programme at Hivre Bazaar was based both on material interventions and lifestyle changing. Forest regeneration activities were undertaken by the community along with the acceptance of rules and restrictions, such as ban on cutting trees, restrictions on free grazing and water rules. Within the Watershed Development Programme 40000 contour trenches were built around the hills, 10 lakhs trees were planted, several structures for water percolation and conservation like earthen dams, percolation thanks, loose stone bunds and check dams were constructed. Altogether these interventions have considerably improved the groundwater recharge in the watershed area, hence revitalising agriculture as well as people's livelihood. The intensity and patterns of cropping have been improved and local resources are now used without jeopardising them.

The Integrated Development Programme at Hivre Bazaar encompasses other aspects of village development, like sanitation infrastructure and waste management, use of renewable energy, education and health care facilities. The village now has primary and secondary schools, *anganwadis*, community centre, library, open air theatre, primary health care centre as well as veterinary clinic.

These developments have led to a beneficial wave of reverse migration from the city back to the village; about 60 families who had migrated in search of livelihood have already returned to their village.

CONTEXT

Hivre Bazaar is located in Nagar Taluka of Ahmednagar district. Back in the 70's, this name was synonymous with conditions like acute water crisis, crop failure, land degradation and social evils. The village lost its fight against ecological degradation; the forests on the surrounding hills got destroyed, run off from the hills destroyed the fields, degraded lands resulted in negligible yields from agriculture, and chronic droughts led to acute water crisis. The result was massive out-migration of the people from the village and those who were coming to the village for work were only the government officials who got the "punishment posting".

Things began to take a U-turn when a group of young energetic people got motivated to do something to bring about a change in the prevailing situation. The initiatives were undertaken under the leadership of Popat Rao Pawar, who was a unanimous choice as he was literate and aware of all the issues.

Need: Located in the drought prone area, Hivre Bazaar faced the situation of acute water crisis. Unfavourable geographical location of the village in the rain shadow area resulted in minimal rains leading to crop failure. Dwindling forests resulted in land degradation, thus rendering land unfit for cultivation. Denuding of the hills in the surrounding areas led to ruining of the fields due to run-off. Social evils like liquor consumption, gambling, fighting eclipsed the village, thus restricting the progress of the inhabitants. There was a lack of basic infrastructure in the village. The effect of all these activities resulted in the migration of villagers to

other areas in a quest to fulfil their basic requirements and better employment opportunities. Unhappy with the situation, motivated youth of the village decided to counter the situation through integrated village development.

Scale

Objectives

The ultimate goal of the development initiatives was to revamp the village and make it a viable entity so as to stop excessive out-migration. All the initiatives were undertaken towards the following objectives:

- To create a model village
- To promote measures of water conservation and water recharge.
- To promote plantation and forest regeneration activities.
- To prevent out-migration of people from the village.
- To generate livelihood opportunities within the village to promote welfare and general well-being of the people.

SIGNIFICANT HIGHLIGHTS

Technology: Solar energy is being tapped as an alternate source of energy for running the street lights. See-saw, as a mechanical groundwater fetching system, has been installed in which water is lifted to an overhead tank by the means of up-down motion of the see-saw. Drip irrigation is used in the fields for cropping, which generates high agricultural output and minimises wastage of water. In order to realise the full potential of the geographical site and fulfil the basic needs watershed management is undertaken.

Institution: This is a rare example of decentralisation working on ground wherein Gram Panchayat is involved in the preparation of plans for the future growth and development of the village. The community itself took an active part in planning and managing the development process. It contributed a lot to the village development in terms of labour and money and also in terms of community feeling and complete faith in the leader. The integrated village development has been made possible by seeking and financial support from different government schemes.

Social: Installation of 112 biogas plants has resulted in expulsion of smoke *chulhas* thus leading to better health conditions for women. Making the village 100 per cent open defecation free has resulted in vulnerability reduction of the women. Construction of a mosque by the village people for a single Muslim family living in the village is an excellent example of integrated community. Moreover, people who had migrated from the village are now back and the situation has started reversing as now more people are coming to settle down in the village.

ENERGY, RESOURCES AND ENVIRONMENT

To meet the energy needs of the village, biogas plants have been installed in many households, however, 80 per cent of them use LPG now. Vermi-composting is done to convert animal waste into manure and use it in the fields or for selling purposes. Animal waste (e.g. cow dung) is being used to produce kitchen fuel. Soak pits have been installed in every household for management of waste water. Underground drainage system has been designed to ensure cleanliness in the village. Separate dustbins for wet waste and solid waste have been installed for waste segregation and making the treatment of these wastes easier and in a judicious manner. Waste water is managed through soak pits which in turn recharge groundwater resources. Human excreta collected in the leach-pit are used as manure in fields and no open defecation has led to reduction in land pollution.

CHALLENGES AND RESPONSE

Strategies

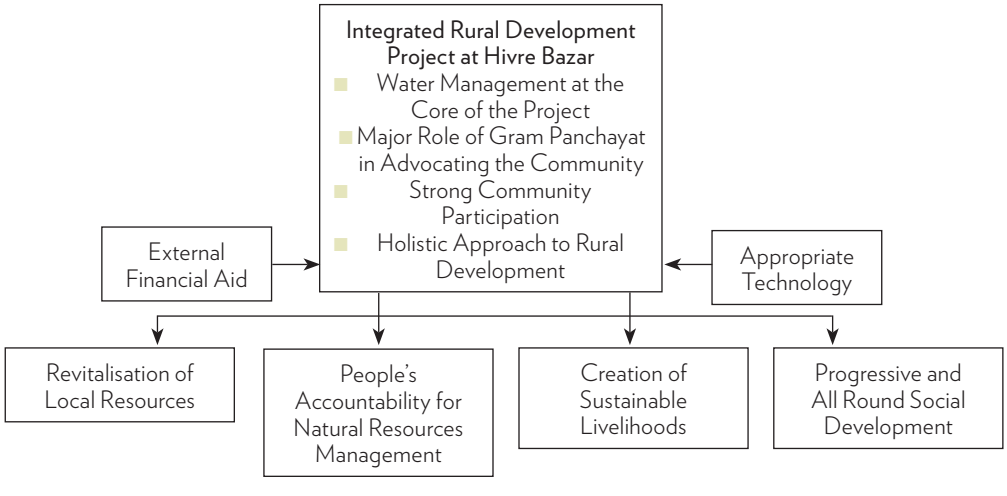
Process: Acute water crisis leading to crop failure, thriving malpractices and people migrating to towns and other villages; all of them were pointing towards a disastrous future of the Hivre Bazaar. This is when a group of young people who couldn't sit back and watch the doom of their village, decided to develop a plan and to do something about it. The youth group, led by Popat Panwar Rao, proved to be the main trigger for the development of Hivre Bazaar.

It started with the Employment Generation Scheme under which people enrolled themselves to earn livelihood. The scheme proved to be beneficial for the village in two ways. On one hand, the villagers got livelihood opportunities within the village; on the other hand it resulted in the physical development of the village by the way of creation and regeneration of productive assets like water conservation structures, forest, etc. Thus, the works undertaken under the Employment Guarantee Scheme (EGS) programme were mainly regeneration of the village land and water resources.

Furthermore, Popat Rao, elected as a unanimous leader in 1989, also started off with the work on water conservation. The social forestry department helped Popat in regenerating the village groundwater resources. With labour donations from the people, contour trenches were built around the hills to conserve rainwater and recharge groundwater. The regeneration of plantations and forests were taken up and enough water was made available to irrigate more land area. Watershed development programme was also initiated for land and groundwater regeneration. Village made its own five year plan for ecological regeneration.

Later, the village was brought under the Adarsh Gram Yojana, which was based on five principles: ban on liquor and cutting trees, free grazing, family planning and contributing village labour for development works. Slowly and steadily, with the guidance of Popat Rao and the dedicated efforts of the villagers, the village started to blossom. Not just agriculture, but animal husbandry also boomed as there was more fodder for the animals. All the funds of the village were utilised in the development process. Initially, it was quite challenging to change the image of such an awful place and instil this thought among the people that development could be brought about in this village but slowly and steadily, the village underwent a transformation. For instance, while transforming the village into an open defecation free zone, it was difficult to get the people to use sanitation units in the beginning. Strict measures had to be undertaken to achieve the desired results. But the people soon realised that it was ultimately for their well being.

Impacts: The village has immensely flourished by the



combined efforts of Popat Rao and villagers. The funds invested and the hard work of the villagers has borne fruits and the development can be seen all around. The water conservation programme has solved the problem water scarcity in the village and there are now around 300 wells in the village. The village has become well equipped to encounter any water scarcity situations. Tube well has been banned for irrigation, bore wells are generally used (drip irrigation in place). The available 15 hand pumps are used for drinking purposes. The choice of crops for cultivation is based on the availability of rainfall during that season. If the rains are not sufficient, then no wheat is cropped and the villagers themselves shift to the cultivation of vegetables. The village has turned completely open defecation free and those who still go out to defecate are punished by the community. The village has transformed into a model village with the construction of hundred per cent *pucca* houses, cemented roads, underground drainage system, primary and secondary schools, community centre, *anganwadi* centres, and primary health care centre. The income levels of the people have risen due to high yield in agriculture and dairy farming. Owing to its development status, the village has won numerous awards at the district, zonal and state level, which in itself is a strong indicator of the development ladder that Hivre Bazaar is climbing.

6.0

KEYWORDS: community process, Jal Swarajya Scheme, water harvesting and recharge, renewable energy, participatory development.

KARVANJI VILLAGE JAL SWARAJYA PROJECT

SUMMARY

Karvanji is located in Lohara Taluka of Osmanabad district of Maharashtra State. The village was relocated to a new place as a part of rehabilitation initiatives after the Marathwada earthquake of 1993 that affected 232 households in Karvanji. After shelter reconstruction, the most important need identified by the people was access to safe, piped water supply.

The solution was found in the Jal Swarajya scheme of the government of Maharashtra under which the government provided 90 per cent of the capital investment needed for the water system. The rest of the amount was contributed by the community. The villagers set up a committee with 3 sub committees to look at different aspects of the programme. A piped water distribution system was thus laid out complete with an overhead tank and undergroundwater pump at a cost of Rs 26 lacs for 150 houses. A pani patti (fund) was created and monthly contribution is being made by the villagers for maintenance of the system at the rate of Re 1/day.

CONTEXT

Karvanji is a small village in the Lohara taluka of Osmanabad district of Maharashtra state, with a population of about thousand persons.

Need: Post Marathwada earthquake, the families from the then Karvanji village were relocated to another place wherein after shelter reconstruction the most urgent need identified by the people was access to safe, piped water supply system. The access to potable water becomes even more important as the village lies in the drought prone area of Marathwada.

Scale: 150 houses have been connected with the piped water supply system by the way of this project.

Objectives: The underlying aim of the project was to provide water security to the village households. The objectives included:

- To provide access to clean and safe water.
- To promote good health, hygiene and sanitation programmes.
- To minimise pressure on groundwater resources and help in their conservation.
- To promote infrastructure building and community development.
- To build capacities of the local institutions for undertaking community development works responsive to the community needs.

SIGNIFICANT HIGHLIGHTS

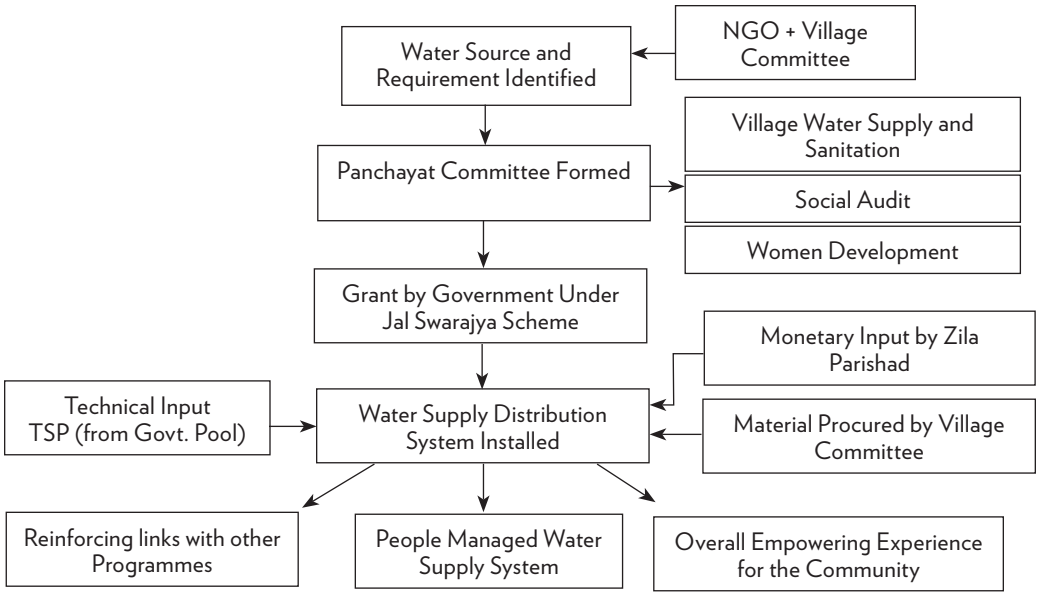
Technology: As part of the project percolation pits have been constructed, with rain water as their main source of recharge. This helps in maintaining the groundwater table level and thus, reducing the pressure on groundwater.

Institution: The official implementation of the scheme rested with the Gram Panchayat. However, a Jal Swarajya Committee (JSC) has been formed with representatives from the community itself to manage the entire scheme. Three sub-committees namely Mahila Samiti, Audit Samiti and General Samiti have been created to look into the various aspects of the scheme. This enhances the community ownership of the scheme and ensures the accountability.

Social: The availability of piped water at the household level has resulted in vulnerability reduction of the women as they no longer have to travel long distances to access water and carry the load over their heads while coming back. In case the piped water supply could not be made available, there are alternative resources available like bore well, open well, hand pump, etc. The involvement of women in the Jal Swarajya Samiti and SHGs has further resulted in women empowerment.

ENERGY, RESOURCES AND ENVIRONMENT

Traditional vattal (the vessel used for heating of water) is still being used, which consumes less energy as compared to other contemporary utensils. On a small scale, the solar energy is being tapped as an alternate source of providing electricity. The form ponds, bunds and recharge pits have been constructed to conserve and tap the scarce water resources.

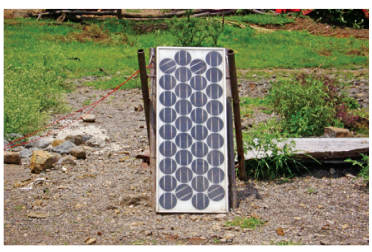


CHALLENGES AND RESPONSE

Strategies: In order to make water available to the households, Jal Swarajya Yojana of the Government of Maharashtra was implemented in the village. It consisted of 90 per cent capital investment from the government and 10 per cent from the community.

Process: Following the relocation and rehabilitation of the village, need for fulfilling its first basic necessity of clean, potable water was felt. To achieve water security, Jal Swarajya Yojana was implemented in the village. The villagers set up a Jal Swarajya Committee, with 3 sub-committees to take care of the various aspects of the programme, which also concentrated upon the various strategies to be made and implemented. Entire community contributed in the development programme, starting from small kids to the old people. The contribution was not just in the monetary terms but also in terms of labour and material. For the water supply system, a percolation well was dug on the downstream side, through which the water is lifted on to the overhead tank (50,000 litres) and distributed to the various households. The water is regularly treated with bleaching powder (125 gm daily). For the maintenance of the whole structure, a pani patti or water fund of Rs. 365 per year (Re. 1 per day) is collected from the community in two phases. The amount is kept in the bank under the committee's account for any expenses to be made. The water remains available from morning 7.00 am to 7.30 am. Earlier the entire water requirement was met from the bore well, which led to the depletion of groundwater resources, but now the bore wells are just a secondary source in case piped water supply is not available.

Impacts: The village has been able to avail the benefits of Jal Swarajya Yojana through this initiative. The scheme has been running successfully in the village for the last 2 years. It is totally a community-owned yojana. It was difficult to generate community participation during the onset of the project. But after the development of the scheme, people are happy and satisfied as they



Jal Swarajya was initiated in 2003 as a composite, water and sanitation project of the Government of Maharashtra with the World Bank. The project was started with the objective of increasing access of rural households to improved and sustainable drinking water supply and sanitation. The project had four main components:

- Community development and infrastructure building - support to community building and implementation of schemes to manage service delivery, and support for women's development initiatives.
- Institutional Strengthening - to focus on building the capacity of local institutions to be responsive to community demand, and to promote sanitation and hygiene awareness efforts.
- Sector Development and Strengthening - to finance technical assistance to the Government of Maharashtra to advance reforms and management of the Rural Water Supply and Sanitation (RWSS) sector.
- A pilot component consisting of three sub-components - to provide incentives to local government institutions to perform and function effectively, to introduce aquifer-based supply and demand management of water to enhance sustainability of water sources, and to develop and scale-up a model for operation and maintenance of water supply facilities.

Under the project, the State contributed 90 per cent towards capital costs while the community was expected to contribute 10 per cent towards capital costs and 100 per cent of O & M. While the project was lauded for making piped water supply accessible in rural areas of Maharashtra, the project was criticised for its heavy dependence on ground-water sources which are already under stress. In addition, the norm of minimum 40 litres per capita per day was found to be too low when compared with the real needs of the people since other water based needs such as cattle and other livelihoods that require water were not considered when the norm was established.

have piped water supply at their doorstep and they do not have to travel distances in search of water. This has been made possible with the continued support and contribution from the community as a whole. The community stands united now. The maximum initiatives were taken by the women who used to face the maximum problem due to non-availability of water at the household level. Earlier, people could not accept the participation and involvement of women in the Jal Swarajya Samiti, but as time passed, value of their work and their worth was slowly understood and accepted.

7.0

KEYWORDS: carbon efficient green technology, poverty reduction programme, women empowerment, habitat based livelihood, self help groups, waste to wealth technologies, fly ash utilisation.

PANCHATANTRIKA KHAPARKHEDA, NAGPUR

SUMMARY

This project shows how sustainable livelihoods can be created by utilising industrial waste. Fly ash from Khaparkheda power plant is used by a women self help group to make bricks. The self help group supported by a local NGO, Vansampada, bought a hydraulic brick making machine from TARA and set up the brick making enterprise. The group comprising of 25 women from 3 villages today, produces around 8000 bricks per day. This has provided them with a sustained source of livelihood making them feel confident and empowered. Each brick is sold at Rs. 2 to 3 in the market. The overall capital investment was about Rs. 10 lakhs out of which Rs. 5 lakhs were contributed by the DRDA, Nagpur and the rest was accessed as a loan from Dena Bank.

CONTEXT

Panchatantrika, the brick making enterprise has been set up in the Khaparkheda village. The unit lies in the close proximity to the Khaparkheda Thermal Power Plant, about 20 km from the Nagpur city. Started in 1989 Khaparkheda is the oldest Power Station in Maharashtra State Power Generation Co. Limited (Mahagenco) with an installed capacity of 4 x 210 MW.

Need: In the process of power generation, thermal power plants generate a lot of waste which are simply dumped at various sites further polluting the environment. However, there has been evidence that is properly managed waste can be converted into wealth. Recognising the worth of industrial waste, NABARD and Development Alternatives jointly came up with the proposal that wherever there was a thermal power plant, a community based enterprise linked to the waste from the plant should be promoted. The idea was to ensure a market-based sustained livelihood base for the community making use of the already running power plant. Khaparkheda fly ash centre in Nagpur is one such example where industrial waste (fly ash) from the power plant is being utilised to make fly ash bricks.

Scale: The fly ash brick centre, known as Panchtantrika, is an SHG-based (five in number) brick-making enterprise employing 25 to 30 women, and producing about 7,000 – 8,000 bricks a day. Each brick is sold at Rs. 2 to 3 in the market. The initial overall capital investment was about Rs. 10 lakhs. After spending the money over all the expenses, the enterprise now makes a net profit of about Rs. 60,000 per month.

Objectives: The underlying objective of this initiative is to create an environmentally responsive community-based enterprise making use of the industrial waste from the already functioning thermal power plant in the vicinity. This would empower the women SHGs involved and ensure a sustained livelihood base for the entrepreneurs.

SIGNIFICANT HIGHLIGHTS

Technology: Conversion from waste to wealth through the use of alternate technologies has been a significant feature of the project. Making use of the fly ash from the thermal plant, the enterprise produces bricks. The hydraulic brick making machine sourced from TARA is used for this purpose. The machine is fairly simple to use and maintain. A personnel from TARA also provides the necessary support to the enterprise for its operation and maintenance. It is seen that the strength of a fly ash brick is almost the same as normal clay burnt brick; however, the cost is less by about 20 per cent.

Institution: The initiative is a unique example of various stakeholders coming together for a common objective. To begin with five SHGs came together to start up the enterprise. Though only some of the SHG members are working in the enterprise, there are plans to share the profit with other members as well. It is also planned to install one more brick-making machine to involve rest of the SHG members as well. Flexibility in terms of choosing the shift and sending someone else in case of leave has been in-built in the system to enable the women to work in difficult circumstances as well.

The entrepreneurs are being supported by various other agencies to ensure the proper functioning of the enterprise. These include local NGO Van Sampada for awareness and mobilisation; National Thermal Power Corporation (NTPC) for raw material supply; TARA

and Development Alternatives for technology and marketing support; and the DRDA and the DENA Bank for the financial support.

Social: The project is a good demonstration of women's empowerment through livelihood creation. The women's collective coming together to set up an enterprise to produce building materials is in itself a breakthrough given the conventional presence of males in the building material production industry.

"Since I have started working in this enterprise my self confidence has increased manifold. I feel no less than a man now."

- Sangeeta Ji, President, Panchatantrika

"Working in Panchatantrika has given me the opportunity to step out the four walls of my house."

-Pushpa Ben, Panchatantrika

"I don't have to ask for money from my husband any longer. On the contrary, at times I earn more than him and contribute and save for the household expenses. The fact that this is our own company and we are not anyone's employees is overwhelming."

- Shubhangi Ji, Panchatantrika

ENERGY, RESOURCES AND ENVIRONMENT

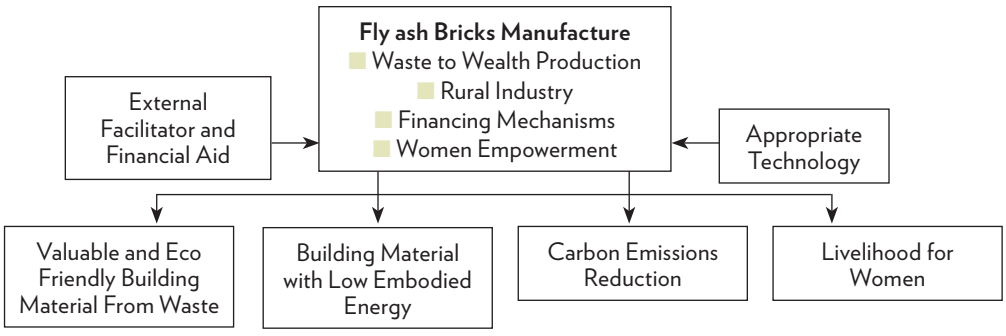
Conversion of waste (fly ash) to wealth (bricks) through the use of alternate technologies has been an innovative feature of the project. Fly ash becomes a hazardous waste when it is reversed in open fields and lagoons. Using coal fly ash for building materials conserves energy by reducing the demand for typical materials such as lime, cement, clay, sand, limestone and gravel which uses energy to mine and produce. Every ton of fly ash reused in cement product means 0.85 ton of carbon dioxide emissions reduction, which is the amount of carbon released into the atmosphere for every ton of cement produced. The recycled fly ash is no more reversed into the environment, therefore preventing depletion of agricultural land. The initiative thus solves dual purpose of waste management and carbon reduction.

CHALLENGES AND RESPONSE

Strategies: The following strategies were adopted as part of the initiative:

- Livelihood generation for women by converting industrial waste (fly ash) from the nearby power plant to wealth (brick) through the use of alternate technologies.
- Mobilisation and capacity development of women SHG to undertake the enterprise.
- Provision of required assistance to the SHG in accessing finance and technology, sourcing raw material and marketing of final product.

Process: Through the efforts of NABARD and Development Alternatives it was proposed to set-up community-based enterprises near the thermal power plants making use of the waste generated at the plant. One such site was selected near the Khaparkheda power plant in Nagpur district. To start up the enterprise, members from five women SHGs were brought together, convinced and supported by a local NGO called Van Sampada. The overall capital requirement for the unit was Rs. 10 lakhs out of which 5 lakhs were provided as the subsidy by DRDA, Nagpur and 5 lakhs were availed as loan from the DENA Bank. The women SHG faced the challenge while availing the loan from the Bank. The regular visits and written assurance from the SHGs removed this bottleneck. Moreover, the regular payment of instalments has also strengthened the trust factor. The land for the unit was taken on rent from a private landowner. The technology, hydraulic brick making machine, was sourced from TARA, which also imparted training to the women entrepreneurs. The raw material is sourced from the power plant on a regular basis. The marketing of the bricks is done by the



entrepreneurs themselves with initial and time-to-time support from the Van Sampada and TARA.

Impacts: The enterprise employing 25 women produces about 8,000 bricks a day in two shifts. Production cost of one brick is within Rs. 1.50 and the bricks are sold for about Rs. 2 to Rs. 3. About one lakh bricks are sold in one month. After deducting the salaries, running cost of the enterprise and the bank instalment, the net profit of the enterprise comes out as about Rs. 60 to 70,000 a month, which is deposited in the bank.

The economic impacts of the enterprise can be seen in terms of monthly income of the entrepreneurs which is Rs. 3000. This has increased the overall household income of these women and has made them economically independent.

The social impacts can be seen in terms of the increased capacities, self respect and self confidence of the women. Working in the enterprise has also affected the internal household dynamics; it has earned respect for the women by their male counterparts. Earlier, the women faced suppression from their male counterparts. However, being an all women enterprise, it became easy for the members to convince their husbands. Moreover, on the receipt of the salary every month, everyone got happy. The husbands are now assisting their wives in household works while they are on work.

The environmental impacts of the initiative can be seen in terms of conversion of waste to wealth and also in terms of reduction in carbon dioxide emission.

8.0

KEYWORDS: sustainable habitat, innovative model of financing, alternative technologies, 'Apna Ghar' or 'My Own Home' concept, cost effective and eco friendly technologies.

MADOR, TIKAMGARH

SUMMARY

Village Mador belongs to one of the most backward regions of India characterised by dwindling natural resources, few livelihood options and poor economic growth. Development Alternatives (DA) initiated the "sustainable habitat project in village Mador" with the objective of providing a *pucca* house with basic amenities and community facilities to 35 tribal families in the village. The project was funded by Council for Advancement of People's Action and Rural Technologies (CAPART) under the Government of India's Innovative Stream for Housing and Habitat Development in April 2005.

The Mador project has proven to be innovative in several ways. It promoted the use of innovative design, materials and technologies in rural housing along with an innovative model of financing, part grant and part loan basis. The village today has *pucca* houses, 2 community halls, 98 individual poultry sheds (generating Rs. 1500 – 2000 per month), 5 solar street lights poles, a motor pump and a storage tank.

This village now has 16 houses constructed with a loan of Rs. 12,000 from Habitat for Humanity International (HFHI) and 35 houses with two-third grant from CAPART and the rest contributed by the beneficiaries. DA provided technical support in the usage of appropriate construction systems like MCR roofing tiles, RCC door window frames and rat trap bond. This was implemented by the formation of village committees (construction committee, audit committee and storage committee).

CONTEXT

Village Mador is located in the Newari Block of Tikamgarh district in Madhya Pradesh.

Need: The Mador Housing Project targeted Below Poverty Line (BPL) families, Scheduled Caste (SC) and Scheduled Tribe (ST) communities in village Mador. These families were primarily dependent on unpredictable wage (from farming or construction activities) earning approximately Rs. 60 per day per family. Low and irregular incomes had direct influence on the quality of their homes. Poor quality materials such as local country bricks for walls, poor baked tiles for roofing made houses susceptible to vagaries of nature like rain. As a result, the houses required weekly maintenance and the roofs had to be replaced annually. There were no proper facilities for cooking. It was done in semi- covered or open spaces and there were no sanitation facilities.

Scale: The village consists of 300 households. The project caters to 35 tribal families belonging to Below Poverty Line, Scheduled Caste and Scheduled Tribe.

Objectives: The objectives of the Mador project were three-fold:

- To improve living conditions in the village.
- To generate income through promoting livelihoods.
- To reduce risk by averting health hazards.

SIGNIFICANT HIGHLIGHTS

Technology

Building Technologies: MCR tiles have been used for roof construction, in place of 'khaprail'. Production of khaprail requires 6 times the wood and the roof constructed is not disaster safe. Moreover, it is not economical as once broken it has to be replaced entirely. On an average 30 per cent of khaprail in the roof is changed every year. 100 pieces of khaprail are required per ceiling. On the other hand, MCR roof is as strong as a *pucca* roof. As the tiles are wider in size, therefore fewer tiles are required for the structure. These tiles can replace expensive options like R.C.C. since they are made up of concrete and wire mesh, less amount of cement is required. If broken, the required pieces can be changed instead of changing the entire roof.

Rat trap bond has been used in the walls. It is a specific type of bond in which bricks are laid in such a way that voids are formed in the walls. The bond requires less number of bricks due to void formation, thereby reducing energy consumption. This type of

bond helps in insulation, as the heat gets trapped in the voids and keeps the inner wall of the house cool, maintaining an ambient temperature both in winters and summers. Bricks produced at VSBK further reduce energy consumption.

Pre-cast R.C.C door and window frames have been installed. These are preferred over the traditional wooden frames for their strength and durability. The wood of the other frames disintegrates easily whereas these types of frames provide stability.

Stone slabs and pre-stressed beam have been laid. This roofing system provides the flexibility to add more floors to the house. This also allows modification and customisation. This house is termed a '*pucca* house' according to government standards as well.

Water Supply and Sanitation: Twin pit toilets have been constructed. This system involves two pits; main and auxiliary. Once the main pit gets filled up, the waste is diverted into the auxiliary pit where it gets converted into manure and can be used again. Water tanks and pumps form an integral part of the water supply system. Water storage in tanks prevents water contamination thereby, improving water quality. The soakage pit system allows the waste water to percolate into the ground and helps in groundwater recharge. In this system, the topmost layer of the pit is of loose gravel which lets water percolate. Due to the construction of a check dam in the nearby village named Burera, whose catchment area is around 5 km, the water level in Mador village has increased, and availability of water is not a problem now.

Institution: The provision of housing finance was in the form of part grant and part loan. Out of the total Rs 25000, 2/3rd was given as grant by CAPART and 1/3rd was people's own contribution (through loans). The concept of 'Apna Ghar' or 'my own home' triggered a feeling of 'ownership' amongst the community and motivated them for capacity building and livelihood related activities. The community was involved in the poultry based enterprise for livelihood generation and capacity building. This has given villagers the motivation to move towards development.

Social: The project had a strong component of community participation. All 35 families were involved in the construction of the houses through CEEF technologies, in the form of labour which amounted to 10 per cent of the total cost. Capacity building of the community by the way of training for construction of houses with CEEF technologies has made the community aware of the latest techniques and methods of construction. This has improved and enhanced their skills and knowledge. It has also increased the livelihood potential due to increased job opportunities, as they are technically skilled and trained to carry out the construction process. Also, poultry farms are a source of increased livelihood options. Repayment of loans has led to circulation of money; others are given loan with the same money, thereby leading to social development. This project has taught the villagers to fight against the most extreme situations and emerge out as winners. It has also motivated them to work for the development of the village, as well for themselves and their progress as individuals. The quality of life has improved with the transformation of their habitat.

ENERGY, RESOURCES AND ENVIRONMENT

Smokeless *chulhas* have been used for cooking purposes. These are cooking stoves which increase combustion efficiency thereby reducing pollution as opposed to the traditional *chulhas* which involve high consumption of wood, and are polluting as well. Closed stoves reduce the quantity of wood required for cooking, hence reducing forest depletion. Solar street lamps have been installed to conserve the non-renewable sources of energy.

CHALLENGES AND RESPONSE

Strategies: The following strategies were adopted to achieve the desired objectives:

- An integrated habitat and livelihood support project to address shelter needs and poverty simultaneously. It provided loans to the people for house construction as well as livelihood opportunities to earn and repay the loans.

- Innovative financial model, part grant and part loan system.
- Community participation, through SHGs.
- Multi- stakeholders Involvement, the 35 families from Adivasi Ahirwar and Prajapati communities in Mador were involved in the construction of the individual houses (using CEEF technologies) through contribution (in the form of unskilled labour) equivalent to 10 per cent of the total cost of the house. The regional appropriate technology resource centre of Development Alternatives in Bundelkhand was responsible for implementing the project strategy. It also facilitated and managed the project processes, as well as arranged the financial resources for the project. CAPART allocated central government funds through the Innovative Stream for Housing and Habitat Development to Development Alternatives (DA). The project was also linked with PRADAN's (a locally operating national NGO) initiative to establish poultry farms in the village with the help of District Poverty Initiatives Programme's (DPIP) funds. Business skills, technical expertise and market connection was provided by Pradaan to run the poultry farms.

Process: In the desire of having their own house, 4 SHGs from 3 villages came together and saved money. With an initial saving of Rs. 2000 they created a registry under the Innovative Scheme for Housing and Habitat Development and thereafter, the SHGs became entitled to take loan from the bank, required for construction of their houses. The Nirman Samiti trained local people/owners in CEEF technologies leading to capacity building of the community, as well as livelihood generation (as local masons, labour required for construction). Under the DPIP, an organisation called Pradaan developed poultry farms as a small business enterprise to generate livelihood, in order to repay the loan through revenue generated from the poultry farm. Initially the revenue generated out of 10-12 days of work was just Rs. 40. Now under this scheme, revenue generation has increased to Rs1800/day thereby generating enough money to be used for construction of houses and facilitating money circulation. Now, the trained masons travel to other villages to work and train other masons.

Impacts: Construction of 52 *pucca* houses in the village has been completed under the project. There is provision of 5 solar street lamps, out of which 4 are operational. 8 hand pumps have also been installed. There is provision for groundwater recharge through soakage pits. 120 poultry farms are present out of which 104 are operational. The waste from the poultry is traded as manure. The skill level of the masons has increased to the extent that they travel to other villages as trainers as well as service providers.

Unresolved Issues

- Toilets are still not being used properly. Villagers still prefer to go to open areas, which are far from their homes.
- Lack of other infrastructure – taps, roads and drainage system.
- There is possibility of increase in health hazards/ environment pollution, with increasing number of poultry farms.
- Forest depletion is leading to reduction in rainfall, which in turn would reduce income generation from farming practices.

9.0

KEYWORDS: renewable energy, solar energy for development, decentralised energy practice, energy saving practices, participatory and community led development.

RAMPURA SOLAR VILLAGE, JHANSI

SUMMARY

Rampura, 17 kms away from Jhansi in the Bundelkhand region, is the first village to get a community based solar power plant (CSPP) in the country. This project demonstrates a village habitat development model with emphasis on renewable energy promoted by SCATEC (Norway) and Development Alternatives (DA). It represents a major step towards rural electrification in India.

The CSPPs, installed 60 solar panels to power 24 batteries of approximately 9 kW each provide clean and reliable electricity to 150 households as well as to local micro-industry. In Rampura, the power is distributed through a local mini-grid; the power in the first stage was used for lighting, fans and entertainment/ educational purposes (TV, radio). The plants are however sized so that the villagers may also utilise the electricity to improve existing, or establish new, income generating activities (flour mill, water pumping and distribution, sewing machine, cash crop drying, etc). The villagers pay for the electricity at a tariff based on what villagers currently pay for different sources of energy, such as kerosene and diesel. The revenues generated cover operations and maintenance cost, as well as the replacement of batteries and other components.

A village energy committee (VEC) has also been established with local people's representatives and experts, actively involved in the development of the area, a major step to enhance knowledge and skills of rural people in energy management. The VEC plans, implements, monitors and controls the project activities.

CONTEXT

Rampura is a village, 17 km away from Jhansi, in block Badagaon of Jhansi district in the Bundelkhand region of Uttar Pradesh.

Need; There was absence of grid electrification in the village. Most of the energy demand in Rampura depended on the fossil fuels and also biomass; thereby polluting the environment, for instance kerosene lamps for lighting, diesel pumps for irrigation and cow dung for cooking. An alternate source of energy was just thought to be worth exploring to meet the energy needs of the village and reducing the dependence on non-renewable sources of energy that also pollutes the environment.

Scale: The village has a population of 332 people inhabiting in 69 households. The village is spread over an area of 99 acres. It is the first village to get a community based solar power plant (CSPP) in the country. The solar power plants, installed 60 solar panels to power 24 batteries in order to provide clean and reliable electricity to 69 households as well as to local micro enterprises.

Objectives: The objectives of the project were as follows:

- To propose a CSPP for electrification of the village through a local mini-grid. To check the techno-social viability of the model and to establish a pilot project that could be replicated all over India.
- To make the community self-reliant through capacity building.
- To manage the demand and supply of energy, giving priority to domestic, enterprise and community services.
- To diminish CO_2 emission and therefore mitigate climate change through the use of renewable energies.
- To facilitate the growth of energy-based sustainable livelihoods for uplifting rural economy.

SIGNIFICANT HIGHLIGHTS

Technology: A power plant of 8.7 kWp has been installed which includes 60 solar panels to power 24 batteries. The 24 batteries (2 volt and 2500 A hrs) provide back-up for the energy requirements of 2 days. The plant generates roughly about 42 units of power on a sunny day. The life of the panel installed is about 20 years. A GSM panel has been setup in the control room, to monitor and control the power consumption and system, to regulate project cost for future.

The tariff structure of the power consumption is as follows:

- Up to 5 unit consumption fix charge of Rs. 20

	+ Rs. 4.50 per extra unit
■ 5-10 unit consumption	fix charge of Rs. 90 + Rs. 5.50 per extra unit
■ >10	fix charge of Rs. 160 + Rs. 6.50 per extra unit
■ Maximum revenue in a month	Rs. 5,500

Institution: The project is a classic example of innovative business model. The electricity is being provided free of cost for the time being for motivation and capacity building. There is potential for the company as service providers in the long run which will be beneficial for them with the replication of such models, hence becoming a business model rather than a welfare model. The revenue generation based on the tariff plans, to be used for replacement of the panels; hence money is being circulated within the system.

The role of Panchayat in realising the importance of assured service on account of refusal to state electricity board for grid-based electrification has been significant. They are contributing, not only in providing service VEC but also taking care of infrastructure and taking up capacity building exercises through computer education for students.

Social: The project has led to capacity building of the community by creating awareness among the villagers on energy efficiency and optimisation of use to ensure a balance between demand and supply. The in-built mechanisms of monitoring, evaluation and learning in the project take care of the techno-social issues and also ensure project learning.

There is enough power supply for both micro enterprises at household level and small rural industries that could be developed over the long. The community has access to electricity at any time, and human activities don't depend anymore on the sunlight. Children are able to study late at night with proper lighting; household activities can be carried out at any time of the day. Overall, the productivity of the individuals in all aspects has improved.

ENERGY, RESOURCES AND ENVIRONMENT

Solar photovoltaic energy is a clean alternative as compared to the use of conventional fuels and biomass. It is also a zero CO_2 emission alternative compared to grid electricity generated from thermal power plants.

CHALLENGES AND RESPONSE

Strategies

- Installation of the community solar power plant and setting up of a village energy committee (to ensure community participation).
- Enhancing and motivating potential micro entrepreneurs and providing them support to develop and run their energy service based enterprises.
- Through capacity building formation of the VEC; assisting technology suppliers to develop infrastructure and services; creating awareness among the villagers on energy efficiency and optimising the use to ensure a balance between demand and supply and initiate a process of adopting energy efficient devices like sprinkler, solar charged batteries and CFL/LED, energy saving practices.

Process: In 1998, Development Alternatives (locally known as TARAgram) under the Swajal Dhara Programme initiated the process of water and sanitation, by introducing hand pumps and toilets with a proper drainage system in the village. 90 per cent funds were provided by the government while the rest 10 per cent by the beneficiaries. Through a selection process, a Chairman (*Adhyaksha*) was appointed, and 10-12 hand pumps were set up in the village. This gave the community the confidence and confirmation, that they could run systems and manage their resources on their own and, find appropriate solutions to their problems.

As a result, the grid electricity, provided by the government (for just a few hours in a day) was refused by the villagers; they wanted their own electricity and wanted to pay for it, in order to have it throughout the day. On getting an approval, the village was provided with the land for this purpose, a VEC was formed, and a bank account was open. DA, along with Bergen and Solar 23 set up the entire system and provided them with technical support and assistance. This initiative was funded by Scatec Solar as they wanted to test the economic viability of a clean and decentralised power plant and its potential for replicability. For this purpose two rooms (power house) were constructed and all the technology components were installed in them. Power plant of a capacity of 8.7 kWp was commissioned on 26th Jan, 2009 generating about 42 units of power per sunny day. Mini transmission and distribution line was then laid down.

A VEC has also been established with local people's representatives plus experts actively involved in the development of the area. This is a major step to enhance knowledge and skills of villagers in energy management. The VEC plans, implements, monitors and controls the project activities. The committee is helping to construct, operate and maintain the centre as well as to mobilise the villagers for various community activities. The whole village has contributed to complete the implementation work within 26 working days. Development Alternatives provided the components of social engineering for the provision of water storage and supply system. SCATEC Solar – Norway funded the entire project, Bergen group India was the technology provider, and technical equipment were sourced from Solar 23 Germany. Panchayat provided the necessary land for the setup.

Other development works carried out in the village beyond CSPP model include: land filing/levelling of school compound, repair and maintenance of 2 Panchayat rooms, repair of 2 hand pumps in school campus, reconstruction of toilets in the school campus, fencing the whole school compound and developing a small lawn, park and play ground for school children. A solar home lighting system has also been commissioned for the school. Computer has been made available for school children with a teacher for at least 1 year. A big TV with dish connection has been donated for school children. 7 soak-pits have been constructed in village, out of which 1 is for school. 2 SHG and 1 farmer's club have been formed.

Impacts: Electricity from the solar power plant is benefitting 69 households. Solar energy is being generated through 60 solar panels to power 24 batteries. 25 electric poles 13 solar power operated street lamps have been installed in the village. 43 households (out total 69) took paid power connection, with meter and MCB for safety of the household. There are CFLs and fans in every house. One enterprise (flour mill of 3 HP) has been established by an individual. VEC members have been trained to carry out various activities related to the project implementation and monitoring. A tariff model has been developed and introduced in the village, to examine possible techno-social integration towards ensuring the financial viability of the power plant. Wall painting (awareness slogan) and game (Energy based Snake and Ladder game) has been distributed in the village to promote energy efficiency.

The fact that we are getting the continuous supply, at least the amount which we are paying for, is much more significant to us, and we do not have any problems paying extra for it.

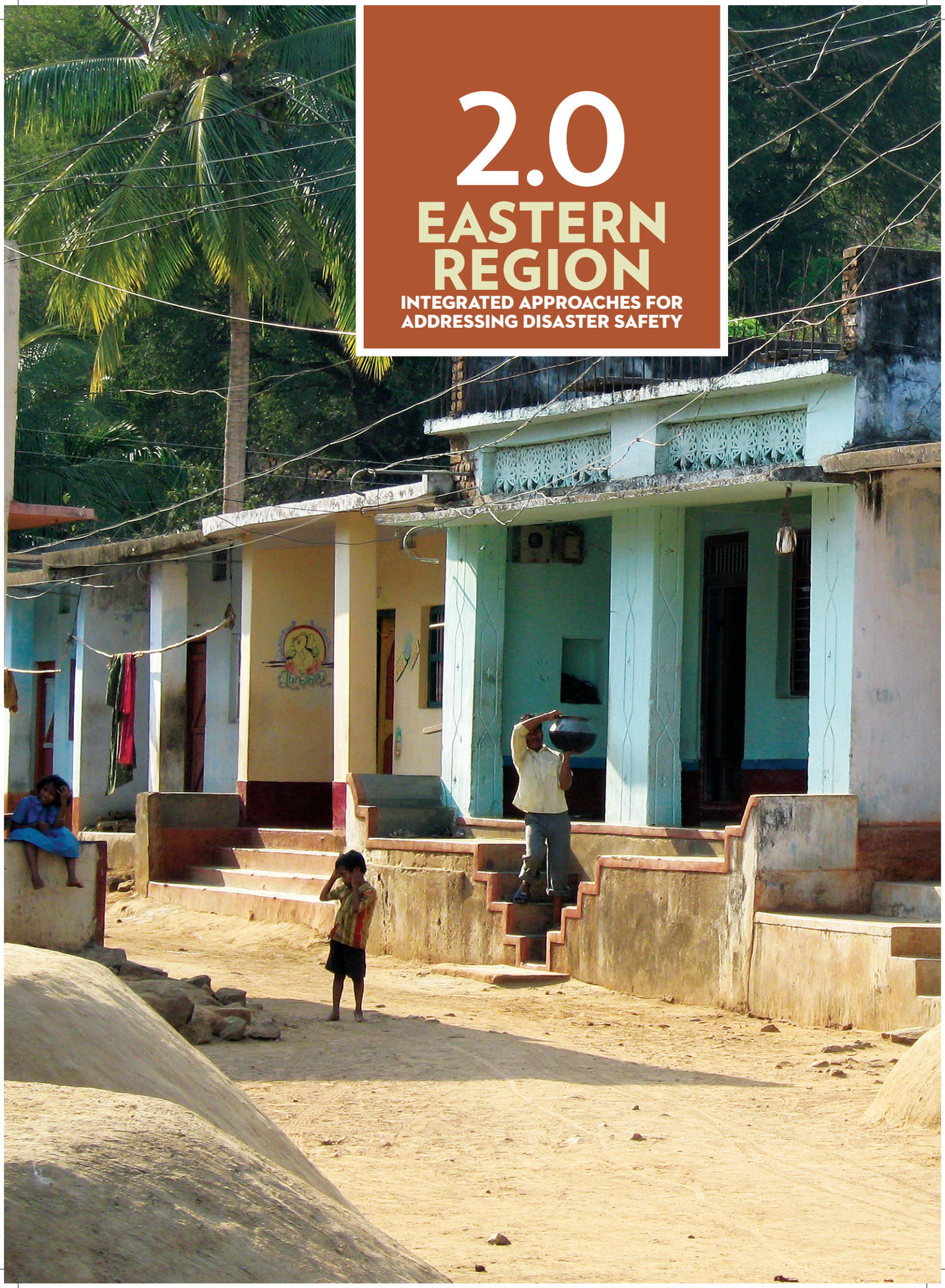
- Anonymous

This is a very good system, a truly unique model!

- Anonymous

Unresolved Issues

- Replacement package not ready yet.
- Dust accumulation on the panels can reduce the life of the solar panel.
- Utilisation of solar energy for farming practices like irrigation.
- Generation of value addition activities to existing enterprises.



2.0 EASTERN REGION

INTEGRATED APPROACHES FOR ADDRESSING DISASTER SAFETY

Civil Society participation took a surge in the Eastern region to rehabilitate communities, by making them resilient through building awareness on hygiene and increasing access to disaster resistant and environment friendly practices.

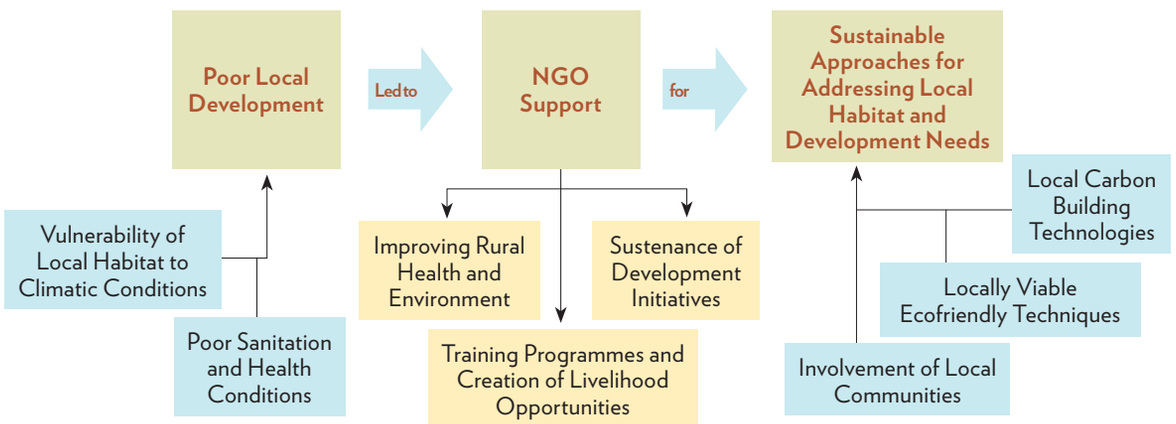
Majority of the eastern region of India lies along the coast of Bay of Bengal and on the Indo-Gangetic plain. The region is characterised by humid sub-tropical weather and is a vulnerable area with regard to cyclones and floods. The Lok Awaas Yatra covered Odisha, Bihar and parts of the Sundarbans in the Eastern Region of India and explored habitat development initiatives that have taken place against the backdrop of the region's vulnerability. A number of cases of local habitat development were covered across two trails during the *Yatra* of this region. Post natural disasters, specifically the cyclones of 1999 and the floods of 2001, NGO support came in for rehabilitating the communities and also helping build resilience through sustainable approaches which included disaster resistant and environment friendly practices. The diagram (Fig 1.) gives an overview of the system that was observed in the Eastern region.

ADDRESSING DEVELOPMENT LACUNAE

The eastern region covered by the Lok Awaas Yatra, is characterised by high climatic risk, as mentioned, in terms of cyclones and/or floods. The pitiable condition of the local habitat (where houses were *kuccha*, made up of mud and thatched roofs) vulnerable to natural phenomenon is compounded by extreme poverty, lack of adequate infrastructure and poor connectivity. Inadequate and poor implementation of government programmes for building houses and for infrastructure is an area of concern for the eastern states.

Poor habitat conditions automatically meant that the situation of health and sanitation in the area was dismal as well. It was found that the access of the population to health and sanitation facilities was incredibly poor coupled with their lack of awareness on maintenance of proper hygiene. *Gram Vikas's* work in the tribal villages of Odisha started with health related interventions when it was realised that poor health conditions was the biggest problem in the state. Unclean drinking water and unhygienic practices like open defecation led to deteriorating health due to water borne diseases such as diarrhoea, typhoid and malaria. The interventions in health and hygiene leading to total sanitation construction of *pucca* toilets and water supply systems grew to address shelter needs as well. Some of the early habitat interventions by Gram Vikas stood testimony to community resilience in facing natural disasters. Documented evidence of communities getting back to their economic activities within weeks after the super cyclone of 1999 as compared to years in the rest

Fig 1: Overview of the Eastern Region System



of State provided lessons on *pucca* habitat solutions being a backbone for building disaster resilience in rural communities.

The Movement and Action Network for Transformation of Rural Areas (MANTRA) programme of the Gram Vikas addresses the issues of natural resource management for promoting food security and livelihood creation. Community forestry, horticulture, land and water conservation methods are promoted along with the implementation of watershed development projects. Also, Self Help Groups (SHGs) have been supported through loans from banks and collective savings from its members. They also support individual and collective income generation activities such as livestock rearing, horticulture, plate making, broom binding and making pickles.

The setting up of community enterprises and SHG groups to promote savings and collective action is another strategy adopted by the organisations in the region for habitat interventions. Savings are directed for accessing and repaying housing loans that help finance house and toilet constructions across the 400 villages where Gram Vikas works.

The Megh Pyne Abhiyan (MPA), facilitated village water communities to ensure community participation in planning and implementation of water and sanitation initiatives. Artisan self help groups have also been set up, which through bank loans have been able to set up microenterprises for offering their services.

The creation of livelihood opportunities and involvement of the community, thus, did not just start and end with masonry and reconstruction processes, but a lot of it was extended to other alternate sources of livelihood. Many of these initiatives were linked with energy related services especially in Bihar where the condition of power supply is dismal.

At the Saran Renewable Energy Systems Project (SRESP), it was seen that the local community is involved in the entire process of procuring raw materials for power generation. This was done through awareness campaigns, which encouraged villagers to cultivate dhaincha on their lands. The plant is benefitting the local society in two ways; firstly, it provides electricity and water for running businesses, industries and agriculture, and secondly, livelihood options have been created through its cultivation. Dhaincha, which is used for fuel, thrives on waterlogged soil. About 2000 hectares of low-lying farmland in Saran remains waterlogged throughout the year, making it unsuitable for most crops. Hence, farmers were given free seeds to grow '*dhaincha*,' and crop is procured as a resource for energy production.

SUSTAINABLE PROCESSES FOR DISASTER SAFE HABITAT

In October 1999, the coast of Odisha was struck by two cyclones. The second cyclonic storm was accompanied by rainfall, tidal waves, and winds of over 250km/hr. According to official estimates, at least 10,000 people died and 800,000 houses were destroyed. The loss of lives and property was compounded by the damage to the overall habitat. Later the floods in the year 2001 also caused immense loss of lives and property in addition to housing shortages. The need for cyclone and flood resistant shelters was thus realised. In addressing the critical situation of housing shortages and damaged houses, the government decided to reach out to the people by providing grants under the Indira Awaas Yojna. However, due to inadequacy of the government grants, insufficient building materials and a lack of appropriate technological expertise and services of skilled masons, construction of durable houses suffered a setback. As a result, the poor were unable to complete the reconstruction of their houses.

These conditions of high vulnerability and poor local development especially in terms of basic services like health and sanitation led to most organisations working in these states to use reconstruction after a disaster as an entry point for introduction of other development initiatives.

The large scale destruction after the natural disasters was an eye opener and triggered interventions in the region. Organisations soon realised that mere reconstruction of the houses was not the answer. Communities would have to be involved to work towards development initiatives to change and improve their living conditions. In this regard the support and guidance of NGOs came in three forms:

- Training programmes and creation of livelihood opportunities
- Improving rural health and sanitation
- Sustenance of development initiatives

SKILL BUILDING AND HABITAT BASED LIVELIHOOD OPPORTUNITIES

Involvement of the community in terms of reconstruction allowed the opportunity to train local youth and artisans

in disaster safe constructions. For instance, in the Ashraya Project, catered to quality building materials and need for skilled construction labourers, CARE India in association with Development Alternatives, SK Das and Associates and a partnership of local NGOs, started an initiative to manufacture building materials as well as train unskilled labourers as masons. The concept of providing building materials as well as trained masons of any gender gave birth to Ashraya Building Materials Services Bank (BMSB) in Cuttak. Their first aim was the construction of core housing units through a community based management approach. This was interlinked with their second goal to build the capacities of the community and local partners through training in selected construction systems and building material production processes for the construction of 1400 core units and the sustainability of the entire habitat delivery process. Training has been given to the local masons, barbenders, welders, carpenters and other affiliated trades. In addition, skill mapping of artisans was conducted which proved to be useful in providing work opportunities to the artisans and in the upgradation of their skills. Ashraya is now a single window centre for all habitat needs.

Similarly, in projects like the Technology Demonstration Units (TDU) led by UNDP in Odisha, masons and artisans from the region have been training in disaster resistant, cost effective and environment friendly technologies. For the purpose of adding brand value to the trained masons, the TDU came up with a classification of masons/artisans. Different training modules and course curricula were prepared for different target groups. Broadly they are categorised into five groups:

i. Construction labourers (men and women) trained on basic construction practices like building foundations, walls, roofs etc.

ii. Semi-skilled masons trained in good construction practices like layouts, foundations, walls, openings and roofs

iii. Skilled masons trained on cost effective, multi hazard resistant construction technologies and the interpretation of drawings and designs

iv. Master masons are trained on multi hazard resistant construction technologies, basic designing and estimations

v. Trainer masons are trained on skills on imparting training programmes

Organisations like Gram Vikas and the Tilothu Mahila Mandal have been working on training local youth in masonry and have also added more trades so that farmers, women and other community members have options for livelihood.

IMPROVING RURAL HEALTH AND SANITATION

Hot humid conditions, water logged soils, poor infrastructure and poverty are recipes for poor health and hygiene conditions. Many of the interventions have targeted rural health and sanitation initiatives. The projects that were studied had a history of open defecation, lack of clean drinking water along with contaminated ground water sources (even though there was abundance of water in the region), high incidence of water borne diseases and lack of access to proper health facilities. All of this together indicated the need for working towards improving the rural health and sanitation scenario. Gram Vikas a forerunner in the region during its inception phase, started with improving rural health and sanitation and then moved on to an integrated rural development programme.

In the reconstruction projects in Odisha and Bihar, toilets were set up along with the houses and awareness building programmes were employed to inform the people about proper sanitation practices. Some projects used fines as penalty for being unhygienic and practicing open defecation. Initiatives were taken to change the behaviour of the people with regard to sanitation. The Jalbandhu Group – an organisation comprising of the village youth, initiated by ***Sabuj Sangha*** and paid for by the panchayat and the community is responsible for the maintenance of the water structures in the village. Every family has a toilet, which is based on the single leach-pit system. Fresh water used for drinking and bathing is tapped from underground sources. Each family pays Rs 1 to 2 per month towards maintenance charges.

The challenge with regard to water in the region was not the access to it, but its potability. The region experiences abundance of rain and has rich ground water sources which unfortunately, as mentioned, are contaminated. Solutions to improve the quality of drinking water has included harvesting rain water in an effective manner and using filters for purification.

The *matka* filter started by the Kosi Seva Sadan in partnership with the MPA is an innovative and affordable solution for water purification. The filter was developed in response to excessive iron content in over 75 per cent of potable water sources in the Supaul district, one of the

areas of operation under the MPA. The filter comprises of filtration chambers containing filtration materials of graded sand and charcoal powder. The lower chamber stores filtered water with a tap outlet. Another alternate model is made with bamboo and earth and has a similar filtration process. Both filter models use natural resources and are made locally by the potters and supplied to the villages. A pilot project was set up for the production and supply of '*matka*' or earthen pot water filters for use in rural Bihar.

Individual household level rainwater harvesting systems have been promoted to collect and store drinking water by the MPA village level overhead water tanks and piped water supply are widely promoted by Gram Vikas.

SUSTENANCE OF DEVELOPMENT INITIATIVES

Systems have been put in place for continuous support services to village communities to ensure sustenance of improved habitat interventions. Civil Society Organisations (CSOs) provided communities with a range of supports and still continue to do so. Initially it started with support in reconstruction. At this point, architectural and structural guidance was also provided. Training was given to artisans and masons in ecofriendly building technologies and safe construction to make this a viable income generation avenue. Artisans were also organised into groups and enterprises.

Technology serves as a catalyst for the generation of green jobs at the Tilothu Mahila Mandal Building Centre. The Centre provides for training and promotes entrepreneurship in resource efficient building components, reinforcing the drive towards a green and sustainable future. The materials are being produced at the centre, entrepreneurial support is provided and these measures help in making the technologies available for application on the ground.

Enabling housing loans through a variety of measures such as providing securities, organising families in self-help groups and negotiating with banks for low interest rates has been strategy to continue habitat development processes. Both Gram Vikas, a fore runner and Ashraya have developed financial linkages between banks and local communities for accessing housing credit. Ashraya encouraged women to start their own savings group. Women masons have also been trained in various low carbon construction practices. The Maa Tarini Savings Credit House Building Cooperative promoted by Ashraya is now a movement in the Cuttak district. The society consists of 825 women SHGs, with 9500 female members. It has been able to promote savings by local women and augment funds through micro credits that are directed to livelihood creation as well as housing construction.

INVOLVEMENT OF LOCAL PEOPLE

Community participation is a key component that has led to the success of programmes that aim at the rehabilitation and overall development of the communities. In this regard in all cases studied, involvement across all social groups - men and women was an integral part of the development processes. Local development committees representative of all communities were set up which managed the process of reconstruction, water management and other initiatives with the assistance of the organisations in the area.

The 'all-or-none' approach promoted by Gram Vikas in 400 villages has brought the community together to create defecation free villages with safe drinking water and *pucca* houses. The Gram Vikas / MANTRA programme believes in equal benefits and hence aims to reach to all households in its project areas. There is involvement of people from all sections of the community irrespective of their class and castes. Both men and women have equal roles in the decision-making processes. The Village Executive Committee is set up that acts as a decision-making body of the village and has 50 per cent women representatives.

Gram Vikas supported community based management systems or sub committees like sanitation committees, education committees and health committees for all the sub programmes under the umbrella approach of MANTRA. As a result, all the decisions that are taken under the programme are for the people and by the people. This ensures that the people who get the benefits are those who are in actual need, making the process just and fair. Moreover, the organisations work in villages only when there is an agreement from the families to be part of the development process. The rationale behind this is, all families in every village where the programme is being implemented must be involved in the process, and unless all the households agree to participate, it is difficult to bring about a change in practice and improve peoples' quality of life.

Another factor in community participation was employing a cost sharing model that this part of the cost of construction in borne by the beneficiaries

so as to allow them to own the process. The cost sharing was seen in a couple of different ways – that in terms of monetary contribution, labour, and material transportation costs. The construction cost of a toilet in 2010 in Odisha was approximately Rs. 8000, where the beneficiary's contribution was about Rs. 2500. District Rural Water and Sanitation Mission's (DWSM) contribution was Rs.1250 and the rest was contributed by Gram Vikas.

In Puraini, Ganjam district, 88 families have built their houses with bricks and used corrugated galvanised iron (CGI) sheets for their sloping roofs. The average size of a house is 290 sq.ft constructed at a cost of Rs. 275 per sq.ft. Every family received financial assistance of Rs. 55,000 (including Rs. 3,000 as incentive for timely completion) and each family contributed about Rs. 25,000 in the form of labour, recycled materials and cash. 66 individual toilets have been constructed with financial support of Rs. 8,000 each. Some joint families (2 to 3 families) have built a common toilet and the money saved has been used to construct bathrooms and other amenities. In many of the cases, the organisations took effort to bring forward women, by training them in skills like masonry. Social and gender equity was thus a priority in many of the cases covered.

Integrating Environmental Concerns into Habitat: Early into the interventions of reconstruction, the organisations working in the area realised it as an opportunity to build disaster resistant and ecofriendly structures, as well as build the local infrastructure along the same lines for long standing durability. This was translated into increasing energy access, access to clean water and other basic services. Three basic themes came forth:

- Low energy and resource efficient building technologies,
- Regional geo-climatic response to housing and habitat, and,
- Integrating disaster safety in construction.

Low Energy and Resource Efficient Building Technologies: We find that a lot of initiatives were taken in terms of introducing resource and energy efficient building materials and technologies. Some of the building materials (Table 1) and construction technologies used in the region are:

Demonstrations and awareness generation with regard to these technologies was a significant part of the initiatives, as these were alien to the local populace, and thus for them to accept their durability and effectiveness for application in their homes there was a need to build their knowledge around such technologies.

Technology Demonstration Units (TDUs) were constructed to demonstrate cost-effective, economically and socially sustainable construction technologies. These TDUs have been built using locally available materials. They are also used to train masons and unskilled construction workers in the villages. The TDUs likewise provide evidences for villagers to experience benefits of appropriate building technologies. These technological demonstrations would build trust in them and they would feel confident in applying these skills in the construction of their own houses. So far, as many as 99 TDUs have been constructed and a number of technologies promoted through them. These technologies have been used in the construction of many individual houses and government buildings. Many villagers of the Jagatsinghpur district in Odisha have been encouraged to adopt these cost effective technologies promoted through the demonstration units set up by the UNDP in about 40 villages of the area. More than 1800 houses have been constructed till date all over the State.

Regional Geo-climatic Response to Habitat: Housing initiatives in the case studies were characterised by appropriate response to the local climate, culture and resource base and focus on improving indoor and external environmental conditions. The example of Sabuj Sangha in the Sundarban region where the design adopted the traditional housing form. Houses constructed were at a minimum distance of about 500 metres from the embankment. The orientation of the houses is generally south–west in the direction of the wind, which aides in cross ventilation since the Sundarban is highly humid.

Gram Vikas' interventions have helped to reduce indoor air pollution and consumption of fuel wood in rural homes through the promotion of 'smokeless' *chulahs* or improved cooking stoves. The distribution of *chulahs* to 1/3rd of the households in every village of Ganjam are a part of the research that is being conducted by the Massachusetts Institute of Technology (MIT), Boston. Other than this, Gram Vikas has also implemented other technologies such as wood gasifiers, micro-hydro projects, solar photovoltaic applications and biodiesel fuelled energy systems in few villages.

Ecofriendly and locally appropriate technology was used in the field of sanitation. Northern Bihar is a highly flood prone zone. The concept of *faydemand*

Table 1: Low Carbon Building Technologies

Ferrocement roofing channels and door and windows
Micro concrete tiles
Plank and joist
Interlocking fly ash/mud bricks
Hydroform blocks
Hollow concrete blocks
Door and window frames
Low cost binding mortar/magic mortar
Paving blocks
Precast leach pits
Rat trap bond
Filler slab concrete roofing
Pre cast plant and joist for roofing
Reinforced brick lintel
Compressed earth blocks
Use of eco-bricks
Micro concrete roofing tiles

shauchalaya developed by Biome in Bangalore has been promoted here. It is a low cost dry toilet system that has separate chambers for faeces, urine and waste water. The faeces decompose into manure, urine is diverted and utilised as urea and waste water is used for watering plants. This model has been accepted in rural areas of north east Bihar. It simultaneously addresses the need for sanitation infrastructure without adverse impact on the local environment. Although the idea of Ecosan toilets has been sourced from Bangalore, it has been modified to suit the local conditions. The use of toilets has reduced land pollution and related diseases. However, the acceptance of Ecosan toilets still remains a challenge.

EASTERN REGION

CASE STUDIES

1.0

KEYWORDS: community participation, enterprise based delivery process, cost effective technology, low carbon technology, habitat based livelihood

ASHRAYA, CHOWDWAR, CUTTAK

SUMMARY

The coast of Odisha was struck by two cyclones in the same month and year. The first on the 17th and the second on 29 October 1999. The second cyclonic storm was accompanied by rainfall, tidal waves, and winds of over 250km/hr. According to official estimates, at least 10,000 people died and 800,000 houses were destroyed. The loss of lives and property was compounded by the damage to the overall habitat.

During the reconstruction phase after the cyclone, there was a shortage of quality building materials. Similarly, there was a great need for skilled construction workers.

To cater for this void, CARE India in association with Development Alternatives, SK Das & Associates and a partnership of local NGOs, started an initiative to manufacture building materials as well as train unskilled labourers as masons etc. The concept of providing building materials as well as trained masons of any gender gave birth to Ashraya BMSB.

The goal set out for the Ashraya project, was to support the cyclone affected and vulnerable households to have access to land as well as gain control over building their own safe habitats. The detailed objectives were:

- To facilitate the construction of core house units using sustainable building technologies and cyclone resistant construction systems, through a community based management approach.
- To build up capacities of the community and local partners through training in selected construction systems and building material production processes. This is for the implementation of the 1400 core units and the sustainability of the entire habitat delivery process.

CONTEXT

Where: The Ashraya resource centre is located in the Chowdhar Cuttak district, around 47 kms from Bhubaneshwar on approximately 5 acres of land.

What: The Building Materials and Services Bank (BMSB) is a centre, which provides technology support, low carbon building materials and finance for rural housing.

Who: Ashraya is a registered society set up in 2000 after the Odisha cyclone. It is now a section 25 company owned by 25 female entrepreneurs and their partners.

For Whom: The initial targets of the centre were the people affected by the cyclone, whose houses had to rebuild. It now caters for a large rural population in Cuttak and its adjoining districts. It also provides material support to corporate for developing their infrastructure.

SIGNIFICANT HIGHLIGHTS

Technology: BMSBs promote a whole range of affordable and low carbon technologies. These include the following:

- **Roofing**
  - Ferrocement roofing channels
  - Micro concrete tiles - they are currently being sold at Rs 7/tile
  - Plank and Joist - The planks are sold at Rs 170/pc and the joists at Rs 70/sft
- **Walling**
  - Fly ash bricks - these consists of blocks made of fly ash sand lime and gypsum (75,83,20,12 kgs resp. to make 18 nos)
  - Interlocking fly ash / mud bricks CSEB - a block made on Hydrofoam machine is produced at a rate of Rs 8/brick and sold at a rate of Rs 10/brick. A house of 100sft, which uses such blocks saves up to Rs 4500 in terms of cost reduction in bricks. A typical block is 9.5x9x4.5 in dimension. The mix consists of sand soil and cement (72,60,14 kg to make 14 blocks). The hydrofoam block-making machine was purchased for Rs. 7 lakhs and produces 2000 blocks/day.
  - Hollow concrete blocks are sold at Rs 20/unit.
- **Other technologies**
  - Door and window frames
  - Magic mortar - this low cost binding material currently being researched, consist of 20 per cent fly ash and 20

per cent sand.
- This will be sold at 1/5th the cost of conventional Portland cement.
- Paving Blocks
- Precast leach pits
- Food processing units

Institution

Single window to meet habitat needs: The BMSB was conceptualised as a one stop shop for;
- Production and supply of building materials
- Demonstration of building technologies - equipment products production process and applications
- Provision of building elements on demand to the community accessing the bank

Unique portfolio: The BMSB has enhanced its portfolio by not looking at the supply side of materials and skills. However, it has strengthened the demand by providing and facilitating access to finance and professional services such as structural and architectural guidance, sanitation, and domestic energy facilities. The Maa Tarini Savings Credit House Building Cooperative promoted by Ashraya is now a movement in the Cuttak district. The society consists of 825 women SHGs, with 9500 female members. It has been able to promote savings by local women and augment funds through micro credits.

Besides normal: loans to its constituent members, the society has also extended loans to the BPL families to construct and complete their IAY/ individual houses.

Social

- Self Help Group - Ashraya resource centre has been involved in organising artisans for SHGs. It has connected rural women's SHGs to habitat finance through the SHG cooperative. In addition, it has created awareness about "environmentally sustainable and locally appropriate" construction technologies in villages through demonstrations, awareness campaigns and training programmes.

Capacity Development of Service Providers: The Ashraya team has undertaken training programmes for local communities in diverse fields which include;
- Training in the production of building elements specifically targeting the artisans at BMSB
- Training masons, bar benders, welders, carpenters and other affiliated trades to improve the existing construction practices. This was specifically needed during the redevelopment stage.

Skill mapping and database creation of skilled artisans in specific construction trades: This is useful for providing work opportunities to the artisans. A specific programme of skill mapping was undertaken in the Balangir district of western Odisha. Trainings were also conducted through the mapping exercise to upgrade the building construction techniques.

Social and gender equity: There is involvement of people from all the sections of the community irrespective of their class and castes. Both men and women have equal roles. Women SHGs are encouraged to start their own savings group. Women masons have also been trained in various low carbon construction practices.

Environmental: Environment friendly construction technologies: The technologies promoted are all low carbon and low embodied energy techniques.

ENERGY, RESOURCES & THE ENVIRONMENT

Strategies: The basic strategy was to link the BMSB enterprise to the larger reconstruction process using the core house model. The technology transfer, capacity building and information flow was integrated with the construction of core houses through a slow yet steady process. BMSB facilitated building material production and services based livelihoods. Three Building Materials and Services Banks (BMSB) were set up during the project, as regional supply nodes for building materials, elements and skills at Astrang, Balikuda and Chowdwar.

Only the Chowdhar BMSB is still functional.

Long Term Sustainability: The Decentralised People's Managed Initiative, has launched a process whereby the quality of habitat and livelihoods would continue to improve long after the direct project inputs are over through the BMSB. BMSBs are uniquely positioned to coopt technologies, products, and services in the allied sectors of domestic water, energy and sanitation, thereby increasing their financial and commercial viability. These BMSBs set up networks with local artisans to provide a continuous training ground for improvement in the local skill base' with technical resource agencies for regular inputs of improved technologies.

Process: Need Based Start - The centre was started to fill the gap of quality construction materials as well as construction materials in a post disaster reconstruction situation.

It established its presence as an enterprise during the reconstruction of 1400 core homes in 100 villages of coastal Odisha.

It grew from a specific programme to a long-term community enterprise. The multiplication strategy and management procedures were regulated through community based local delivery channels. The strategy was supported by building capacities of the local implementing partners, trained local implementing agencies, and communities in selected construction systems and building materials production processes to meet standards in quality and cost.

It is now a single window centre for all habitat needs.

Impacts: Ashraya was recognised as one of the ten best Indian habitat projects between the years 2000-2001 by the UN Habitat. The project was felicitated on the occasion of World Habitat Day in Delhi in the year 2002.

BMSBs are not only catering to people's needs to access affordable shelter but also addressing other infrastructural needs like drinking water, alternative energy sources for lighting and cooking, rural sanitation, construction and management of public buildings.

- They have facilitated improved access of people to a variety of low carbon construction alternates.
- They have also trained masons, who have helped to create more services for the local people who cannot afford the services of professionals.
- They have enabled improved access to housing finance for the rural poor through linkages with local saving groups, which also ensure a reduction in the overall default rate.

2.0

GOOD HOUSING, BALIKUDA, JAGATSINGHPUR

KEYWORDS: post disaster reconstruction, training and skill upgradation, construction technologies, technology transfer.

SUMMARY

Odisha is one of the poorest states in India, which is prone to natural disasters. The housing conditions in the rural areas of the state are poor. The houses are kutcha - made up of mud and thatched roofs, which make them vulnerable to natural calamities. As a result, people are left homeless after every disaster.

The super cyclone of Odisha in 1999 and the floods in 2001 caused immense loss of lives and property in addition to the housing shortages. The need for cyclone and flood resistant shelters was thus realised that would prevent damages during future disasters. Jagatsinghpur district in Odisha was worst hit. As per the government records, close to 9885 people lost their lives, out of which 8119 were from Jagatsighpur alone.

In addressing the critical situation of housing shortages and damaged houses, the government decided to reach out to people by providing grants under the Indira Awaas Yojna. However, due to inadequacy of the government grants, insufficient building materials, a lack of appropriate technological expertise and services of skilled masons, construction of durable houses suffered a setback.

As a result, the poor were unable to complete the reconstruction of their houses. The way forward was to adopt appropriate technologies, which the beneficiaries could use in completing their houses. This was quite unaffordable.

However, in 2001, the UNDP responded to such a critical need by offering the services of skilled personnel and technology know-how, to promote sustainable reconstruction. The funding for the project came from the Swiss Agency for Development and Cooperation (SDC). The activities started at the village of Rahana in the Balikuda block of the Jagatsinghpur district. The two major activities were:

Training of Masons: Under this programme, masons and artisans from the region were trained on disaster resistant, cost effective and environment friendly appropriate technologies. More than 1600 masons have been trained through intensive theoretical and hands-on training sessions.

Setting up of Technology Demonstration Units (TDUs): The technology demonstration units have been constructed to demonstrate cost-effective, economically and socially sustainable construction technologies. These TDUs have been built using locally available materials. They are also used to train masons and unskilled construction workers in the villages. The TDUs likewise provide evidences for villagers to see the necessity of implementing appropriate building technologies. These technological demonstrations would build trust in them and they would feel confident in applying these skills in the constructing of their own houses.

So far, as many as 99 TDUs have been constructed and a number of technologies promoted through them. These technologies have been used in the construction of many individual houses and government buildings. Many villagers of the Jagatsinghpur district have been encouraged to adopt these cost effective technologies promoted through the demonstration units set up by the UNDP in about 40 villages of the area. More than 1800 houses have been constructed till date all over the state.

CONTEXT

Where: Balikuda block of the Jagatsinghpur district in Odisha that was most affected by the 1999 super cyclone and the 2001 floods

What: Promotion of appropriate building technologies through the construction of TDUs and the training of masons

Who: UNDP shelter team and the masons/artisans of the community

For Whom: For the villages of Jagatsinghpur in Odisha

SIGNIFICANT HIGHLIGHTS

Technology: A wide range of appropriate housing technologies have been promoted. These technologies are cost optimised while ensuring structural strength, prepared from locally available resources, are environment friendly and easily replicable. These technologies include:

The well foundation: Well foundation has been used in the TDUs along the coastal areas. In such a type of foundation, 40 mm thick cylindrical shells, which are 45 cm high are inserted in excavated pits. These pits are filled with sand. The wall centre lines lie in the centre of these wells.

The rat trap bond (RTB) technology: In the RTB technology, bricks are placed on the edge of a 1:6 cement mortar, creating a void in each course. With this technique, there is a reduction in the cost of the wall by 25 per cent.

Compared to the conventional English bonds (9"thk wall), 350 bricks are required per cm. Whereas in the rat trap bond, only 280 bricks are required and less number of joints reduces the mortar consumption. No plastering of the outside face is usually required and the wall is aesthetically pleasing. Apart from this, the air gaps created within the walls help to make the house thermally comfortable. In the summer, the temperature inside the houses is usually at least 5 degrees lower than the outside ambient temperature and vice versa in winter. Arches are used to reduce the overall cost. The arches are used as a replacement of RCC lintel over all openings.

Filler slab concrete roofing: Filler slabs are a cost effective roofing system that saves concrete by replacing the lower portions of concrete in the RCC slab with filler materials like clay, tiles or pots.

Precast plank and joist for roofing: This is a cost effective roofing system used as an alternative to flat RCC roofs.

Reinforced brick lintel: This reduces the amount of steel required in the lintel, hence reducing the overall cost significantly.

Ferrocement doors and windows: These are prefabricated and save precious wood.

Institution: Market linked development activities / building up self-supporting sustainable institutions - Artisan's Self Help Group (ASHG)

153 ASHGs have been formed under the programme. These groups are a 'one stop shop' wherein all services such as excavating, brick laying, roof casting, bar bending, carpentry works, electrical works, plumbing works, painting etc, are made easily available and affordable to the rural households. These ASHGs have availed loans from local banks to start micro-enterprises for the production of better quality building materials using local resources like brick kilns, tile production, sanitary marts, renting of steel shuttering sets etc.

Social

People's process: Though the master mind behind the TDUs was the UNDP, the construction and planning was done by the local people. Nirmithi Samiti or the Village Construction Committee set up in every village for this purpose, takes charge of procuring materials, employing masons, supervising the overall work and maintaining the funds.

Capacity building of various stakeholders in the construction sector: Masons and artisans have been trained by the UNDP, who now provide trainings to other organisations and undertake private constructions. Masons and engineers have been trained in the most disaster-prone states of Uttaranchal, Karnataka, Bihar, Uttar Pradesh, Tamil Nadu, Northeastern states and West Bengal. Skill upgradation trainings have also been conducted for female construction labourers in masonry.

Environmental: Aesthetically pleasing building designs i.e. the TDUs are designed in such a way that they ensure sufficient light, cross ventilation and thermal insulation.

ENERGY, RESOURCES & ENVIRONMENT

The optimal use of local materials helped in the minimal use of high energy consumption materials like cement and steel without compromising the structural strength and durability of the building.

CHALLENGES & RESPONSE

Strategies

Classification of masons/artisans: Different training modules and course curricula are prepared for different target groups. Broadly they are categorised into five groups:

i. Construction Labourers (men and women) are trained on basic construction practices like building foundations, walls, roofs etc.

ii. Semi-skilled masons are trained in good construction

practices like layouts, foundations, walls, openings and roofs

iii. Skilled masons are trained on cost effective, multi hazard resistant construction technologies and the interpretation of drawings and designs

iv. Master masons are trained on multi hazard resistant construction technologies, basic designing and estimations

v. Trainer masons are trained on skills on imparting training programmes

Process: The UNDP played the role of a facilitator and an enabling agent, while masons and artisans were trained by the United Nations Volunteers (UNVs) comprising of architects, engineers, and planners. Masons were identified as the main agents of change and trained in disaster resilient construction techniques. The UNVs later registered themselves as the Odisha Development Technocrats' Forum (ODTF) to support the programme technically.

The trained masons and artisans were grouped into Artisan Self-Help Groups (ASHGs), who took up construction activities. Thus, services of skilled masons and artisans, which were previously unaffordable and inadequate, were readily available to all. Even the government, NGOs, local masons as well as the women self help groups showed interest in constructing their houses, which could be used for demonstrative purposes. Many who never thought of having a masonry *pucca* structure came forward to construct after understanding the cost-effectiveness of these technologies

The government supported houses under the social housing programme, which was intended to provide free safe houses to the beneficiaries. However, these were insufficient due to the increasing cost of materials. By adopting these appropriate technologies, beneficiaries could now build their houses within the sanctioned grant.

In every village, a Nirmitee committee was formed that looked after the overall management of the programme. So far, 1800 houses have been constructed using the technologies demonstrated by the TDUs. The houses constructed with the technologies promoted under the programme cost up to 25 per cent less. The technologies are not only cost effective but also strong enough to withstand high velocity winds and cyclonic storms.

The TDUs constructed under the programme serve as model houses for the villagers who built their own houses using the same techniques and technologies. In addition, they are also used for multiple functions such as aaganwadi, classrooms, training centers for masons and community halls for the villagers.

Impacts

Improved Livelihood opportunities

- The ASHG's have made job opportunities available in their villages and other villages, which has provided a stable livelihood for these villagers throughout the year. This kind of association also helps to add to their confidence, status and better wages.
- Improved access to a variety of construction methods for all.
- Training of masons has helped to create more services for the local people who cannot afford the services of professionals
- Replication of appropriate building technologies and houses: Seeing the success of the technologies demonstrated in the TDUs, families, communities and the Government have started applying these technologies in building construction throughout the state.

3.0

KEYWORDS: integrated development, social inclusion, community participation, piped water supply.

GRAM VIKAS, ODISHA

SUMMARY

Gram Vikas's work in the tribal villages of Odisha started with health related interventions when it was realised that poor health condition was the biggest problem in the state. Unclean drinking water and unhygienic practices like open defecation led to deteriorating health due to diarrhoea, typhoid, malaria and other water born diseases. To address this problem, Gram Vikas initiated the Rural Health and Environment Programme (RHEP) in 1992, to improve the quality of life of disadvantaged rural communities through the provision of safe drinking water and toilets. Eventually, this programme graduated to an umbrella programme called Movement and Action Network for Transformation of Rural Areas (MANTRA) that addressed not only health issues but also catered to the needs and interests of the backward communities in the areas including sanitation, education, livelihoods, food security and infrastructure.

The Gram Vikas's MANTRA programme, which has an integrated approach to rural development, has been the winner of prestigious awards such as the Kyoto World Water Grand Prize and the Ashoka Change Makers Innovation Award in 2006.

Villages which were deprived of basic services such as water and sanitation, schools and hospitals, now have piped water supply, toilets, bathing rooms, clean roads and water bodies. The basic health condition of people has improved significantly.

Villages under the MANTRA programme have become active advocates in the spread of the programme. Girls from MANTRA villages are now reluctant, and have often refused to be married in villages where there are no toilets, bathing rooms, and piped water.

SIGNIFICANT HIGHLIGHTS

Technology: The programme balances the use of traditional knowledge and modern technologies, which includes the following:

Compressed earth block technology: It offers a cost effective and environmentally sound masonry system. The product, a stabilised compressed earth block has a wide application in the construction of walls, roofs, arched openings, corbels etc. Stabilised Earth Blocks are manufactured by compacting raw materials and earth mixed with a stabiliser such as cement or lime under a pressure of 20 - 40 kg/cm using manual soil press. A number of manual and hydraulic machines are available in India. The basic function of all the machines is the compaction of raw earth to attain a dense and even sized masonry.

Prefabricated ferrocement door shutters and door-window frames: These are optimised cement elements which are extremely easy to manufacture, are durable, resistant to water and save on scarce wood.

Use of eco-bricks: Eco-bricks production from Vertical Shaft Brick Kiln (VSBK) is a cleaner and more energy efficient method of firing clay bricks. The VSBK technology considerably economises on fuel cost, with savings between 30 to 50 per cent when compared with other common firing technologies such as Clamp or Bull Trench Kilns. Pollution levels are extremely reduced compared to other prevalent methods of brick firing.

Gravity flow water supply from perennial springs: Gram Vikas has harnessed water from perennial springs and diverted it through pipelines (from as far as 5 - 6 kms) using the principles of gravity flow and siphoning to traverse over small hills to reach a storage tank in the village and from there, to individual homes. Along with optimal utilisation of local knowledge and resources, this also enables the establishment of a reliable community-managed water supply system, low maintenance costs, and ensuring environmental sustainability. The water quality is periodically tested by the village communities, who have been trained to do so by Gram Vikas. Gram Vikas has successfully implemented this concept in nearly 80 tribal villages in remote hilly parts of rural Odisha.

Institution: There is cost sharing with part contribution from beneficiaries and part contribution from Gram Vikas. The latter provides training and facilitative support to beneficiaries and masons, who are engaged in the construction activities. Beneficiary contribution is

in the form of cash, materials, and unskilled labour and they gain ownership of the houses or other services they receive.

Beneficiaries as Clients

Gram Vikas believes that the poor can and are willing to pay for the services they receive. Gram Vikas acts as guarantor to obtain funds from banks and the people themselves repay the costs over a period of time.

Social

Inclusion: The programme believes in equal benefits and hence aims to reach to all households in its project areas.

Social and gender equity: In the programme, there is involvement of people from all sections of the community irrespective of their class and castes. Both men and women have equal roles in the decision-making processes. The Village Executive Committee is set up that acts as a decision-making body of the village and has 50 per cent women representatives.

Environment

Environment friendly construction technology: Houses and toilets are constructed using cost effective , environment friendly and energy efficient technologies like eco bricks, doors made from ferrocement etc.

The low carbon construction technologies promoted have effectively been replicated in villages all around as a replacement to the modern practices of using steel and cement.

ENERGY, RESOURCES & ENVIRONMENT

Gram Vikas' aim is to reduce indoor air pollution and consumption of fuel wood in rural homes through the promotion of 'smokeless' *chulahs* or improved cooking stoves. The distribution of *chulahs* to 1/3rd of the households in every village of Ganjam is a part of the research that is being conducted by the Massachusetts Institute of Technology (MIT), Boston. Other than this, Gram Vikas has also implemented other technologies such as wood gasifiers, micro-hydro projects, solar photovoltaic applications and biodiesel fuelled energy systems in few villages.

Strategies

For the people and by the people: Community participation is a key component that has led to the success of the programme. Community based management systems or sub committees like sanitation committees, education committees and health committees have been set up for all the sub programmes under the umbrella approach of MANTRA. As a result, all the decisions that are taken under the programme are for the people and by the people. This ensures that the people who get the benefits are those who are in actual need, making the process just and fair.

100 per cent consensus factor: Gram Vikas works in villages only when there is an agreement from the families to be part of the development process. The rationale behind this is, all families in every village where the programme is being implemented must be involved in the process, and unless all the households agree to participate, it is difficult to bring about a change in practice and improve peoples' health.

Monitoring the use of toilets and keeping it clean: This is done through a system of imposing fines for unclean toilets and open defecation. Villagers themselves supervise each other to guarantee the prevalence of clean and hygienic conditions.

Process

Health was the entry point of the MANTRA programme but it expanded further to include the following areas:

Water and sanitation: Households are encouraged to use and construct their own toilets, bathrooms, and common overhead water tanks. Drainage systems have also been set up that prevents the accumulation of water. The construction cost of a toilet is approximately Rs. 8000, where the beneficiary's contribution is about Rs.2500. District Rural Water and Sanitation Mission's contribution is Rs.1250 and the rest is contributed by Gram Vikas. The toilets are constructed a few feet away - behind every individual house, because first generation users have been used to defecating in the open. There are also prejudices associated with odour and impurity of toilets. Hence bathrooms and toilets should not be constructed inside the houses.

Enabling Infrastructure: Housing is a key component of this programme. Disaster resistant and low cost housing of 450 sqft have been constructed. The average cost of each house that has two rooms (which can be used as separate sleeping rooms at night), a kitchen, and a front veranda is Rs. 45, 000. Housing loans ranging from Rs. 15,000- Rs. 40, 000 are made available to the beneficiaries from the Housing Development Finance Corporation (HDFC), payable in 15 years at an interest rate of 9 per cent.

Education: Village and residential schools as well as Balwadi centres have been set up in areas where there are no government schools. The annual fees for a child in a residential school is Rs. 1000 which is born by the family and the rest of the costs are covered by Gram

Vikas. The Gram Vikas staffs pay 1.5 per cent of their salary as donation to cover the costs of the schools. The curriculum at the schools are designed and teacher training sessions are conducted by Gram Vikas to ensure joyful learning processes that helps the children get introduced to social, environmental and health related issues covered under the MANTRA programme.

Livelihood and food security: The MANTRA programme addresses the issues of natural resource management that leads to the provisions of food security and livelihoods. Towards this objective, community forestry, horticulture, land and water conservation methods are promoted. Gram Vikas has also implemented watershed development projects. Other than this, Gram Vikas supports Self Help Groups (SHGs) through loans from banks and collective savings from its members. They also support individual and collective income generation activities such as livestock rearing, horticulture, plate making, broom binding, and making pickles.

The programme has involved local people who are trained in masonry. This enabled them to build their own houses, bathrooms and overhead water tanks in their villages. They also supervise the work of master masons and engineers.

Changing people's mindset and attitudes is the backbone of the programme. Through awareness and motivation campaigns, people were informed and encouraged to keep their households and surroundings clean. The campaign programmes discouraged people from defecating in the open and encouraged them to develop the habit of keeping their hands and nails clean, wash their clothes regularly etc.

Village general bodies were established that selected the beneficiaries. The general body creates an executive committee, which is a registered body that implements policy decisions. The financial and institutional mechanisms set in place makes the MANTRA programme sustainable in nature. After 3-5 years of intervention, Gram Vikas ensures that the villagers take ownership of the programmes.

IMPACTS

Gram Vikas has been able to change people's mindset. The technology programmes promoted by Gram Vikas has changed people's mindsets, who now use ferrocement doors, other cost effective and alternative technologies in the construction of their houses and toilets.

- This programme has led to increased capacity of local masons and increased the scope of livelihood opportunities for trained masons.
- Water and sanitation programmes have ensured privacy for women and improvement in their health conditions.
- Women's confidence has been built through capacity building programmes for women in shelter construction, participation in executive committees and sub committees and trainings given to SHG women members to handle financial activities. Unlike the stereotype role- played by them, they are seen to actively engage themselves in the implementation of the MANTRA project.

4.0

KEYWORDS: water management practices, sanitation infrastructure, people's participation

MEGH PYNE ABHIYAN

SUMMARY

Megh Pyne Abhiyan (MPA) is based on the belief that every individual has a right to lead life with 'dignity, determination, and dominance'. It is a commitment towards behavioural change amongst the rural communities to effectively revive, innovate, and institutionalise water management practices and mainstream issues concerning floods through collective accountability and action.

The campaign is a functional network of grassroots organisations and professionals working in 21 panchayats across five flood prone districts of North Bihar covering about 50,000 people. Arghyam has been supporting MPA since its inception.

Floods in North Bihar are a recurring disaster. Lack of clean drinking water and sanitation facilities along with inadequate health facilities adversely affects people, particularly women. MPA has successfully taken small yet meaningful initiatives to address water and sanitation needs of the people.

CONTEXT

Launched in 2006, MPA is a network of five grassroots organisations and independent development professionals working across five flood prone districts (Supaul, Saharsa, Khagariya, Madhubani and West Champaran) of North Bihar. The partners in this Abhiyan are Gramyasheel, Kosi Seva Sadan, Samta, Ghoghardiha Prakhand Swarajya Vikas Sangha, SAVERA, and development professionals such as Luisa Cortesi and Eklavya Prasad.

Need: It is ironical that flood prone districts of North Bihar lack clean water for drinking purposes. In response to this, MPA was launched, which literally means 'Rain Water Campaign', to address the water needs of the people. Since these areas have a high water table, safe sanitation facilities are also necessary to prevent groundwater pollution. For this purpose, MPA has undertaken initiatives to address the sanitation needs of the people as well.

Scale: Through the network of local NGOs, MPA is working across five districts of North Bihar.

Objectives: The following are objectives

- To provide safe drinking water solutions to the rural people of North Bihar.
- To encourage rain water harvesting in the villages at the household level.
- To promote safe sanitation practices in North Bihar.
- To reduce incidences of disease in the rural areas.

SIGNIFICANT HIGHLIGHTS

Technology: Some of the technological innovations of MPA partners are given below:

The matka filter enterprise: Kosi Seva Sadan in partnership with MPA has set up a pilot project for the production and supply of '*matka*' or earthen pot water filters for use in rural Bihar. The filter was developed in response to excessive iron content in over 75 per cent of potable water sources in the Supaul district, one of the areas of operation under the MPA. The filter comprises of filtration chambers containing filtration materials of graded sand and charcoal powder. The lower chamber stores filtered water with a tap outlet. Another alternate model is made with bamboo and earth and has a similar filtration process. Both filter models use natural resources and are made locally by the potters and supplied to the villages.

The filters are booked in advance with area representatives upon payment of Rs. 10. The potters then supply the filters and are given some rice as a gesture of appreciation besides the balanced cost of the filters. The filter enterprise has effectively addressed the iron contamination in potable water and contributed in local livelihoods.

Rain water harvesting: As sources of potable water are scarce in the flood prone districts of Bihar, it was decided to utilise the rain water for drinking purposes. Rain water harvesting has been widely promoted under the MPA. Individual rain water harvesting structures have been constructed at the household level to collect and store rain water.

Faydemand shauchalya (Ecosan): Northern Bihar is a highly flood prone zone, which has several water

logged areas. Sanitation is one of the critical needs of the people in the area. This is true especially for women, adolescent girls and handicaps who are most affected by the absence of sanitary facilities. Given the high flood vulnerability of the area, the need gets even more critical during floods. The concept of Faydemand Shauchalaya was developed by Biome in Bangalore. It is a low cost dry toilet system that has separate chambers for faeces, urine and waste water. The faeces decompose into manure, urine is diverted and utilised as urea and waste water is used for watering plants. This model has been accepted in rural areas of north east Bihar. It simultaneously addresses the need for sanitation infrastructure without adverse impact on the local environment.

Institution: MPA is a network of five organisations working at the grass root level. At the village level, water committees (Jal Samitis) are formed with members of the local village community as its members. These committee members are first taken into confidence and trained in the various technologies, which then helps the organisations work with the entire village.

Social: The Jal Samitis have helped bring about social cohesion in the villages. Interventions like Faydemand Shauchalaya has helped to create open defecation free villages. The use of *matka* filters has decreased the incidence of water borne diseases in these villages.

ENERGY, RESOURCES & ENVIRONMENT

The various interventions of MPA are based on the utilisation of local resources and giving back to nature, thus promoting local sustainability. The filters are produced locally utilising local resources both materials and manpower. Although the idea of Ecosan toilets has been sourced from Bangalore, it has been modified to suit the local conditions. The use of toilets has reduced land pollution and related diseases. Promoting rain water harvesting on a large scale, addresses the problem of drinking water shortages.

CHALLENGES & RESPONSE

Strategies: Networking of NGOs and independent professionals for a common cause; development of technologies for the provision of water and sanitation services at the village level; awareness campaigns for encouraging rain water harvesting and the use of Ecosan facilities; creation of village water committees to ensure community participation in planning and the implementation of projects.

Process: MPA started with the amalgamation of five local NGOs and few independent development professionals for the common cause of providing water and sanitation services. The first step was to develop appropriate technologies for use at the village level. Thereafter, individual organisations worked in their respective areas with cross sharing of experiences and technologies. Each organisation starts its work in the village with awareness generation campaigns and the creation of village water committees. Then, the capacities of the village people are built in construction and the use of different technologies, which include *matka* filters, rain water harvesting structures, and Ecosan toilets. Arghyam financially supports Abhiyan.

Impacts: The campaign has succeeded in addressing the problem of drinking water by tapping available rain water. The use of *matka* filters and toilets have been instrumental in raising the standard of living of the village people.

The economic impacts of the initiative can be seen in terms of opportunities created for the local potters. The impact is also seen in terms of reduced health expenditure of the households after the use of the *matka* filters. With availability of filtered water, stomach infections has decreased significantly among the households. Manure generated from the toilets has indirectly helped in increasing families incomes.

The initiative has also helped in bringing together the entire community towards a common cause. For the first time in certain communities, the entire village acted like a single social unit. The vulnerability of women and adolescent girls has been reduced significantly, as they no longer have to go out in the open to defecate during odd hours.

The environmental impacts of the project can be seen in terms of a clean and healthy environment. Manure generated also helps in land and soil improvement. The use of rain water for drinking purposes also reduces dependence on groundwater.

5.0

KEYWORDS: Owner driven reconstruction, participatory and community led development, water and sanitation, solar lighting, rain water harvesting.

HOUSING IN PURAINI

SUMMARY

A cataclysmic flood due to a breach in the Kosi embankment hit Bihar in August 2008. The river changed its course and inundated areas that had not experienced floods in many decades. The flood submerged most of the Kosi alluvial fan area, which is very fertile and has dense agrarian population, leaving about 2.3 million people affected.

Owner Driven Reconstruction (ODR) collaborative, led by Kutch Nav Nirman, Abhiyan, Bhuj, engaged itself in advocating owner driven reconstruction processes in Bihar, after the Kosi floods of 2008. The ODR collaborative has been involved in supporting policy initiatives with the Bihar government, to put an owner driven policy and programme in place for implementation. The pilot project in the hamlet of Puraini in Supaul district, demonstrates the various mechanisms required for putting homeowners at the centre of all decision-making and management for the reconstruction of their homes.

In Puraini, 88 families have built their houses with bricks and used corrugated galvanised iron (CGI) sheets for their sloping roofs. The average size of a house is 290 sq.ft constructed at a cost of Rs. 275 per sq.ft. Every family got financial assistance of Rs. 55,000 (including Rs. 3,000 as incentive for timely completion) and each family contributed about Rs. 25,000 in the form of labour, recycled materials and cash. 66 individual toilets have been constructed with financial support of Rs. 8,000 per toilet. Some joint families (2 to 3 families) have built a common toilet and the money saved has been used to construct bathrooms and other amenities. All the toilets are dry pit Ecosan toilets, which address the limitations posed by the high water table in the area. Upon completion of their houses within the four month period, each house became eligible to get a solar lighting system. Towards common infrastructures, Rs. 25,000 per house was made available for the village to collectively invest in improving the status of their Tola infrastructure. 17 solar lights have been installed and a 500 m road has been constructed through a Tola Committee. Two wells have been dug to meet the drinking water needs of the families.

CONTEXT

Puraini is a village in the Supaul district of North Bihar. Mandal is a Tola in the Puraini village.

Need: The need for this reconstruction project arose because of the flood that hit North Bihar in August 2008. The damage caused by the flood called for reconstruction activities all across the region including Puraini.

Scale: 89 houses have been reconstructed in the Mandal Tola of the Puraini village; this number was based on the government's damage list.

Objectives

- To reconstruct in a participatory manner 89 houses in the Puraini village that were destroyed during the flood of 2008.
- To provide the households with basic amenities such as roads, lighting, toilets, and safe drinking water.

SIGNIFICANT HIGHLIGHTS

Technology: Earthquake and flood resistant technologies have been used in house construction. The technology was sourced from Hunnarshala and Kutch Nav Nirman Sangathan in Gujarat. 88 families have built their houses with bricks and CGI sheet sloping roofs. The average size of a house is 290 sq.ft

constructed at a cost of Rs. 275 per sq.ft. The house design was finalised in consultation with the villagers. Water and sanitation facilities have been integrated in the house design. Key innovations of Megh Pyne Abhiyan – Faydemand Shauchalaya, *Matka* Filters and Rain water harvesting structures have been installed in each reconstructed house. Hand pumps are not promoted in the area but there are plans of reviving two wells in the village. Solar lighting is being promoted at the village and household level.

Institution and Finance: Post the flood of 2008, a number of organisations came together to work on the reconstruction activities in the disaster affected villages. The key role players in Puraini are Megh Pyne Abhiyan with its member organisation, Gramyasheel.. They tied up with Hunnarshala and KNNS of Gujarat for required house technology and training support. The community was involved at all the stages of the reconstruction process. A village development committee was formed to look after the entire process.

Funding was secured from various sources including WIPRO, BPCL, KNNS and the India Today Group. A total Rs. 55,000 was made available per household for house reconstruction. Another Rs. 20,000 was contributed towards services such as water, sanitation and lighting. In order to transfer the money, a bank account was opened in the name of husband and wife. Above this amount of Rs. 55,000 plus Rs. 20,000, the extra cost was borne by the concerned family.

Social: The most important feature of the project has been the 'Owner Driven Reconstruction' approach that positions the homeowners at the centre of the reconstruction efforts. The disaster affected families and their representative committees have played a critical role in village planning, house designing, technology selection, materials procurement and all other activities related to reconstruction.

The community's contribution in the reconstruction of their own houses has been another interesting feature of the initiative. Towards common infrastructures, Rs. 25,000 per house was made available to collectively invest in improving the status of their Tola infrastructure. A participatory rural appraisal of infrastructure needs within the Tola was undertaken with the community through which common infrastructure needs were identified and implemented. Sufficient earthquake and flood safety measures have been adopted in the designs. The design incorporates the local building practices of the people and provides techniques to improve them using building materials like brick/RCC poles, tiles, tins and bamboos.

ENERGY, RESOURCES & ENVIRONMENT

Environmental friendly technologies have been used in the initiative. Ecosan toilets have been installed in both locations as the water table is only 5 feet below ground level and soak pit toilets would contaminate the groundwater and their drinking water wells. Faeces are not allowed to mix with urine using a specially designed pot. The faeces fall into a pit over which some ash is placed. This ultimately composts itself. The urine is a rich source of nitrogen that is directly used to irrigate trees outside the toilet. Solar lights for home lighting as well as street lighting have been installed.

CHALLENGES & RESPONSE

This was one of the first projects of its kind in Bihar. It faced numerous challenges in the beginning, which were resolved over time. Some of the challenges included the effective utilisation of funds, extra contributions by villagers, and acceptance of technologies for house and toilet construction.

Strategies

- Adoption of disaster resistant technologies
- Partnership of various agencies for a common cause
- Owner-driven reconstruction process for total acceptance and ownership of the project
- Integrated habitat development including house, water, sanitation, roads and lighting
- Use of ecofriendly technologies and traditional resources

Process: In response to the damage, which occurred during the flood of 2008, various agencies started reconstruction activities in North Bihar. In Puraini, Megh Pyne Abhiyan along with others engaged in the processes of reconstruction. The technology was

Table. Works done Under this Reconstruction Project

Total Number of Houses Reconstructed	89
Total Number of Ecosan toilets	66
Total Number of Animals provided to Enhance Local Livelihoods	80
Total Number of *Matka* Filters	95
Total Number of Landless Families	18
Assistance Given per Landless Family to Buy Land	Rs. 5,000
Total Area of New Roads Constructed	20,000 sq.ft
Total Number of Street Lights	17
Total Number of Solar Lights at the Household Level	89
Total Number of Rain Water Harvesting Structures at the Household Level	89
Number of Wells to be Constructed (Proposed)	2
Number of Community Platforms to be Constructed (Proposed)	2

sourced from Gujarat where a lot of reconstruction had already taken place in the past. The community was put at the centre of the initiative to ensure participation and ownership of the project. Village development committees were formed and facilitated by the NGO. The NGO workers also worked on behavioural changes among the community members. The funding was secured from various agencies and transferred to the families. The local masons and artisans were trained by the Hunnarshala, who then built the houses of the entire community. The Ecosan toilets, rain water harvesting structures, *matka* filters and solar lights were installed at the same time when the houses were being constructed. The village infrastructure is also being developed side by side to ensure integrated development.

Impacts: The project has led to the reconstruction of 89 disaster-resistant *pucca* houses, some of which were originally kutcha habitats. A situation of integrated village development has been achieved through this project with the simultaneous construction of houses, roads, toilets, and the installation of drinking water facilities and lights. The table alongside provides a summary of the works done under this reconstruction project.

The project has built the capacity of the community for such development works. The use of *matka* filters and toilets has reduced the incidence of diseases. The Tola is almost defecation free now.

It is an environmentally responsive initiative, which makes use of the available resources and gives back to nature in terms of manure from Ecosan toilets and water from rain water harvesting structures.

Unresolved Issues

- 100 per cent acceptance of Ecosan toilets
- Problem of cleanliness and maintenance of Ecosan toilets
- Households damaged during the flood but not included in the government list have not been provided with a house and/or land.

6.0

KEYWORDS: rural electrification, green technology

SARAN RENEWABLE ENERGY SYSTEMS

SUMMARY

Blackouts are frequent and debilitating for local businesses and farmers in Bihar, often lasting for days at a time. Expensive and polluting diesel generators are often the only answer. In response, Saran Renewable Energy (SRE) Pvt. Ltd. has set up a power generating plant that runs on gasified biomass, in the Garkha village of Saran district in Bihar. The biomass comes from dhaincha, a local woody plant that can be easily and profitably grown by local farmers. The generator connects to transmission lines to supply small businesses with electricity for a guaranteed 11 hours a day. A visit to the DESI Power plant in the Baharwadi village and the Arariya district plant inspired a private entrepreneur Mr. Vivek Gupta from the Saran district to start a power generating plant on similar lines. In 2007, SRE was set up as a solution to insufficient power supply and frequent power cuts in villages. The technology was sourced from NetPro Renewable Energy India Ltd in Bangalore, which also provided the training to run the plant. The total budget for the project was over Rs. 1.5 crore. The significant highlight of the machinery was that it could use dhaincha as a raw material for power generation. For this purpose, farmers from 10km radius were initially provided free seeds and encouraged to cultivate dhaincha on their lands. Electricity is then generated and distributed on a daily basis. The electricity is also used to extract groundwater, which is supplied to the surrounding farms for irrigation.

In its first year of operation, the plant generated 120kW to meet the demand for electricity to run industries, local businesses and irrigate agricultural lands in rural areas of Garkha and Raipura villages. The 220 MWh of electricity produced last year is currently sold to ten businesses, which previously used diesel generators, as well as to farmers, a school and a clinic. The result is a better quality and more reliable electricity supply that prevents the emission of about 200 tonnes of CO per year from the 77,000 tonnes of diesel that would otherwise be used. This also helps to secure income for the 100 local farmers who supply biomass.
On one hand, it provides power to the villages and on the other, it provides income to farmers who grow dhaincha. It is a zero investment crop grown on barren land between 6 and 8 months. Around 5 tonnes of dhaincha can be produced on 1 hectare of land annually. For a farmer that means Rs. 7500- 10000 per hectare annually from a plot of land which is generally of no use. The initiative has received the Ashden Renewables for Sustainable Development Award in 2009.

KEY FEATURES

Strategies

- Decentralised production of electricity
- Use of local waste material (dhaincha) for power production
- Awareness generation among farmers on the cultivation of dhaincha
- Free distribution of seeds to encourage dhaincha cultivation

Technology: The power generation plant is a 'gasifier' that uses wood, dhaincha and saw dust as raw materials for the production of electricity. The technology was sourced from a Bangalore based company called Net Pro. The overall cost of the machinery was around Rs. 1.5 crores. The total capacity of the plant is 150 kW. However, it is currently running at a capacity of 128 kW. The plant has a dual fuel set and uses diesel to start up, then switches to wood and dhaincha for further production of electricity. The running cost of the plant is about Rs. 800 per hour as compared to Rs. 1500 per hour in cases were only diesel is used. There is a water treatment plant in the entire set up to re-use the waste water generated during the production process. The electricity generated is transmitted to the villages through high tension (HT) wires. Water pumps, roasters and flour mills have also been set up in the plant area, which utilises this power for carrying out various activities. The water pumped out from the ground is supplied to the farms (falling in the radius of 1 km) through pipes.

Energy, resources and environment: Electricity generation is from locally and easily available renewable sources such as corncobs, twigs of sesbania and a leafy plant called 'dhaincha' in Bihar. Dhaincha, which is used for firewood, thrives on waterlogged soil. About 2000 hectares of low-lying farmland in Saran remains

waterlogged throughout the year, making it unsuitable for most crops. Hence, farmers were given free seeds to grow 'dhaincha,' and were assured that the crops will be bought at Rs. 2 per kg, They readily accepted and so far, there has been no ban on the cultivation of dhaincha. In addition, the power generated through this plant is of good quality, saves carbon emissions and is less polluting compared to traditional sources of electricity generation.

Social: The local community is involved in the entire process of procuring raw materials for power generation. This was done through awareness generation campaigns, which encouraged villagers to cultivate dhaincha on their lands. The plant is benefitting the local society in two ways; Firstly, it is providing electricity and water for running businesses, industries and agriculture, and secondly, it is providing livelihood options by growing dhaincha and obtaining income through its sales.

Impacts: The plant has proven to be beneficial in a number of ways:

- Electricity is generated and distributed to about 500 units in Garkha and Rajpura villages. The electricity is supplied at a cost of Rs.10/unit.
- Water is supplied for irrigation to about 35 to 40 farmers in Garkha and Rajpura villages.
- Dhaincha cultivation has emerged as a source of livelihood for about 40 farmers in the surrounding villages. The dhaincha is purchased at a price of Rs. 2 per kilogram, while its wood is purchased at a price of Rs. 2.5 per kilogram. In an hour, about 1.5 quintal of fuel is required for power generation.

7.0

KEYWORDS: disaster resistant housing, low cost technology, low carbon renewable energy sources

SABUJ SANGHA

SUMMARY

Sabuj Sangha is a Sundarban based NGO, working towards the development of villages in Sundarban, West Bengal. Their approach to development is through selection of the poorest of the poor and migrant families.

The project targeted the need for low cost yet disaster safe housing for the poorest of the poor and migrant population inhabiting the villages. After the devastating cyclone and floods of 2007 and 2008, houses were reconstructed using disaster resistant techniques and toilets were provided to every household.

Village Kuemudi, Sundarban district, West Bengal

Village Kuemudi, which forms the seaward fringe of the delta, located in the Sundarban, district, was badly affected by cyclone Aila followed by a flood that erased most of the structures dotting the landscape. The cyclone left behind dilapidated houses and barren land. Only few structures withstood the catastrophe – these were the houses constructed by Sabuj Sangha.

Mohabbatnagar, Sundarban district, West Bengal

Mohabbatnagar, another village in the Sundarban had an influx of migrant population from neighboring villages after they were hit by the cyclone, leaving many without shelter. Sabuj Sangha selected few of these migrant families termed as the 'poorest of the poor', and constructed 50 disaster resistant, low cost houses for them.

KEY FEATURES

Shelter for migrant families: Houses built in the village have each cost between Rs. 30,000 to 35,000. GOAL funded 90 per cent of the construction cost while 10 per cent was contributed by the beneficiaries. The recipients also contributed to the process by providing labour and transportation costs for construction materials. The funding was provided in the form of an interest free loan, with the beneficiaries repaying Rs. 50 every month. The funds collected were then used for further development by the organisation.

Sabuj Sangha provided the technical skills required for construction and the masons trained have formed artisan groups.

Technology: The design provided by Sabuj Sangha incorporates disaster resistant technologies and addresses the issue of low carbon construction at the same time. Materials used for housing construction have been sourced locally, within a radius of 30 kms. Only 1200-1700 burnt bricks were required per unit.

Form: The shelter design adopts the traditional housing form, which responds well to the climatic and cultural needs of the area. Houses constructed were at a distance of about 50 m from the embankment. The orientation of the houses is generally south–west in the direction of the wind, which aides in cross ventilation since Sundarban is highly humid.,

Foundation: The foundations are designed to be flood resistant, with plinths raised to avoid the flooding of houses.

Punctures: Bamboo screens on three sides surround the houses. This provides excellent ventilation in the humid areas of Sundarban. The core units or rooms measuring 16' x 12' are placed at a distance of 1.2 m inside this frame and the punctures in them have been filled with bamboo mats. The door frames are made of wood obtained from eucalyptus or khirish rain forest trees that are easily available in the area.

Walling: The walls use mud and bamboo thatch over burnt brick masonry. The height of the brick walls is a minimum of about 450 mm, which varies according to the location and the anticipated rise of the water level during floods. Burnt brick columns at the four corners support the roofs.

Roofing: The roofing has been done using terracotta tiles resting over wood and bamboo frames

Water and sanitation: A major initiative by the NGO has been to address the issue of open defecation through the water and sanitation programmes. The jalbandhu group – an organisation comprising of the village youth, initiated by Sabuj Sangha and paid for by the panchayat and the community is responsible for the maintenance of the water structures in the village. Every family has a toilet, which is based on the single leach-pit system. Fresh water used for drinking and bathing is tapped from underground sources. Each family pays Rs 1-2 per month towards maintenance charges.

Community centre: The community centre functions as a shelter during disasters, a school and as an office space for visiting officials.

School and health facilities: Schools painted yellow believe in the motto 'Education for all – children as well as adults'. Girls are also motivated towards behavior change and provided sanitary pads. Sabuj Sangha believes in educating the masses and using it as a tool to fight against exploitation. Vocational training is also provided in the field of fishing, poultry, and integrated architecture.

Health facilities have been provided and poor families are charged less or sometimes treated free of charge. The hospital was clean, had an outpatient department, an eye clinic, an emergency ward and a labour room. The doctors also visit the houses when required. Families who live above the poverty line contribute money to support the treatment of families who live below the poverty line.

Electricity: Electricity is being provided through the use of solar panels. These have also been provided by WBREDA, at a subsidised rate to the families who live below the poverty line, with each unit costing about Rs. 2500.

Socio-cultural Livelihood issues: Fishing is considered for the lower classes bringing a lot of land under agriculture and destroying the ecosystem of the area.

8.0

TILOTHU MAHILA MANDAL

KEYWORDS: alternate technologies, low carbon construction, decentralised production of building materials.

SUMMARY

Tilothu Mahila Mandal (TMM) is an NGO working towards the economic empowerment of the poor in Bihar. All the members of the committee are women. The specific objectives of the building centre are:

- Research and development of various alternate building technologies solutions
- Demonstration of the production and application of these technologies
- Conducting training programmes for masons and artisans
- Undertaking construction works using alternate building materials and technologies The organisation manages three building centres at Indrapuri, Aurangabad, and Caimoor.

The Indrapuri building centre is the biggest one, spread over 10 acres of land and a one-stop shop for various alternate building technologies and related services. The centre showcases the production and application of cement stabilised compressed earth blocks, micro-concrete roofing (MCR) tiles, ferrocement channels and concrete blocks among others. The centre provides demonstrations, trainings and also undertakes construction using alternate technologies. In addition to the building materials production, TMM also manages a sewing and embroidery training centre that provides training, direct employment and market linkages to the women who are trained at the centre.

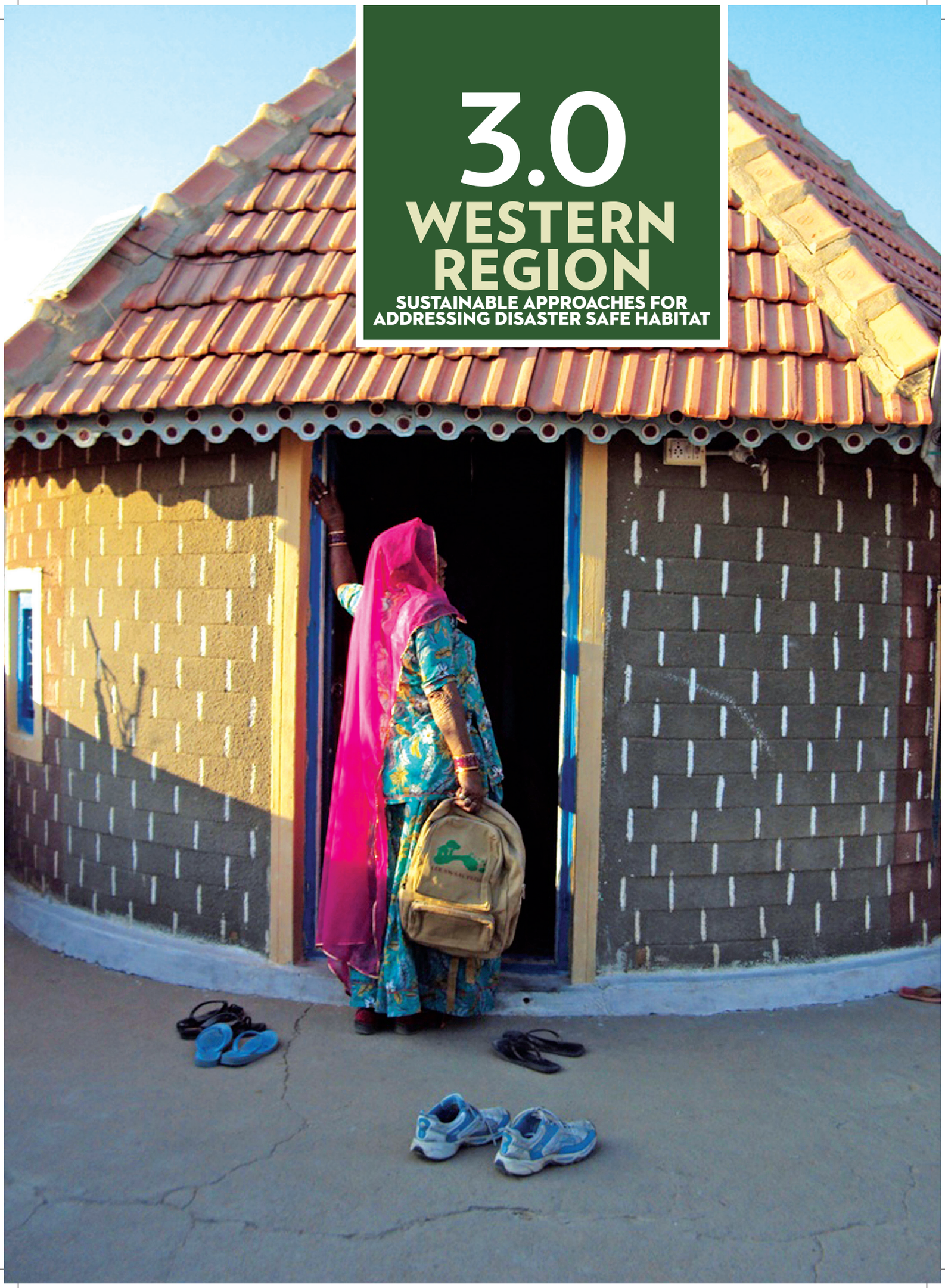
Founded in 1972 by Mr. Ranjeet of Tilothu village, the building centre in Indrapuri village (near Tilothu), Rohtas district, Bihar was started in response to the alternate building technology needs of the people of remote areas in the state. The initial grant (Rs. 5 lakhs) to set up the centre was given by HUDCO. The technologies demonstrated at the centre are sourced from institutions such as Development Alternatives and Laurie Baker among others. These technologies were subsequently modified to suit the local conditions. The process so far has been of continuous learning and developing.

KEY FEATURES

Technology: The technologies being promoted at the building centre are essentially the ones that have low carbon impacts. Compressed earth blocks, ferrocement products like roofing elements, door and window frames, door and window panels, micro concrete roofing tiles, etc have been displayed in the demonstration buildings in the centre. Rat trap bond and filler slab technologies are also demonstrated and used by the building centre. The alternate materials are being produced at the centre itself, entrepreneurial support is also provided and these measures help in making the technologies available for application on the ground.

Impacts

- Promotion of green building technologies in difficult to reach or remote areas of the state
- Reduction of carbon footprint in construction
- Use of environment friendly building materials in the construction of houses and institutional buildings. A school, college and hospital have been constructed using these technologies.
- Alternate technology provided by TMM serves as a catalyst to the generation of green jobs. The centre provides for training and promotes entrepreneurship in low energy alternate technology building components, reinforcing the drive towards a green and sustainable future.



3.0 WESTERN REGION

SUSTAINABLE APPROACHES FOR ADDRESSING DISASTER SAFE HABITAT

Habitat development in the Western Region is a cornucopia of best practices, which employed locally viable disaster resistant techniques for reconstruction efforts - improving habitats through community involvement.

The Western Region covered under the Lok Awaas Yatra looked at rural habitat innovations across two states of India – Rajasthan and Gujarat. The two states are similar in terms of climatic conditions - characterised by dry and arid climate, these areas are also earthquake and drought prone. In fact in 2001, an earthquake of 6.9 on the Richter scale with its epicentre near the town of Bhuj in Gujarat devastated four towns and more than 10,000 villages in the Kutch region. Houses built of poor quality rubble and mud mortar covered with fired clay roof tiles came crashing down as did tall buildings made of modern construction materials and technologies. In view of the harsh climate and vulnerability to natural disasters, the western leg of the *Yatra* looked at the local responses aimed at providing safe and sustainable housing as suited to local climate conditions. Besides housing the focus was on community led development with a provision of water as a significant intervention as a response to drought conditions that both the states face. Fig. 1 indicates the summary of the development process in the western region.

Process based intervention was a characteristic of most of the projects, which may be classified as encouraging and setting up systems for community engagement, capacity building through awareness, demonstration and skills, facilitation to access land, finance and technology for safe and sustainable construction, etc. Processes were directed to respond to the need for earthquake resistant housing and community facilities. Provision of basic facilities – such as drinking water, toilets and disaster safe structures, alternate sources of livelihoods for the local communities (including women in a large way) were promoted to reduce dependence on agriculture for sustenance.

BUILDING TECHNICAL AND MANAGEMENT CAPACITIES OF LOCAL COMMUNITIES

Capacity building of the local community was directed to improvement and maintenance of basic village services and the use and practice of disaster safe technologies, all of which led to the overarching idea of community led development of safe and sustainable habitat.

Demonstration of disaster safe technologies and enhancing access through skilled manpower coupled with technical guidance was a common strategy to facilitate uptake of safe construction processes in the community. Awareness building drives were a useful vehicle helping people to understand the technologies. In Gujarat, the government and civil society efforts effectively complimented each other. The Shikara Technology Park was established as a resource cum training centre for the village communities in Bachau Taluka by Unnati. Its key role is technology transfer about disaster safe construction. The technology park demonstrates various construction technologies to ensure seismic and cyclone safety. It serves as a very good model for capacity building of the community by displaying procedures for various disaster safe technologies and renewable energy. It is a self-learning process, which does not require a high degree of technical assistance.

Most of the organisations took the role of facilitators of the process components. Kabrau Setu in fact emerged as a network of nodal points, in order to provide relief and rehabilitation in Kutch after the 2001 earthquake. As an information providing system, Setu has evolved from a material management node to an institution coordinating and facilitating development interventions and promoting community based disaster preparedness. The wider objective of Setu is to respond to the needs of the community, by providing essential backward and forward linkages. The current focus areas are panchayats, education, health and special groups.

In the role of a facilitator, Lupin in Rajasthan was seen supporting land acquisition and financing construction of houses by the backward and least privileged communities of the village. Lupin facilitated a housing and renewable energy project implemented in 35 villages across the Bharatpur district of Rajasthan. Under the initiative, more than 100 houses have

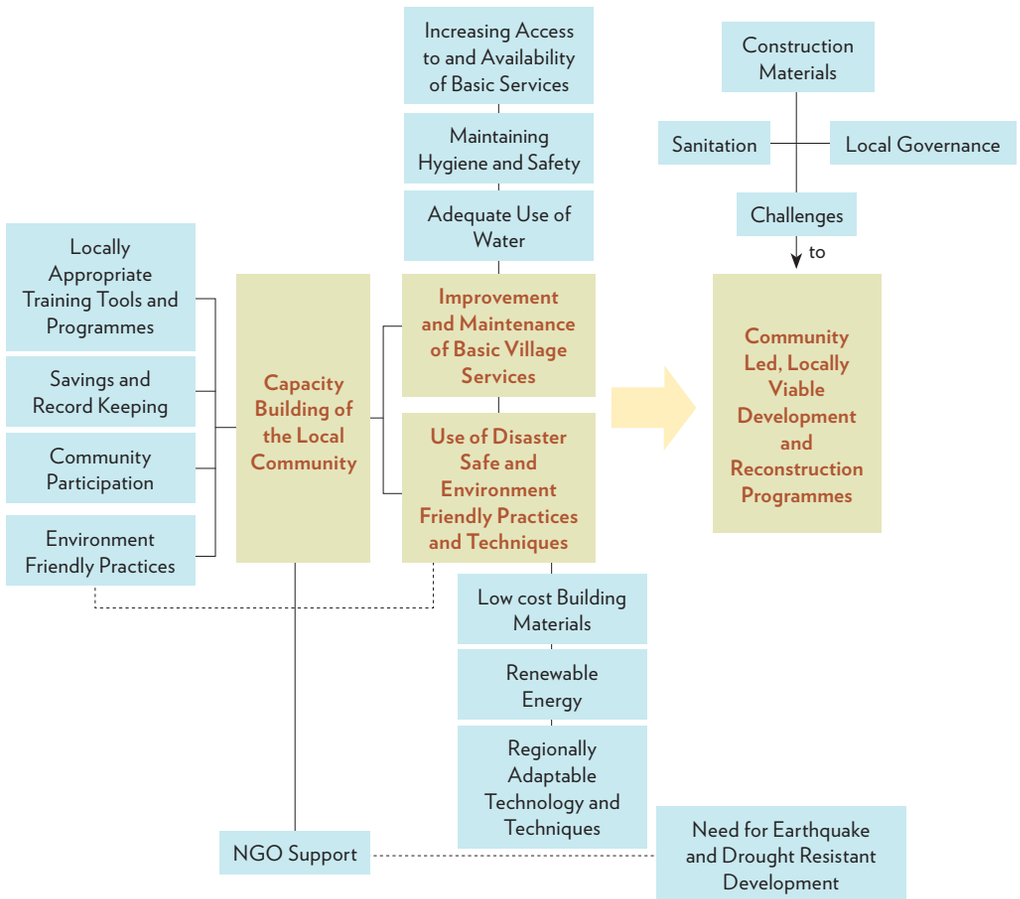
been constructed within a two year period, jointly supported by the Lupin Foundation and the Habitat for Humanity International. Poor families who could not afford a house but were not below the poverty line (BPL) were identified by the Gram Sabha. A low interest loan equivalent to 2/3rd of the estimated cost of construction was provided to the family in the form of cash or materials. Land was allotted free or at subsidised rates by the panchayat and the house was designed and constructed in a participatory manner, using locally appropriate building technologies that included toilets and rain water harvesting structures. A comprehensive programme was undertaken to educate the villagers on the maintenance of their houses.

Participatory approaches were a large part of the initiatives taken by the organisations, which included women significantly. Training to manage the entire development / reconstruction process included-

- Awareness of community with regard to ecofriendly, locally appropriate disaster safe techniques and practices,
- Encouraging savings and record keeping,
- Building community cohesiveness to own the process of development.

Across the initiatives, construction management committees were made up of villagers – the village reconstruction committees in the case of the Asha project, or the *mahila mandals* as in the case of Anandi, or the Nayaghar committees in the case of Sewa Nirman in Gujarat. The basis of the assembly of these were the same, that is, to get representation of the community members especially those who are marginalised on caste and gender – however the composition differed according the local social conditions. For instance in Anandi, the women were thought to be the most marginalised and thus were empowered to take positions

Fig 1: Development Processes in the Western Region



Since its inception in 1972, the Barefoot College has encouraged skill building capacities through 'learning-by-doing' that encourages innovative techniques for water harvesting, the utilisation of renewable energy and low carbon building techniques, contributing towards livelihood creation as well as the conservation of ecological systems in rural communities.

of decision making in the village development process – resulting in local committees made up solely of women.

Mahila mandals were formed to carry out the management of the reconstruction in the 10 villages of the Malliya Taluka of the Rajkot district in Gujarat after the earthquake disaster in 2001, right from selection of the beneficiaries to management of materials to supervision of the building process. For developing their capacities for this role, various tools and techniques such as posters, audio-visual presentations, theory classes and on-site practical classes, orientation sessions, regular meetings and review sessions, on job training and exposure visits were organised by Anandi and People's Science Institute (PSI). At the beginning of each programme, an orientation was held on concept, methodology and implementation schedule, followed by monthly meetings at the village level, and fortnightly meetings with the construction committee. About 40 volunteers from local organisations worked with the committees. Men became part of the committee although initially they were against women leading the re-construction process.

The primary focus in involving the community extensively in the process of development was to enable them to take ownership of the process, but the secondary focus was at reducing the cost of labour, leveraging people's own contribution towards the reconstruction of their houses (which they did). Thus, in the quest for reducing costs and being environment friendly, materials from the old houses were salvaged. These materials included substantial numbers of wooden elements. Further, in designing the houses, traditional structures were upgraded to be durable and meet the basic needs of the family.

IMPROVEMENT AND MAINTENANCE OF BASIC SERVICES

Beyond work on disaster safe construction, the western leg of the *Yatra* explored projects that addressed provisions and maintenance of basic services in the villages. Projects of Sewa, Unnati, Anandi, and the Barefoot College all addressed water and sanitation interventions through community based efforts. Technical and management based capacities of village communities specially women's group for water, sanitation, lighting services were studied. The Dabad Bhatian – village water security project supported by Unnati and Prayas, in 2003 was designed in response to the water scarcity faced by communities in Barmer where people walked an average of 1.5 km to get water. Under the initiative, a tank of 32,000 litres capacity has been constructed with a total cost of about Rs. 19,000, out of which Rs. 3,500 were contributed by the families.

Water scarcity enhances the marginalisation of women with stereotypical division of labour. Fulfilling the basic need of water is the responsibility of women, which in many cases means walking for long distances. Yet women are rarely involved in community level decision-making on how to improve the access to water. In Sewa, to address these problems of water, and the drudgery levied on women, each new house has rain water harvesting incorporated in its design. The collected rain water is stored in an underground tank of 5000 liters capacity. This water is used for drinking purposes throughout the year. The home owners use an age-old water disinfection technique of dipping a lime-filled pot in the tank which helps to kill water borne bacteria. A full tank can cater to drinking water needs of a family of 5 people for 6 months.

At the community level, the example of Anandi is a significant one, where the *mahila mandals* that were set up for the reconstruction process were also involved in strategising for addressing the problems of water shortages in their villages. In order to address this situation, women decided to construct wells, ponds and check dams to end the perennial water shortage. Some

Community driven reconstruction programmes have been the characteristic feature post the Gujarat Earthquake. Involvement of the community such as in the Asha Recontruction project (Nagavaladiya, Bhuj), or in Baniari, meant that the community formed committees with representation from all social groups and were engaged in all processes from acquiring material to actual construction, allowing them to take ownership of their development efforts.

of these initiatives have indeed helped to put an end to their ordeal.

Linked with the problems of water, are issues of hygiene. The villages before intervention were backward with no concept of proper sanitation. A few of the organisations, especially in Gujarat worked towards addressing the problems of hygiene. Moreover, these efforts were coupled with factors that led to the overall development of the villages. In this regard the local Panchayat was seen to take a serious role. In the case of Mayapur village in Gujarat, before the earthquake there were no toilets in the village, but after the earthquake with the reconstruction effort, the Panchayat sanitised the entire village, made it completely open defecation free (ODF) and received the Nirmal Gram Puraskar. The village satisfies all the four prerequisites for the Nirmal Gram Puraskar namely self cleanliness, clean environs, 100 per cent ODF and wastewater treatment. In order to maintain such an environment in the village, a cleanliness drive is organised every month where 12 women and 12 men are randomly selected and given the duty to clean the whole village. The campaign was started by the Panchayat members, who themselves cleaned the village for the initial two months and succeeded in setting an example. A garden called '*panchvati*' has also been developed and cutting of trees is banned in the village. Likewise, other sectors including water supply, environment, education, health, etc. have been worked upon after the initial task of house reconstruction. Women's groups as grassroot service engineers in Sewa repair handpumps and provide solar lamps to the families in Rann. The pioneering initiative by the Barefoot College is to provide training to women in solar energy products.

Besides the up-gradation of traditional techniques, application of science and technology in simple and effective ways has contributed to sustainable habitats. For instance, in the village Raj Samadhiyala, water scarcity was a huge problem. Today, however, there is a piped water distribution network in the village providing water at the household level. The village has two wells for drinking water, one tube well, eight percolation tanks and 40 check dams. Remote Sensing techniques and Geographic Information System (GIS) were used to locate subsurface dykes for water storage that have gone dry over the years. These dykes once excavated and injected with rainwater, help in faster recharge of groundwater. The village leader has with him the GIS map of the entire taluk, which has been used to build check dams in the neighbouring villages of Aniala and Kasturbadham, hence, benefitting the entire region.

Ease of assembly and user friendliness of the technologies was also a significant feature of the process seen in the western region. In fact in construction of toilets in Nanikhodiyar village through the Environment and Health Improvement Programme of Aga Khan Rural Support Programme with the prefabricated toilet pans ensured that the villagers had a cost effective model which could be easily installed.

Prefabricated toilets are a six feet high cubicles made with interlocking prefabricated concrete panels. These toilets can be easily assembled with the total cost of per unit including a soak pit was approximately Rs. 5000 in 2010, about 40 per cent less as compared to the conventional construction. In addition to being low-cost, these pre cast RCC units are user-friendly and easy to handle. The panels can easily be transported in an auto rickshaw to the villages and the construction

The Rudramata village demonstrates a village habitat development model where artisans, using their traditional skill and knowledge, have decorated their own traditional houses locally called bhungas using the local materials available. This has led to revival of the old traditional crafts and reinforced the capability of the local artisans. The project ensured the rapid assimilation of new construction techniques, which would further help in easy upkeep, renovation and addition of new units without any support.

Under the Environment Health Improvement Programme (EHIP) of Aga Khan Planning and Building Services – India (AKPBS-I) a highlight is the use of pre cast toilets and bathroom units, the purchase of which is being facilitated through the programme in combination with the Total Sanitation Campaign of the Government (As seen in the Nanikhodiyar Village)
Baniari Village, Kutch District: Reconstruction efforts in Baniari Village, led to a housing design which included a fenced plot with a large open space, a separate kitchen in the open for each family bringing a sense of ownership of the land and a self-governed territory. The material used were resource efficient which allowed the training of the youth which led to creation of livelihood opportunities.

BHUNGAS OF THE RUDRAMATA VILLAGE

The shape of the Bhunga provides minimum resistance to air flow and acts well under seismic conditions, hence was most suitable for the place.

Cluster arrangement: Two or three circular huts enclosing a central space constitute the house of the artisans. Each hut was used for a different purpose. The most decorated one was used as a workplace, selling unit and as a guest room for visitors. The second hut for sleeping and adjoining structures as kitchen and bathrooms. The huts were joined with temporary covering to form a sitting place (*verandah*).

Foundation: Sand columns have been used as part of the foundation.

Walling: The walls have been made by compressed stabilised earth blocks laid to achieve a circular form.

Punctures: The door and window frames were made of wood. Also the door and window leaves were of wood.

Roofing: The roof is made up of Mangalore tile and has a wooden understructure, which is well tied to prevent collapse during disasters.

Disaster resistant techniques: The entire structure is disaster resistant due to reinforcement tying the structure. Tie beams have been provided at three levels – plinth, sill and lintel to secure the structures against possible earthquakes.

Finishing: The exterior is either covered with plaster or left as it is in accordance with the owner's desire. The interiors have been decorated by the homeowners themselves using traditional methods of mud and mirror work to form inlays on the walls. This gives them an opportunity to showcase their skills and crafts besides making it a participatory process.

Other Technologies: The families also use solar lamps for lighting their houses at night.

of the pre cast RCC unit can be completed within five hours as against 5 – 6 days in a conventional method; time spent by the beneficiary is minimal and by being a folding unit it can be shifted anywhere, or even after installing it can be dissembled and reinstalled

The use of renewable energy in the region was widely practiced as well. In Sewa, after the completion of the reconstruction, the Naya Ghar Samiti in Degam has now taken the form of SHGs engaged in assembly and the repair of solar lanterns. The lanterns are mostly sold to salt workers in the village as well as outside. These lanterns are useful to them during their migration to remote salt pans in the Rann of Kutch where they are completely cut off from the world and have no electricity. Local innovations/modifications have been made to the lanterns to recharge mobile phones and operate small music players. The Barefoot College in Rajasthan is also known for its initiatives in training the local populace in solar technology. These people are now known as the 'Barefoot Solar Engineers'.

USE OF DISASTER SAFE AND ENVIRONMENT FRIENDLY PRACTICES AND TECHNIQUES

Post 2001 earthquake, the massive scale of destruction brought into focus the need for sustainable housing and infrastructure for the villagers. Linked with this was the need for overall development of the communities especially with regard to the drought proneness of the areas and the dependence of the people on agriculture for livelihood.

To meet these needs a highly participatory mode, was taken by the organisations working in the area. In this regard technologies, techniques and practices were chosen which were not just suitable for the local populace but simple, cost effective and easily retained by the community. These are given in table 1.

A classic example of the use of traditional technology which was upgraded to suit the local conditions is that of the bhungas in the Rudramata Village (artisans cluster). The bhungas as they are traditionally called are made of compressed earth blocks laid out to achieve a circular form. In the upgraded version - the design was humanised and traditional form was adapted both for its climatic and cultural significance. Local production of materials such as compressed earth blocks ferrocement, roofing channels and toilets through local community groups, entrepreneurs and petty contractors has been a mechanism to both reduce costs as well ensure availability of these materials beyond "project" periods.

CHALLENGES

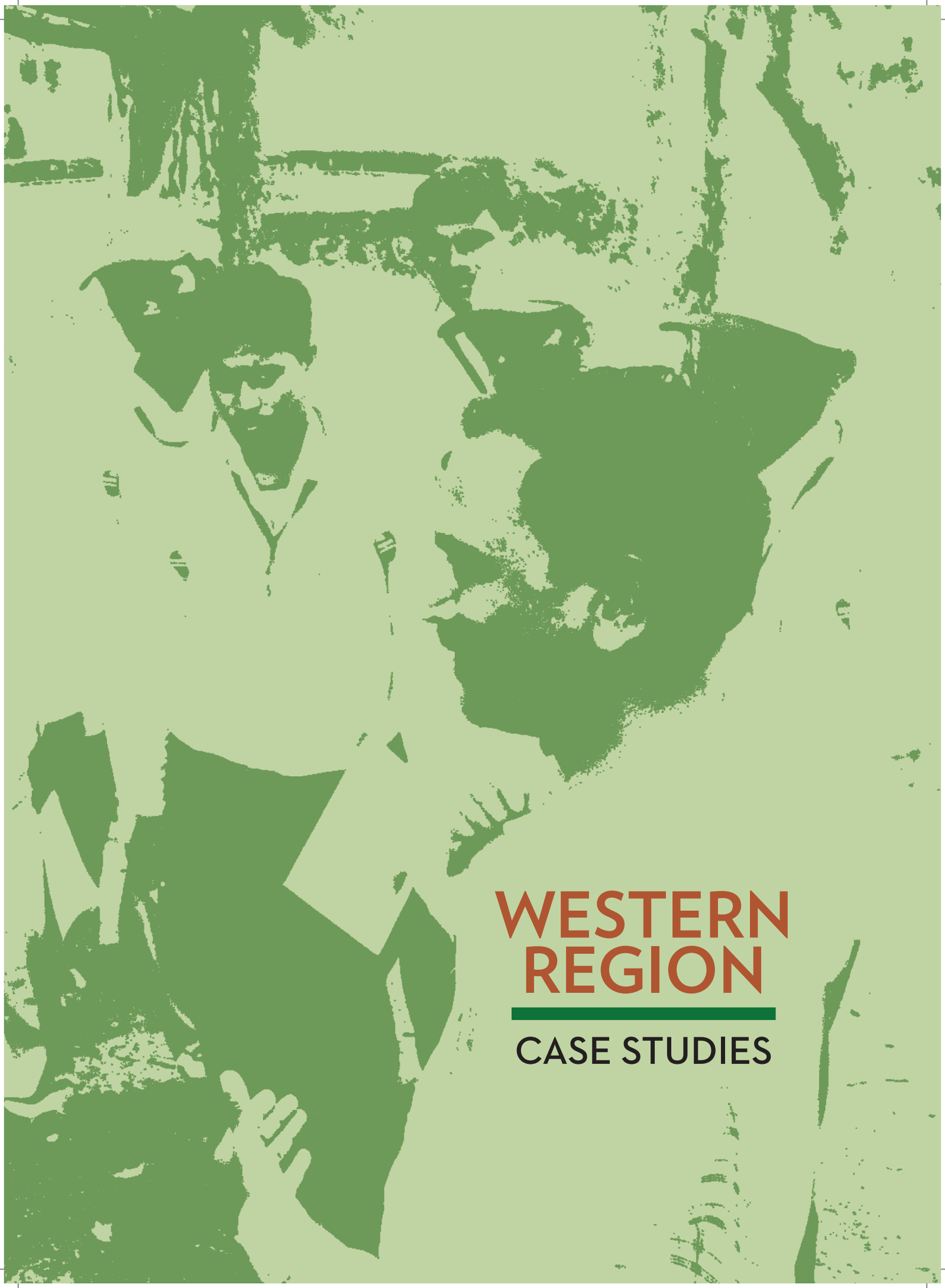
The improvement in the overall living and habitat conditions is significant especially in villages like Rajsamadhiyala in Gujarat. However looking at the region as a whole there are enduring issues which still require a great deal of work and attention. Of these the local governance issues especially with regard to inclusiveness is one, the other related issue is that of communication problems between the villagers due to distinctions based on caste and gender. For instance, in many cases the local governance still

Table 1: Technology Options Observed in the Western Region

Use of disaster safe and environment friendly practices and technology	Renewable Energy	Solar lamps
		Community biogas
		Wood gasifiers
		Solar home lighting
		Solar street lighting
	Disaster Resistant and Locally Viable Technology and techniques	Remote Sensing and GIS technology for sourcing water
		Prefabricated toilet panel
		Low cost pre cast units
		Easy assembly
		Disaster resistant construction techniques
		Concrete blocks
		Ferrocement channels
		Interactive and user friendly
		High structural strength
		Low building cost
		Less water consumption
		Use of local materials
		Mangalore tiles
	Low Cost Building Materials	Wood
		Lime
		Sand
		Chipped stone

doesn't accept the role of women in the process of development. For instance, in Anandi there was little communication between the village women collectives and the Panchayat. Moreover, in certain cases where the women were trained in construction work, the demand for their work post reconstruction depleted – somewhat due to the lack of acceptance of the local governing bodies of the women's work and partly due to the low levels of empowerment of the women which prevented them from working in areas beyond their villages and/or taluks.

There are also persisting issues about sanitation and the construction materials used in some of the areas as also the problems with technology uptake. Much of this can be correlated to the level of illiteracy and low capacities of village governance structures that exists in the areas covered by the western Lok Awaas Yatra. While civil society action is vibrant with a strong emphasis on community led processes, engagement with and strengthening village governance institutions still remain a major concern.



WESTERN REGION

CASE STUDIES

1.0

KEYWORDS: ideal village, panchayat-led development, water and sanitation, crime-free, self-reliant

RAJ SAMADHIYALA IDEAL VILLAGE

SUMMARY

Raj Samadhiyala is the ideal village situation. The village once known for a lot of notorious activity is now known for, how one man by gaining community cooperation managed to eradicate this and move the village towards a well developed form, which is clean, sanitised and safe. The village received a Nirmal Gram Puraskar for ensuring that every household along with schools and *anganwadis* had sanitation facility, dust and litter free roads, and proper drainage.

CONTEXT

Raj Samadhiyala is a village in the Rajkot district, about 25 kms from Rajkot city.

Need: The village faced a major water crisis with groundwater table receding to a depth of 250 metres. By 1985, villagers started to build check dams and tanks by using funds under the District Rural Development Authority (DRDA) programme.

Scale: The village is spread over an area of 1500 acres and has a population of 1800 people. Practically all the households in the village have access to safe drinking water and sanitation facilities.

Objectives: The initiatives in the village have been undertaken to make Raj Samadhiyala:

- A self reliant village
- Crime free and a safe village
- Sufficient in drinking water supply
- A Clean and sanitised village

SIGNIFICANT HIGHLIGHTS

Technology: There is a piped water distribution network in the village providing water at the household level. The village has two wells for drinking water, one tube well, eight percolation tanks and 40 check dams. All these measures have resulted in sufficient supply of water to the households even in times of droughts and water scarcity.

Electronic techniques like Remote Sensing and Geographic Information System (GIS) are used to locate subsurface dykes for water storage that have gone dry over the years. These dykes once excavated and injected with rainwater, help in faster recharge of groundwater. The village leader has with him the GIS map of the entire taluk, which has been used to build check dams in the neighbouring villages of Aniala and Kasturbadham, hence, benefitting the entire region.

Institution: There is a Lok Adalat, which takes care of the crimes that happen in the village. No complaint is to be lodged by any villager in a court, especially for theft. In case of theft, a complaint is filed with the Lok Adalat, which gives 24 hours to search for the stolen items. If it is not traced, the committee compensates for the loss. This mechanism is applicable to the theft of farm products as well.

The village has a strong Panchayati Raj system with clear distinction of powers with the Gram Panchayat. The Panchayat has made it very clear that only those people who can live peacefully are allowed to stay in the village, otherwise they would be boycotted in case they do not conform to the rules and regulations. In return, the panchayat ensures the safety and clean living standards for the people. Unlike many villages, winning awards is not what drives development works in this village. The village Panchayat primarily works on the principles of unity for the benefit of the entire community.

The Panchayat has therefore undertaken several measures for the overall development of the village. It has set up certain rules for the villagers, a volley of strict guidelines and has a system of charging fines in case anyone does not abide by these rules. The rules were set up in 1978 when a Gram Samiti was formed and through sustained efforts of local leaders and law-abiding villagers, the entire community now adhere to these rules.

"Anyone found littering or wasting water is fined Rs 50" – Jadeja, Village Leader.

In the past, the Panchayat has collected almost Rs. 17 lakh as fine from people for dirtying their hamlet by either spitting or littering around. The Panchayat also

collects house tax, light tax, village cleaning tax and water tax. The house tax is collected on the basis of the type of roof; it is Rs. 1400 for a house with permanent roof and Rs. 600 for a house with a semi-permanent roof.

There is a Village Development Committee (VDC) in the village that takes decisions on village welfare schemes, their management, finance and people's participation. It has the power to even overrule decisions of Government officials that may be detrimental to the interests of the village. This body has also ushered in social change.

Social: The Sarpanch calls the village a 'Kutumb' (family), with no distinction among households on the basis of caste and class. There are about five to six castes in the village. The villagers without any prejudice interact with each other, and they even attend the weddings of the so-called 'lower' caste people without creating any issues. There is also a sense of belonging and community living, among the people for their village. The Panchayat has hired a person only for cleaning the main road, however cleaning the rest of the village is the responsibility of the people themselves. Gender issues also feature in the development agenda of the village. It is mandatory for all the girls to attend school.

ENERGY, RESOURCES AND ENVIRONMENT

Several measures have been undertaken to protect the environment of the village and its surroundings. Bursting of crackers is prohibited in a bid to maintain a healthy environment. Several check dams have been constructed by the villagers over a period of time, this perhaps has enabled them to drastically cut down on their dependence for water supply on external sources in times of drought. Villagers have also been working to increase greenery in the village; about 60,000 trees have been planted in the village. The residents also take the responsibility of solid waste management, i.e. to dump the garbage and animal waste in the landfill site outside the village.

CHALLENGES AND RESPONSE

Initial phases of development works encountered a number of challenges that were skilfully dealt with by the Panchayat and Village Committee.

Strategies: There were certain notorious residents (5 – 7 per cent) in the village who tried to create hindrance in these noble activities. To check this, the first step was to identify such people and then through dialogue, explain to the remaining community about the development work, needs to be executed for the prosperity of the village. Through this dialogue majority of the villagers were targeted to get them in alignment with the village development work. For the people who created trouble, dialogue was used, and if that did not work some forms of coercion were also employed. The underlying principle was to take the people into confidence, get their support and cooperation by making them work as one community towards the common goals in the long run.

There were about 30 odd people working as witch doctors in the village who were misguiding the whole community, by the ways of involving different kinds of magic and superstitions in various social and economical activities. The Sarpanch not only stopped all of this, but also imposed a penalty of Rs. 500 against the activities of this group. He also engaged them in the works of check dam construction.

Another consequent barrier in the village developmental activities was casteism. To check this, the Sarpanch introduced the community to 'villageism' (*gramwad*) to help the community become united.

Impacts: Former Sarpanch Jadeja 'had transformed the village Raj Samadhiyala into a model village, totally crime-free and characterised by self-reliance, inter-caste amity and active community participation'. He succeeded in convincing the village people that demanding or begging from the Government is not the solution to their problems, but joining hands and

working in unity would be the answer. It is a model village not only for Third World villages, but also First World villages who suffer the same droughts and calamities. This village shows all the necessary ingredients for success: A visionary leader, a village institution to take decisions and community participation in resource management.

Water is a major agent of change in this village. The village has generated an income of Rs. 5 crore, much higher than what it was expected. In 2001, the village generated an income of Rs. 4.5 crore. In 2002, with enough water harvested from the rains, the villagers of Raj Samadhiyala started cropping 3 times a year, generating much higher incomes than what was expected from double cropping and farm diversification. The villagers also started planting high-value crops such as cumin, vegetables and fruits. Not only that, the supplies of food, feed, fodder and fuel improved as did the incomes, literacy and social development. Raj Samadhiyala is a village in a new incarnation (Hilario, 2007).

To conclude, Raj Samadhiyala also received the Nirmal Gram Puraskar for ensuring that every household along with schools and *anganwadis*, had sanitation facility, dust and litter free roads, and proper drainage, in order to bring about absolute hygiene and sanitation awareness, contributing to a better well being of the villagers.

2.0

KEYWORDS: appropriate construction technology, integrated village development, water and sanitation, women led reconstruction, disaster, habitat based livelihoods

WOMEN LED RECONSTRUCTION

SUMMARY

Following the devastating earthquake of 2001, Anandi, with technical support by People's Science Institute Dehradun, took up reconstruction in 10 villages of Maliya Block in Rajkot district. The reconstruction experience demonstrates the untapped potential of women in the community to take full charge in the face of disasters. Women however, were the main actors across all stages of the project. They were involved in identification of the poor and the most vulnerable families, seeking owner contributions, signing of agreement, approval of construction sites, finalising of layout plans, material procurement and quality control. *Mahila mandals* and construction subcommittees were the primary decision makers and managers. Skills up gradation of women construction labourers through training had a ripple effect. The trainees were employed and engaged, as were the trainers for other women of their category in other districts and neighboring states. Khilij was one of the villages developed under this initiative.

CONTEXT

Village Khilij is located in Maliya Block of Rajkot district in the Saurashtra region of Gujarat. It suffered badly during the 2001 earthquake.

Need: The block is among the five most backward blocks of Gujarat. The earthquake damaged 70 per cent of the village Khilij. Maliya block has population of 72,014 people in 47 villages, comprising mainly of Muslim, Koli, Bharwad, Patel, Ahir and Darbars castes. The caste and communal differences are rife and they came to the fore soon after the relief phase was over. On the other hand, the poor and vulnerable groups remained marginalised, even when it came to retrieve compensation for houses damaged or be liable to other Government schemes. In keeping with its basic approach of targeting the poorest, Anandi decided to channelise the resources of rehabilitation for the poorest in the region.

Scale: The process was undertaken in 10 villages of the Malliya Taluka and 710 houses were constructed, impacting housing practices in the region with regard to earthquake safe features and aterials. A total of 300 people were trained in the process.

Objectives: The primary project strategy was to achieve shelter rehabilitation for the most vulnerable, while empowering and enhancing the capacities of the women in the villages. In the short term, transitional shelters were constructed by women from the community themselves with facilitative support from Anandi and PSI. The long term objective was to ensure appropriate construction standards in seismic zone through transfer of earthquake safe technologies. The project created safe and appropriate habitat, while ensuring gender justice and helping to reduce poverty in the process.

SIGNIFICANT HIGHLIGHTS

Technology: As mentioned earlier, first temporary shelters were constructed and then subsequently these utilised recycled materials such as wooden members of old houses, stone blocks, morvi tiles (C class clay tiles) and steel members. The technologies used were designed to be low cost, disaster proof and those that could be quickly assembled. The technology selected after a survey of the area revealed that the roofs made of the aforementioned tiles did not suffer the kind of damage, as compared to the other houses that bore the brunt during the earthquake. These structures were built in about 11.000 rupees by 3 masons in approximately 5 days. Of this, around 6 to 8 thousand was material cost and the rest was the labour cost. The steel sections were used as vertical frame and horizontal framing was done by steel trusses or wooden members. The clay tiles were laid as bricks in stabilised mud mortar as infill material.

The first few models were demo houses for the community after which they were validated by the community and soon replicated on a larger scale. As a strategy, substantial numbers of houses were built

spread over 10 villages, which created an impact on housing practices in the region.

Institution: In the entire reconstruction process, women were the main actors. They were involved in the identification of the poor and the most vulnerable families, seek owner's contributions, signing of agreement, approval of construction sites, finalising the design layout, and managing the construction process (raw material procurement and quality control.)

Mahila mandal: In each village a *mahila mandal* was formed to oversee the entire process of construction. The different tasks of the construction process were assigned to groups of two- three women called samitis. Working in collectives gave women the much needed support of each other. The solidarity amongst the women got intensified with experience sharing in the cluster meetings held regularly.

Capacity building of Mahila mandals: For developing their capacities for this role, various tools and techniques such as posters, AV presentations, theory classes and on-site practical classes, orientation sessions, regular meetings and review sessions, on the job training and exposure visits were organised by Anandi and PSI. At the beginning of each programme, an orientation was held on the concept, methodology and implementation schedule, followed by monthly meetings at the village level, and fortnightly meetings with the construction committee. 40 volunteers worked with the committees. Even men became part of the committee eventually.

Transparency in financial transactions: In order to help women feel confident about the security of their money, they were issued separate passbooks and one common register was given to the Mandal in which a literate woman made regular entries. This regular habit of saving not only enhanced their savings and improved their ability to maintain records; it also improved their confidence in dealing with banks and most importantly, improved their ability to work as a collective.

Targeting: At the start of the process, identifying the housing beneficiaries was the most difficult task at hand. Anandi embarked on this exercise as a participatory exercise with women recognising this as an opportunity to demonstrate that women are capable of decision making in matters related to distribution of resources within the village. This arduous task was performed by the *mahila mandals* with great diligence.

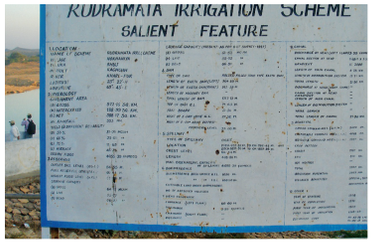
An earthquake resistant house of 260 square feet area (which is approximately the area that the Government allocates to BPL families) was built with Rs. 35,000. Out of this Anandi contributed around Rs. 27000. The cost of house was Rs. 40,000 when toilet and undergroundwater storage tank were added.

If an individual who had been rejected felt she should be included, then the women would give reasons in public for non-inclusion. Initially the women were hesitant to face people's ire, but gradually developed better understanding of their role in selecting the most vulnerable families. They felt a great sense on having the onus of "doing it right". After the initial hesitation of the women themselves, they soon began performing these roles with confidence. The community was surprised to see women taking decision, spending time outside the home "roaming" the streets of the village and discussing schedules, rates of materials in preparation of the construction. Later, if the house owners were being lax or if the supplier sent poor quality material, the women would chide them and coax them to do better next time.

Management of construction: Construction is considered male domain. Purchasing of aggregate, sand, cement, dealing with suppliers, arriving at the right price etc is normally done by the men of the household. But in the collective construction process that Anandi initiated the strategy was to involve women.

Social: Women empowerment is key social highlight in this project. The women came forward and took charge of the entire rehabilitation process. In fact, since the houses were given according to an order, people would get agitated, but women's support helped the organisation to carry on their work without any trouble, despite repeated threats.

These were critical times and it was only due to the strength of the few women leaders who remained steadfast, that Anandi's patience managed to continue



to stand by the *mahila mandal* even when there were negative rumours that helped women emerge stronger in these non-traditional roles.

ENERGY, RESOURCES AND ENVIRONMENT

To build temporary shelters, the organisation surveyed the area, and discovered that the houses of some of the poor in the village were intact and these were made of tiles. With this in mind Anandi designed the houses with the help of PSI that made use of local material. The villagers are still living in these very shelters that were constructed and they have so much faith in the endurance of these structures, that the villagers believe that their houses will outlast them.

Use of local resources: The Anandi initiative was successful with extensive involvement of local people particularly women. This can be seen through the formation of the *mahila mandals*. In the use of materials, locally available ones were used. In fact wherever possible, materials from the old houses were salvaged to decrease the costs further. These materials included substantial numbers of wooden elements that were salvaged from the original houses.

Drinking water: Although water is everyone's need, fulfilling the basic need of drinking water is perceived as women's responsibility. The stereotypical role division assigns the task of fetching water to women and girls. Water has always been a problem in this block and the women would walk several kilometres to fetch water. Yet the women are rarely involved in community level decision making on how to improve the access to water. Anandi initiated a demonstration project by offering the *mahila mandals* to provide viable suggestions to reduce the drudgery involved in arranging drinking water, primarily that involved long travels on foot. In order to address this situation, women decided to construct wells, ponds and check dams to end perennial water shortage. Some of these initiatives have indeed helped to put an end to their ordeal.

CHALLENGES AND RESPONSE

Strategies

Design: Anandi did not have previous construction experience. Therefore, the design was finalised with a local survey of the area, along with the help of PSI. The design chosen for the temporary structure had tile and a plywood roof, but this design was not initially accepted by the villagers. To gain acceptance of such a design was difficult as the people only wanted RCC roofs, which in turn is more energy intensive and more expensive. To gain wide acceptability of designs, the first few models were presented as demo houses to the community after which they were validated with certain modifications and then replicated on a larger scale.

> When the women in Khirai realised that it was the duty of the sarpanch and taluka development officer to help them in securing an electricity connection, the women marched up to his office and forced him to write an application.

Communication/politics: There was not much communication between the villagers especially the poor people and the Panchayat. The Panchayat however, always acted as a barrier in the construction work of these people. For 30 years there was Samras in the village, although all the villagers were not happy with the leader. It is with Anandi's help that in 2006 election took place in the village. They felt that this would lead to greater functioning of democracy in the village. Although despite the NGO workers were often threatened, intervention by the *mahila mandal* brought back confidence. Continuous capacity building effort of *mahila mandals* improved communication within the villages and the different group member were more empowered to present ideas across the different sections of people.

Drinking water: Malliya Taluka is a geographically difficult area and due to this there were a lot of problems in getting clean drinking water. In order to address this, Anandi trained 100 women in water and sanitation. These women learnt to make containers ferrocement tanks, and even sold them outside the village for 200 rupees each. However, these tanks and skills remain unused today, as with advancement of the community the houses now have a water connection. This has led to the women going back to working in the fields.

Illiteracy: To overcome the barrier of illiteracy in maintenance of records of the construction material (sand, water etc), a voucher system was developed. Each family where construction had begun was given a set of vouchers. Every time a load of sand or a water tanker was delivered the family would give the supplier a voucher. At the end of the week, *samiti* made the payment against the number of vouchers deposited by the supplier. This process transferred responsibility to the people, as each person was then directly involved in

PEOPLE'S PARTICIPATION IN THE DESIGN OF THE HOUSE

A demonstration unit of this design type was constructed at one of the villages. Community members took the opportunity to provide their feedback; for instance, they preferred to have a bigger verandah instead of a separate kitchen space. The logic was they normally build a *kuccha* kitchen (of straw and dung plaster – covered with corrugated Iron sheets) outside the house, which prevents smoke entering into the house. In order to help them remain within the limit of Rs. 35000 they suggested to increase the width of the verandah and not to keep the provision of kitchen in the building. They also preferred to have smaller windows in the house. The architectural design was accordingly revised, inner width of the verandah was increased by 1', and two small windows of size 1' -6 "x 1' - 6" were provided in the room. All other interior and structural designs were same as in the original design.

the construction of their houses.

Crossing the caste barriers: *Mahila mandals* comprising of women from all castes without any discrimination against the dalits, a classic example of Babu Solanki of Kumbhariya explains that discrimination doesn't exist. The *mandal* women, whether they were from the higher castes such as Patel, Bawaji or Koli, all united to build him a house. Such experiences increased solidarity amongst them and provided opportunities to address problems of the dalits.

Process: The major stakeholders in the process were the community, especially peoples' organisations- the *mahila mandals* and the *samities* (women's' committees). Throughout the entire process of planning, execution and monitoring, women were the main actors. Right from the stage of identification of the poorest and the most vulnerable families, seeking beneficiary contributions, signing of agreements, approval of construction sites, finalising layout design, material procurement and quality control, it was the *mahila mandals* who took the lead. They were the primary decision makers and managers. The *mahila mandals* used simple to understand observable criteria i.e. households with no earning members, women headed households (typically widows and women abandoned by their husbands), households with many small children and only two working members, aged spouse, and salt pan workers.

The authenticity of the cases was verified by making detailed assessment of assets, and the salvageable material from the house destroyed. The final list was shared in a transparent manner in a public meeting, where assessment norms were discussed and consensus sought from the community.

Once the process of construction started, women came forward enthusiastically to learn, despite the initial hesitation. Several discussions on the values of being pro-poor, transparent and being honest were woven into the ongoing interaction between the Anandi team and the *mahila mandals*. Women came forward as empowered force that had the confidence to deal with the ridicule, and hostility of some of the men in the village.

Focus was on capacity building of the women using various tools and techniques. The different tasks of the construction process were assigned to groups of two to three women (*samities*). With a view to empower women, women were encouraged to carry out conflict resolution with house owners, suppliers or the masons. However in serious cases Anandi took a public stand to support the women and stood by them to drive home a positive message. To overcome the barrier of illiteracy in maintenance of the records of the construction material supplied, a voucher system was developed.

Between Anandi and PSI, one engineer and two ITI trained professionals took care of technical aspects of the entire construction process. For every three villages two social workers were assigned
to facilitate the community participation in the process. The social workers mostly stayed in the villages during the intense construction phase. Hence, there was fairly close monitoring at the village level. Senior team members visited the villages once a week and fortnightly meetings were conducted between the team members, who enabled trouble shooting and regular planning to complete the work on time. The cluster meetings were also forums, which also enabled direct interaction between the senior Anandi team, and the village women.

Quality control in the construction was monitored at the important stages – foundation, sill, lintel etc. by way of house-to-house survey. Erring households were warned and in certain cases the masons' services were withdrawn till the family agreed to follow the stipulated norms.

Impact:

Women's empowerment: Inclusion of women in the

entire process of reconstruction and rehabilitation as key drivers has led to high degree of empowerment for them, economically and socially. In fact, once the rehabilitation work was done, it is the women who indicated that work in creating livelihoods needs to be done. Women have emerged as more confident individuals who have the capacity to carry out development work, in taking informed decisions and in executing quality and cost effective seismic resistant houses. The immediate project impact can be seen on the quality of habitat now available to most vulnerable families in the targeted villages. Women (well equipped with skills in construction) now have alternative livelihood options available, apart from longer-term impacts on the overall quality of life of their respective families; women have demonstrated their capabilities in the public sphere.

Targeting the most vulnerable: Proper target detailed analysis, helped the poor and the most vulnerable gain access to durable shelter and a decent livelihood. People with migratory livelihoods and not having any entitlements such as saltpan workers and fisherman drew benefits from this programme. The most appreciated aspects of this programme are that it covered the poorest families and ensured technical soundness of the structures built.

Unresolved Issues

The Panchayat still creates problems in the work that benefits the poorest in the village. Initiatives undertaken by women are still not highly appreciated in the village. Moreover, an issue that seems to have arisen is that when the earthquake struck, the women were given training and these women at that time had a lot of work due to rehabilitation, but now demand for their work has gone down. Further even if there is demand the women are reluctant in leaving the village and going out for work. In the Khilij village, 20 women were trained and today only 10 are working in the sector. Despite various discouraging factors, a significant number of motivated women have continued with their work.

Construction work was carried out by the women who came forward enthusiastically to learn after initial hesitation. Several discussions on the values of being propoor, transparent and being honest were woven into the ongoing interaction between Anandi team and *mahila mandals*. Monthly meetings were held at the village level, fortnightly meetings were held with the construction committees. Different tasks of the construction were assigned to groups of women who could share the same in cluster meetings. Voucher system developed helped to overcome the problems occurring due to illiteracy. Anandi and PSI steered the process along with women. Quality control was maintained by empowered women's' groups.

3.0

KEYWORDS: inclusive and participatory processes, agency support for construction.

BANIARI VILLAGE, KUTCH DISTRICT

SUMMARY

Baniari, 15 kms from Bhachau, is a village that had 47 dalit families. This village was located at the edge of Rann of Kutch with poor soil conditions. As a result of the post-earthquake disasters, the dalit families who were dependent on agriculture for their livelihood, decided to move towards Budharmora and settle there. This new settlement was named Harinagar. The villagers purchased a small piece of land with their own contributions, divided it into sub-plots of 200 square meters, and made provisions for future extension of the community.

Within nine months, all the houses along with the infrastructure were completed and families moved in to new houses. During the last four years, people managed to bring electric power supply, drinking water pipe lines and constructed primary schools through their own efforts. The group built a temple in the village. Overall, the settlement, environment and safety are well maintained and a spirit of solidarity and unity is demonstrated.

CONTEXT

Harinagar is a small rural settlement in Anjar Taluka of the Kutch district of Gujarat.

Need: The devastating earthquake of 2001 left the labour class of Baniari village jobless and vulnerable. These people collectively decided not to resettle in the same place and moved towards Budharmora for better land, livelihood and other opportunities. This new settlement is now known as Harinagar.

Scale: 47 families of the Baniari village are resettled at this location.

Objectives: The underlying purpose of migrating to Harinagar was to look for better livelihood and other opportunities. The core objective of the project was to construct houses for the 47 families and create household and village infrastructure in a progressive manner.

SIGNIFICANT HIGHLIGHTS

Technology: Each family has its own fenced plot, which includes a large open space, a separate kitchen in the open and the house. This brings a feeling of ownership of the land and a self-governed territory. The roof of the house is made of Mangalore tiles and the walls are made up of cement stabilised soil blocks. The block production centre was set-up on site. A team of 11 youths were provided training to produce cement stabilised soil blocks. After training, they were engaged in a rate contract to supply blocks and thus livelihood opportunities were created for the relocating families along with the housing construction. Disaster resistant construction practices have been used.

Water and electricity is available to all the families living in the village. The electricity meters are installed in all the houses and water is supplied to each household through pipes from borewells.

Institution: This is a community driven relocation and reconstruction process. The community itself decided to move from their original village, bought land at a suitable location and divided it into plots for everyone's use leaving aside areas for community facilities. The involvement of the community in the planning process was also immense. House owners were engaged in material production and labour supply. Unnati guided the community in the planning and designing process. The Maître - MBT of Pune provided financial support for this project.

Social: A harmonious well-knit community has led to the success of this project. The role of women was crucial in motivating the households to relocate and in tapping new opportunities for development.

Environment: Trees have been planted in each of these plots. Some of the villagers have their own kitchen gardens and cost effective environment friendly construction practices have been adopted.

CHALLENGES AND RESPONSES

Strategies

- Owner-driven reconstruction was the key strategy of this project, which led to its success and long term sustainability.

- In order to use the limited resources effectively, a need based development was undertaken in a progressive manner to keep the scope for future expansion.
- Awareness generation and community mobilisation was done to involve every member of each household.
- Community participation was central to the entire process and decision-making.

Process: After the earthquake of 2001, 47 dalit families of the Baniari village in the Kutch district decided to move out of the village and settle in a place with better accessibility and livelihood opportunities. They bought a piece of land easily accessible from the main road in Anjar Taluka of the Kutch district. The plot division and distribution was done by the households themselves after which they started living in tents on their plots. Thereafter, Unnati entered this area and started working with these 47 families. Detailed surveys were conducted and the community was mobilised to initiate house construction in the village. The Maître - MBT of Pune provided the financial support. With Unnati's support, the families constructed their houses and a community hall in about nine months' time.

Impacts

- The creation of safe housing stock for the households with adequate space for expansion.
- The provision of piped water and a 24x7 electricity supply at household levels.
- Capacity development of community members in planning, implementation and management their own projects.
- Increased accessibility of the settlement from other areas.
- Increased opportunities for the households in terms of livelihoods, education and health.
- Creation of a strong community that can put forward its needs and demands to the government.

Unresolved Issues

- Open defecation is still being practiced with no provision of individual or community toilets.
- School buildings are yet to be constructed.
- During monsoons, rain water percolates through the Mangalore tiles.

4.0

KEYWORDS: alternate technology, green development, water and sanitation, building materials, community development, training, people participation.

ASHA RECONSTRUCTION PROJECT, NAGAVALADIYA

SUMMARY

An earthquake of 6.9 on the Richter scale with its epicenter near the town of Bhuj in Gujarat devastated four towns and more than 10,000 villages in the Kutch region. Houses built of poor quality rubble and mud mortar covered with fired clay roof tiles came crashing down as did tall buildings made of industrial materials.

One of the components of Project Asha, implemented by Development Alternatives in association with EFFICOR, a National Christian Relief and Development organisation, was the reconstruction of 275 houses in the Nagavaladiya village in Anjar Taluka.

The project provided design, information on construction, and project management support with a transparent flow of information about the housing programme to communities with respect to the new designs and building systems. This enabled the communities to make informed choices and enabled an appreciation for the new technologies proposed.

Consequently, the village constructed a panchayat *ghar*, a primary school, an *anganwadi* and a temple. Each house has a toilet, a verandah, a kitchen attached to the living space and a bedroom.

The houses are made of concrete blocks and ferrocement channels. There is provision of electricity and water supply as well.

The construction of houses was done through a contractor based on each family's requirements, who later served as quality and time managers. A Village Reconstruction Committee (VRC) was formed.

It had representatives from all caste groups in the village and served as a mediator between the project managers, the contractors, and the villagers.

For the community to fulfill these roles, necessary training was provided to the VRC for process and quality monitoring. In addition, IEC tools were developed to introduce new technologies and disaster safety features. Also, material passbooks, checklists and other tools helped the community to effectively participate in project delivery.

CONTEXT

Nagavaladiya is a village in Anjar Taluka of the Kutch district.

Need: The earthquake of 2001 caused damage to many of the houses and community structures in Nagavaladiya. Therefore, reconstruction in the village was necessary.

Scale:

Two hundred and seventy five houses were reconstructed in the Nagavaladiya village.

Objectives

- In-situ reconstruction of 275 houses in Nagavaladiya village using appropriate and disaster resistant technologies for construction.
- Provision of community facilities in the village.

SIGNIFICANT HIGHLIGHTS

Technology

- Each house has a toilet, a verandah, a kitchen attached to the living space, and a bedroom. The house is made of concrete blocks and ferrocement channels.
- Use of building technologies appropriate for the region; The technologies used have high structural strength and low building cost with less water consumption using local materials.
- Flexible village planning, catering to in-situ as well as relocated house construction is seen appropriate by the design team in consultation with the village community.
- Detailed and participatory design processes were carried out with each family to allow for minor modifications in typical unit designs according to individual family needs while key structural elements such as horizontal tie bands and foundation depth were non-negotiable.

Institution

- The DA team played the role of an 'enabler' rather than the 'designer'. The actual reconstruction of houses was implemented through a contractor. The families defined their requirements and served as quality and time managers. A Village Reconstruction

Committee (VRC) with representatives from all caste groups in the village was formed and served as a mediator between the project managers, the contractors and the villagers.

- For the community to fulfill these roles, necessary training was provided to the VRC for quality and process monitoring. There were improvements in the understanding of various building materials and technologies during meetings, small group discussions and various tools such as posters, photographs, models and design documents were used. Technical guidance to the families for expansion and maintenance of the houses was provided. The families also used a 'passbook', an effective tool to keep detailed technical records of the construction process.

ENERGY, RESOURCES AND THE ENVIRONMENT

- Locally appropriate, low energy construction technologies were used.
- A local production centre was set up which also gave livelihoods to local people.
- Safe sanitation formed an integral part of the reconstruction process.

CHALLENGES AND RESPONSES

Strategies

- Community participation in design, implementation and monitoring of the project.
- Constitution of a Village Reconstruction Committee.
- Capacity building of the community in undertaking various tasks.
- On-site production of building materials.

Impacts

- Availability of safe shelter to all the households in the village.
- Availability of basic services, including water, sanitation, electricity, *anganwadi* etc.
- Capacity building of the community in undertaking and managing projects.

Unresolved Issues

- Leakages from the roof.
- Availability of alternate technology for future extension of the houses.
- Continued open defecation and conversion of toilets into store rooms.

5.0

KEYWORDS: solar energy, participatory and community led development, traditional building technology, owner driven processes

RUDRAMATA - ARTISAN'S VILLAGE

SUMMARY

This project demonstrates a village habitat development model with emphasis on traditional craftsmanship of the local artisans. Using their traditional skill and knowledge, the artisans have decorated their own traditional houses locally called bhungas using the local materials available. This has led to revival of the old traditional crafts and reinforced the capability of the local artisans. The project was initiated by KMVS along with participatory processes by the community. The bhungas are made of compressed earth blocks laid out to achieve a circular form. The roof is made up of Mangalore tiles with a wooden understructure. People of the village are also using solar lamps for lighting their houses at night.

CONTEXT

Rudramata is a small village in the Kutch district of Gujarat located at a distance of 15 km from Bhuj

Need: The project responded to the need for safe and affordable dwelling units in the earthquake and cyclone prone region of Kutch. The traditional 'bhungas' were made of mud walls and thatch roof, which demanded maintenance every year. Susceptible to the blows of natural forces of earthquakes and wind people felt vulnerable in the face of a natural calamity. The artisans were poor and lacked knowledge of new construction trends and practices. This dictated the need for financial support and better housing.

The families were primarily dependent on crafts as a source of livelihood. Proximity to the local market and support from NGO's acted as a vehicle to the development of traditional crafts as the main source of income.

Scale: The village consists of about 200 households.

Objectives: The village presents a model of the community's involvement in the development of a sustainable habitat and revivalism in traditional crafts as a source of livelihood. The underlying objectives of the project were:

- Construction of safe and sustainable houses.
- Revival of old traditional crafts and skills.
- Capacity development of the community to undertake house construction and earn their livelihoods from local crafts.

SIGNIFICANT HIGHLIGHTS

Technology

Building technologies: The design was humanised and traditional form adapted both for its climatic and cultural significance. The shape itself provides minimum resistance to air flow and acts well under seismic conditions, hence was most suitable for the place.

Cluster arrangement: Two or three circular huts enclosing a central space constitute the house of the artisans. Each hut was used for a different purpose. The most decorated one was used as a workplace, selling unit and as a guest room for visitors. The second hut is for sleeping and adjoining structures as kitchen and bathrooms. The huts were joined with temporary covering to form a sitting place (verandah).

Foundation: Sand columns have been used as part of the foundation.

Walling: The walls have been made by compressed stabilised earth blocks laid to achieve a circular form.

Punctures: The door and window frames were made of wood. Also the door and window leaves were of wood.

Roofing: The roof is made up of Mangalore tile and has a wooden understructure, which is well tied to prevent collapse during disasters.

Disaster resistant techniques: The entire structure is disaster resistant due to reinforcement tying the structure. Tie beams have been provided at three levels – plinth, sill and lintel to secure the structures against possible earthquakes.

Finishing: The exterior is either covered with plaster or left as it is in accordance with the owner's desire. The interiors have been decorated by the homeowners themselves using traditional methods of mud and mirror work to form inlays on the walls. This gives them an opportunity to showcase their skills and crafts besides making it a participatory process.

Other Technologies: The families also use solar lamps for lighting their houses at night. This has reduced the

dependence on grid electricity.

Institution: Kutch Mahila Vikas Sangathan (a rural women's group) geared the process for development of a sustainable habitat through people's participation, harnessing their traditional skills of making their houses. It also provided the required financial support. The project also ensured the rapid assimilation of new construction techniques, which would further help in easy upkeep, renovation and addition of new units without any support. The technical support to the programme was provided by Hunarshalla (an NGO) working in the area. Understanding the lifestyle of the people and respecting it Bhunga - the traditional circular form of the house was adopted. A personal touch was given to each dwelling unit by an inlay of mud and mirror work, done by the inhabitants themselves.

Water and electricity is provided to the village by the government. Other organisations working in the area are: Srujan (provides support in crafts related livelihoods), Abhiyan, KNNA and Sahjeevan.

Social: The project aimed at sustainable habitat development through people's participation. It involved extensive participatory processes. People's participation was necessary to ensure their inputs and ownership of the technology upgradation and innovation.

Capacity building of the community, through training for construction of houses with suitable building technologies has opened the doors of awareness towards the latest construction techniques. This has improved and enhanced their skills and knowledge. The units were made by people themselves invoking a sense of belonging and high level of satisfaction with the project. It has also increased the livelihood potential due to increased job opportunities, as they are technically skilled and trained to carry out the construction process. This further reduces the cost for addition of similar units and repair works.

The support from the NGOs has gone a long way in promoting the artistic flair inherent in the community. People are encouraged by training provided by the NGOs and are ready to inculcate new designs to sustain in the competitive world of handicrafts. The women work along with the men in the family to produce various handicrafts ranging from traditional chappals, mats and lampshades to hand bags in leather and fabric. The materials- mainly leather are sourced from Bhuj, 15kms away and the products are sold through NGOs like Shrujan, exhibitions in cities, or markets in Bhuj. This has made traditional crafts as an increased source of livelihood.

ENERGY, RESOURCES AND ENVIRONMENT

- The housing uses clean and green technology.
- Locally available materials like mud for walls and sand columns for foundation have been used. Mud being the most cost effective and energy efficient material makes the construction low carbon.
- Cement, Mangalore tiles and other materials required for construction are sourced from Bhuj.
- Overall the houses have a small ecological footprint.
- Solar street lamps have been installed to conserve the non-renewable sources of energy.

CHALLENGES AND RESPONSE

Strategies: The following strategies were adopted to achieve the desired objectives:

- An integrated habitat and livelihood support project to address shelter needs and livelihood simultaneously.
- Community participation.
- Multi-stakeholders Involvement.
- Training in crafts and house construction using disaster resistant techniques.
- Exposure to craft markets around the country.

Process: The project was initiated by Kutch Mahila Vikas Sangathan (KMVS), along with the people through an extensive participatory process. Technological inputs were given by Hunnarshala. Livelihood linkages have been strengthened by KMVS and Shrujan.

Impacts

- Construction of disaster resistant permanent houses in the village has been completed under the project.
- The skill level of the artisans has increased to the extent that they can construct new dwelling units or similar structures without any technical support. This greatly reduces the construction cost as the labour is provided by the people themselves.
- Support from various NGOs united with the efforts from artisans' has painted the fabric of the community both in terms of better infrastructure and generation of livelihoods. Income generation and preservation of traditional crafts go hand in hand, paving the way for development of a sustainable community.
- The villagers are happy at receiving the training to develop and enhance their traditional skills of leather works.
- The artisans create their livelihoods by selling handicrafts which they make themselves with materials locally available, thereby continuing their traditional art and crafts.
- People in general are satisfied by the construction done.

Unresolved Issues

- Open defecation. Toilets are still not being used. Villagers go to open areas, which are far from their homes.
- Lack of other infrastructure – individual taps, roads and drainage system.
- Lack of health services.

6.0

KEYWORDS: alternate technology, green development, water and sanitation, building materials, community development, training, people participation.

SHIKARA TECHNOLOGY PARK, BHACHAU

SUMMARY

As an initiative of Unnati, the technology park located in Shikara is a resource-cum-learning centre for the village communities in Bachau Taluka. Its key role is technology transfer and the know-how of disaster safe construction. The technology park demonstrates various construction technologies to ensure seismic and cyclone safety. It serves as a very good model for capacity building of the community by displaying procedures for various disaster safe technologies used in construction and renewable energy for electricity generation. It is a self-learning process, which does not require high technical assistance.

SIGNIFICANT HIGHLIGHTS

Technology: Disaster safe construction technology and regional adaptability are the prime highlights of the initiative. The technology park demonstrates techniques and provides information for the disaster safe construction of traditional single storey dwelling units in the earthquake and cyclone prone areas of Kutch. The technology park demonstrates disaster safe construction techniques through scale models of a dwelling unit at various stages of construction including, foundation, plinth, staircases, superstructure, fenestration, roofing, retrofitting, and rain water harvesting. Partially built structures with various layers of materials, show the details of reinforcements required to ensure safety. Retrofitting for existing structures has also been demonstrated through various models, with 10-15 per cent additional costs in comparison to a new construction that makes the structure as safe as new. The use of locally available materials and building practices is promoted in the technology park.

CONTEXT

The technology park is located at village Shikara, about 4 - 5 kms from the Unnati Campus in Bhachau. The technology park is well connected and easily accessible since it is located right next to the highway.

Need: The earthquake of 2001 raised an alarm over the construction techniques adopted by the communities. It was realised that there was a need for dissemination and adoption of disaster safe techniques in house construction. The dissemination of such knowledge in rural areas was even more crucial since most of the villagers constructed their houses themselves. Hence, the Unnati organisation felt the need for a self-learning centre for the transfer of technology and knowledge on disaster safe construction.

Scale: Located in Bhachau Taluka of the Kutch district, the technology park caters for about 73 surrounding villages.

Objectives: The underlying objective of the technology park is to transfer disaster safe technology and knowhow to the village communities in Bhachau through a self-learning process.

Institution: After the initial setting up of the technology park, Unnati has promoted the self-learning process in rural areas through this initiative. The technology park is interactive and user friendly in line with the literacy levels of common villagers. The learner need not depend on an engineer or technology expert as things can be learnt by self-learning.

Social: The centre serves as a catalyst for development of the rural masses by providing them with assets such as safe housing. It allows equal access to all the communities irrespective of their caste, class, etc. The technology park is an innovative and effective means to enhance the capacities of masons and villagers in building construction.

ENERGY, RESOURCES AND THE ENVIRONMENT

The technology park promotes the use of locally available materials. It also promotes the use of renewable energy, such as solar energy for lighting. Rain water harvesting is also demonstrated at the technology park.

7.0

KEYWORDS: habitat finance, participatory design, renewable energy, community mobilisation, participatory processes

NAYA BARKHEDA VILLAGE, BHARATPUR

SUMMARY

The housing and renewable energy project was implemented in 35 villages in the Bharatpur district of Rajasthan and Naya Barkheda is one such village. Under the initiative, more than 100 houses have been constructed within a period of 2 years, jointly supported by the Lupin Foundation and the Habitat for Humanity International. Under this project, poor families were identified by the Gram Sabha, who were not below the poverty line (BPL), yet could not afford a house. These families were provided with a low interest loan of 12 per cent equivalent to 2/3rd of the estimated cost of construction by the family, in the form of cash or materials. The land was allotted free or at subsidised rates by the Panchayat. The house was designed and constructed in a participatory manner, using locally appropriate building technologies and included toilets and rain water harvesting structures. A comprehensive programme was undertaken to educate the villagers on the maintenance of their houses.

In addition to the housing energy needs, the villagers were also satisfied with this initiative of using renewable sources. Apart from the energy initiative, income generation and infrastructure development activities have also been started. This is also backed by literacy drive and SHG formation.

FACTS

Context: Naya Barkheda is one of the 35 villages in the Bharatpur district of Rajasthan where the 'Housing and Renewable Energy' project was implemented.

Need: To meet the housing and energy demands of the poor families who cannot afford proper housing but do not feature in the BPL list and hence are not covered under the Indira Awas Yojana.

Scale: Over 100 houses in 35 villages have been constructed with in a period of 2 years.

Objectives:

- Provision of permanent houses to poor households through participatory processes.
- Evaluation and the provision of energy to each household.
- Inclusion of income generation and infrastructure development activities backed by literacy drive and SHG formation in the overall project.

SIGNIFICANT HIGHLIGHTS

Technology: The houses were designed and constructed with the assistance of the beneficiaries, who used locally appropriate building technologies. The house design included a toilet and a rain water harvesting structure. A comprehensive programme was undertaken to educate the villagers on the maintenance of their houses.

Institution and Financial: The identified poor families were provided with a zero interest loan equivalent to 2/3rd of the estimated cost of construction. The land was allotted for free or at subsidised rates by the Panchayat. HFHI contributed a revolving fund of Rs. 1,000,000 in cash and 814,800 in kind in the form of 3,880 bags of cement. After the completion of the construction, the repayment phase started. The EMIs of varying tenure are collected every month and are paid back to the HFHI every quarter (not clear).

The total amount estimated for the house construction was Rs. 51,000. One third was donated by the Lupin Foundation and another one third by the HFHI. The rest of the cost is covered by the owner himself. There is a basic design of a single room made by Lupin and the house usually costs the owner Rs. 40,000 above the given loan. This design was not well received. Hence the houses are built as per the design requirements of the owner himself. Still, the loan module did not seem sufficient.

Social: The villagers were given training in different fields to support their livelihoods, which in turn would help them repay their loans. SHGs were formed and literacy drives were carried out.

ENERGY, RESOURCES AND THE ENVIRONMENT

Some of the villages had minimal development, no

electricity and suffered conditions that led to persistent poverty. The Lupin Foundation identified two clusters from three villages and evaluated the energy needs of each household. Community biogas, wood gasifiers, solar home lighting and street lighting were then incorporated into each village according to the expected demand. These are used to run bore wells for drinking water and grinding machines/flour mills, which provided economic activities to the populace.

In general, local materials like stone *pattis* are used in the house construction and that reduced the overall embodied energy. Affordable housing technology options are provided to the households for sustainable *pucca* housing.

CHALLENGES AND RESPONSES

Strategies:

- Large numbers of people were listed based on their needs and the decision for beneficiaries was done on selection basis by the village panchayat.
- The integration of social, economic and physical development of the village
- The formation of the Gram Sabha for village development activities.
- Livelihood support to reduce the risk of home owner default.
- The use of local materials like stone pattis and a reduction in the overall embodied energy.
- Composite renewable energy programmes for maximum viability.
- Affordable housing technologies for sustainable *ferrocement* housing.

Process: The Lupin Foundation took loans from the HFHI against their assets and provided money to the borrowers (villagers) for the construction of their houses. Lupin also provided technical support during the construction processes like procurement of materials from the market and in developing linkages between the villagers and the material suppliers.

Impacts: People now have *pucca* houses and roads in the village and are working together for the development of their village.

Unresolved Issues:

- The is no direct link between the villagers and the actual source of the loans. The Lupin Foundation is acting as an intermediary.
- The amount of loan assigned for a house construction is not sufficient to construct one room with a store.
- There are no toilets in the village because the people do not feel the need for one. This may be due to lack of awareness and/or non involvement of government bodies.
- There are no rain water harvesting structures as planned by the Lupin Foundation.

8.0

KEYWORDS: low carbon technologies, renewable energy, capacity building, integrated village department, education and training, water harvesting and technology demonstration.

THE BAREFOOT COLLEGE, TILONIA

SUMMARY

This project showcases an innovative model of rural education and capacity building, which has brought about a phenomenal change in the conditions of rural habitats in the area. Since its inception in 1972, the Barefoot College has encouraged skill building capacities through learning by doing. This process of education in Tilonia that encourages innovative techniques for water harvesting, the utilisation of renewable energy (solar cookers, solar water heating systems, cost effective solar lighting) and low carbon building techniques, have contributed towards livelihood creation as well as the conservation of ecological systems in rural communities.

CONTEXT

The Barefoot College in Ajmer began in 1972 with the conviction that solutions to rural problems lie within the community. The college benefits the poorest people and promotes practical knowledge and skill building, rather than paper qualifications through the process of learning by doing in education.

Need: Their programmes aim to equip the rural poor of all age groups with the right balance of technical knowledge and practical experience, so that in the long run each individual can choose to stay in the village and work for its development instead of thinking to move out.

Scale: The college serves a population of over 125,000 people in close and distant areas. Over the last 35 years, it has produced thousands of skilled workers like barefoot educators, doctors, night school teachers, solar engineers, water drillers, architects, midwives, masons, communicators, hand pump mechanics, computer programmers and accountants.

SIGNIFICANT HIGHLIGHTS

The college was entirely built by barefoot architects. It is spread over 80,000 square feet and consists of residences, a guest house, a library, a dining room, meeting halls, an open air theatre,, an administrative block, a ten-bed referral base hospital, a pathological laboratory, a teacher's training unit, a water testing laboratory and a post office. The college has other facilities like an STD/ISD booth, a craft shop, a development centre, an Internet café, a puppet workshop, an audio visual unit, a screen printing press, a dormitory for residential trainees and a 700,000 litre rainwater harvesting tank. The social work and research centre (SWRC) has also started a community radio and a digital empowerment foundation around the school premises.

Technology

Water harvesting structures constructed by the barefoot architects: The Barefoot College has embraced and acknowledged the architectural brilliance of traditional knowledge, skills and age-old techniques used to collect or 'harvest' rain water in order to meet the needs of drinking water and sanitation in rural schools and communities.

The Barefoot approach draws on local techniques and materials and specifically targets schools. The tanks are constructed with community contributions, which generate employment. 13,000 schools in 17 states have already been targeted, with direct impact on over 235,000 children. A tank takes 15,000$ and about 5 months to get constructed.

Solar power as a source of renewable energy: The Barefoot College first embraced solar technology at Tilonia in 1984. What began as a small experimental project to electrify a community health centre with a mini-plant of 145W, has grown to become the first and only fully solar electrified campus in rural India.

45 kilowatts of solar modules with 5 battery banks provide power to 500 lights, fans, a photocopying machine, more than 20 computers and printers used in the hospital and pathology lab, the library, the marketing centre for selling handicrafts, a centre training illiterate rural men and women to solar electrify their own villages, a traditional media centre holding puppet shows, a

communication centre with a screen printing device, film editing and audio-visual facilities, a phone and milk booth. What makes this unique is that the installation of all these modules and applications were carried out by barefoot solar engineers who have not been through more than 10 years of rural schooling.

The solar electrification training programme can be broadly classified into: a) Circuit assembly (of solar lamps, lanterns and charge controllers) b) Circuit testing (of solar lamps, lanterns and charge controllers) c) Fabrication and assembly (of solar lamps, lanterns and charge controllers) d) Unit installation (of home lighting systems, lanterns and REW) and e) Unit Maintenance (of home lighting systems, lanterns and REW).

Solar Lighting: The Barefoot College provides its users with a choice between two kinds of solar lighting units – Fixed Home Lighting Systems and Solar Lanterns. Fixed home lighting is a semi-portable ecofriendly lighting system designed for rural area development where minimal lighting is needed to carry out day-to-day activities even in the dark.

Solar cooking: The Barefoot College set up the Women Barefoot Solar Cooker Engineers Society (WBSCES) in Tilonia, Rajasthan in November 2003. It is the first association of illiterate and semi-literate women who independently fabricate, install and maintain 2.5 square metres parabolic mirrors solar cookers.

FIXED HOME LIGHTING UNITS

A. Four hours of lighting is available at any given time. Therefore, it is dependable unlike the grid electricity supply.
Users can choose between:
1. 12V, 20W fixed home lighting unit
2. 12V, 40W fixed home lighting unit
3. 12V, 80W fixed home lighting unit

SOLAR LANTERN (12V, 10W)

A solar lantern is a portable lighting system suitable for both indoor and outdoor lighting. On a full charge it can provide light for four hours daily. A solar lantern is like a mini system with everything inbuilt except a module. A 12V, 10W solar lantern consists of a CFL tube (7W), 1 SMF battery (12V, 7AH), an electronic circuit placed in the main house and a photovoltaic module (12V, 10W).

Institution

The barefoot college is an institution that refuses to call itself an NGO, and rather refers to itself as a voluntary institution. The building of the institution has two sections- an old and a new building. The 180 years old building is a British structure that has been donated to the institute. The new building was constructed 24 years ago. The produce from the institute are sold in their own shop or sold to other companies who deal in the mainstream market. Products can be ordered and custom made as per requirement.

Social

Training of barefoot hand pump technicians: Between 1981 and 1989, 1,042 unemployed rural people including 39 women were trained as barefoot hand pump mechanics to repair and maintain hand pumps in villages. Based on the successes of their efforts, the Government of Rajasthan adopted the barefoot approach and went on to employ more than 10,000 rural men and women to repair and maintain hand pumps in their respective villages. 105 barefoot drillers have installed 3,144 Indian Mark II hand pumps across 764 villages from the cold deserts of Ladakh to the hot deserts of Rajasthan.

Training of barefoot engineers in rain water harvesting and wasteland development: 475 barefoot water engineers trained by the Barefoot College have built 1,286 underground rain water harvesting tanks in rural schools, with the capacity of collecting 95 million litres of rainwater. These tanks provide water for at least 4 to 6 months to 1.5 million children in 20 states of India.

1,500 men and women have been trained and

PARABOLIC SOLAR COOKERS

A parabolic solar cooker uses solar energy to cook food. Its shape and construction allows the sun's rays to fall on 300 mirrors that reflects the rays to the bottom of a cooking pot and cooks food quickly. Parabolic solar cookers work well in places that receive abundant sunlight such as Rajasthan, India.

A parabolic solar cooker is ecofriendly since it does not use fossil fuel, wood or battery to cook food. It helps in conserving trees especially in places where they are scarce. Women who spent long hours fetching firewood need not do so anymore. Their time can be better spent in other productive activities.

A parabolic solar cooker may not be portable but it is user friendly. The only attention it needs is adjustment once in the morning and it will track the sun all day by itself leaving one free to cook uninterruptedly for the rest of the day. An in-built spring and clock system is accurately set to complete one rotation every 3.23 minutes, which in turn rotates the cooker to track the sun throughout the day.

Building a parabolic solar cooker demands high accuracy and skill in metal craftsmanship. A craft that has traditionally been synonymous with men is today being practiced by women. The cooker weighs 130 kg and is fabricated to precise measurements by bending, welding and cutting in a matter of just one month. There is no scope for inaccuracy as it will result in the cooker not working at all. Almost 100 people including 80 women have been trained to construct and cook on parabolic solar cookers.

Parabolic solar cookers produced by the WBSCES have been installed in 9 villages and meet the eating needs of more than 400 people daily. They have been installed in the college fields at Kadampura, Tikawda, Singla, Jawaja, Solavta, Nalu and Tilonia in Rajasthan.

Dimensions - length: 280cm, breath: 170cm, height: 250cm

Space required for installation - length: 305cm and breath: 305cm

Price (excluding tax and transportation/installation charges): Rs. 13, 000

SOLAR HEATING PRODUCTS

Solar Water Heaters (SWH): They are two varieties available – oil-based and non oil-based. Oil-based solar water heaters do not allow the stored water to freeze. Users have a choice between tank capacities of 100 litres (ideal for 5 persons), 200 litres (ideal for 10 persons) and 300 litres (ideal for 20 persons).

The Solar Powered Desalination Plant: The RO plant is powered by a 2.5KW power plant which helps it to produce 600 litres of water per hour, for 6 hours daily. Even though Kotri is 'electrified by grid' it barely receives supply for three hours in an entire day and that is erratic. For this reason the plant has been solar electrified to ensure uninterrupted supply of electricity for 6 hours, with some power to spare for a computer, a solar workshop, fans and lighting.

The RO plant reduces the locally available blackish water with a salinity of Total Dissolved Solid (TDS) between 4000-6000ppm to 450ppm only, making the water not just sweet but also safe to drink. The plant meets the drinking water needs of more than 1,000 men, women and children from Kotri and its surrounding villages. Each family can take 40 litres of water per day but pays an amount of Rs.10 monthly.

employed for laying pipelines, developing wasteland and for constructing rainwater harvesting structures such as tanks, dug wells, trenches, anicuts and small ponds. 300 barefoot water engineers have built 1,686 toilets for girls in 1,286 rural schools across 20 states of India.

Training of surveying technicians: More than 180 semi-literate men and women have been trained as barefoot surveyors, technicians and chemists to test samples from more than 3000 drinking water sources in almost 250 villages in four development blocks of Rajasthan. They have also been trained to update test results on computers.

Trainings in simple management methods: Members of the Village Water Committees (VWC) are trained in simple management methods for keeping financial records. They are trained to manage the construction and implementation work and keep records of the number of people working at a site. The Barefoot College organises three day camps for these 'barefoot managers', in which they are trained to allot and measure work done at a site, fill up of job cards and disburse wages.

Training of barefoot health professionals: Since 1973, more than 1,442 rural men and women have been trained as barefoot health professionals. Presently, the team consists of 6 barefoot doctors, 10 barefoot health workers, 58 barefoot midwives, 2 barefoot pathology labs technicians and 2 barefoot dentists, who make available basic health services to more than 150 villages in five development blocks of Rajasthan.

Trainings to assemble radios: Since 2009, 7 rural

women including 5 physically challenged women have been trained to assemble
FM transistor radios and broadcast programmes on the Community Radio Station.

Other trainings: Since 1981, 137 groups, including 1,538 women and men, have been trained in making and handling puppets as well as perform street plays for rural development. 30 barefoot communicators have spread traditional media to states of Bihar, Andhra Pradesh, Orissa, Tamil Nadu, Kerala, Madhya Pradesh and Gujarat, through barefoot affiliated centers as well as independent groups.

Since 1982, 7 rural people including 2 women have been trained to take pictures, record videos and make/edit films. 20 men from rural communities have been trained by them to do the same. They document all activities and initiatives related to health, education, rural women's development, alternate energy, people's action and rural handicrafts.

Since 1984, 15 men including one deaf and dumb man has been trained to print booklets, maps,
manuals, posters, banners, pamphlets, invitations and T-shirt graphics through screen printing.

ENERGY, RESOURCES AND THE ENVIRONMENT

Low cost building materials such as wood, plywood (hard board), lime, sand, chipped rock and stone, have been used in the construction of the Barefoot College building. Cement has not been used in the buildings. Over 150 geodesic domes made out of scrap metal have been used as schools, dispensaries, telephone booths, community centers, and meeting places for village women.

A 700,000 litre of rainwater harvesting tank has been made to cater for the water needs of the resident trainees. The college is completely solar-electrified.

The barefoot approach to rural solar electrification has been replicated across 751 villages in 17 countries and 16 states of India. As of December 2009, 461 people have been trained as barefoot solar engineers (BSEs), of whom 211 are women. These BSEs have fabricated, installed, repaired and maintained more than 14,800 fixed solar units and 8,585 solar lanterns. Their collective efforts have benefited at least 896,000 men, women and children.

Barefoot solar engineers: The methodology applied for rural solar electrification is unique to the Barefoot College. Only villages that are inaccessible, remote and non-electrified are considered for solar electrification. The college essentially trains a few members of the community to be 'Barefoot Solar Engineers' (BSEs), who will install, repair and maintain solar lighting units for a period of at least five years, as well as set up a 'Rural Electronic Workshop' where components and equipment needed for the repair and maintenance of solar units will be stored. A special effort is being made to provide solar lights to the night schools.

The college motivates the communities to give opportunities especially to middle-aged women, who are widows and single mothers with families. They are persuaded to choose people who have their roots in the village and will stay and work there for its development rather than migrate to the city soon after training. By being solar engineers they receive an additional source of income as well as continue to be involved with their family, crafts, agriculture, animal husbandry and other income generating activities.

BSEs are trained to understand and identify basic electrical terms, components and equipment. They learn to assemble and fabricate circuits and solar lanterns, solar lamps, charge controllers, choke coils and transformers, and also learn to correctly connect modules, batteries, lamps and charge controllers. The trainees are selected by SWRC centres from all over India and even other countries in Asia and Africa and are provided lodging and food on the campus. The Barefoot College strives to make every trainee capable enough to confidently and independently install, test, repair and maintain fixed solar lighting units, solar lanterns, as well as an REW.

At the end of six months the trainees pass out as Barefoot Solar engineers. As per prior agreements, the 'graduates' go back to their respective villages and electrify the households with solar lighting units and assume the responsibility of repair and maintenance for a minimum of 5 years. Barefoot solar engineers play a key role in sustaining and replicating solar technology in rural communities.

The college also trains women in making solar cookers by assembling components. The trainees are given a minimum stipend of Rs. 100 per day. A solar cooker costs Rs. 13,000 and is built on an adjustable mechanism where the mirror always faces the sun.

CHALLENGES AND RESPONSES

Strategies: The Barefoot College creates livelihoods directly as well as indirectly, through its programmes

such as Solar Energy, Water, Education, Health Care, Rural Handicrafts, People's Action, Communication, Women's Empowerment and Wasteland Development. Since all programmes and its initiatives are planned, managed and implemented by members of the rural community, each one acts as a source of employment to some degree.

People's Actions, Communication and Women's Empowerment initiatives, indirectly create employment within rural communities to reduce migration. They encourage and motivate poor and unemployed rural youths, as well as middle-aged men and women, to seek jobs that help to develop rural communities and improve the quality of life.

The Barefoot College is one such source of livelihood, through which any (adult) member of the rural community, irrespective of their gender, caste, ethnicity, age and schooling, can work for the development of rural communities, as well as provide basic services and sustainable solutions through a combination of demystified technologies and traditional knowledge and skills.

Process:

The barefoot approach to community management and ownership of RWH structures: Work selection and demand proposal The Barefoot College first organises a collective meeting with all the members of the community, in which the requirements and needs of the people are discussed. Public places or schools are selected as sites for the construction of RWH structures, so that men, women and children can have unrestricted access to the water. The capacity of a RWH tank is determined by the average rainfall in the area, the total size of the rooftop (catchment) area, as well as the number of users in the community. Once the site is unanimously selected, a written proposal is formally submitted by the community and school to the Barefoot College.

Village water committees: The Barefoot College sets up a Village Water Committee (VWC) consisting of 10-15 members of the community with equal representation of women. Members on the committee should be persons who are genuinely interested in the well being of the community and are willing to devote their time to the construction of RWH structures. The VWC is responsible for the smooth, effective and transparent implementation of the construction work, for the purchase of good quality raw materials and for the payment of labourers wages. The committee must also motivate the people to participate in the construction of the RWH structures.

Selection of the poor as wage labourers: Members of the community and the College, collectively draw up a list of wage labourers who will construct the RWH structures. Since it is an income opportunity, the poorest people in the village are given preference to earn minimum wages. The VWC ensures that the selection is unbiased.

The barefoot approach to the use of solar energy: The methodology applied for rural solar electrification is unique to the Barefoot College. Only villages that are inaccessible, remote and non-electrified are considered for solar electrification. In the initial meeting, members of the community are told about solar lighting and its benefits. If villagers express the need and wish for solar lighting then a Village Environment Energy Committee (VEEC) is formed. This committee consists of the village elders, both men and women. The VEEC consults with the entire village community and identifies households which are interested in acquiring ecofriendly solarlighting units. Every family that wants to obtain solar lighting must pay a minimal monthly sum irrespective of how poor they are. This is so that even the poorest people can feel a sense of ownership towards their unit and take care of it.

The village must agree, in writing, to build or donate a building for the Rural Electronic Workshop (REW), select barefoot solar engineers and allow them to go to India for six months of training, as well as identify individuals who will be responsible for punctually collecting the monthly household fee. This way the entire rural community can take part in solar electrification, control and management together.

While a percentage of the total contribution pays

a monthly stipend to every BSE, the rest covers the costs of components and spare parts like CFL tubes used during repairs. The batteries used in solar lighting units need to be replaced every five to ten years. Households that wish to replace their battery through the organisation need to pay an amount which will be collectively deposited in a bank as a fixed deposit, where it will gain interest between five to ten years. Once the fixed deposit matures, the rest of the money is used to buy new batteries. However, if this amount falls short fo the purchase of all the batteries needed, then, the villagers need to pay the balance.

The process of solar electrification is not undertaken till the villagers, who have expressed a desire for solar lighting, agree to pay or collect the nominal monthly fee, to select the barefoot solar engineers for training, as well as to arrange for an REW, in writing. The Barefoot College implements this to initiate and ensure complete participation on behalf of the rural community. Therefore, this community managed, controlled and owned approach is innovative and can be replicated in other parts of the world.

Selection and the role of barefoot solar engineers (BSEs): Barefoot solar engineering is an employment opportunity for the poorest members in a rural community. It generates an additional source of income for those who do not 'qualify' even for the lowest government jobs. The College motivates the communities to give this opportunity especially to middle-aged women like widows and single mothers with families. It persuades them to choose people who have their roots in the village and will stay and work there for its development rather than migrate to the city soon after training. By being solar engineers they receive an additional source of income as well as continue to be involved with their families, crafts, agriculture, animal husbandry and other income generating activities.

If the village is a small and clustered one with about 50 houses, then only one BSE is selected for training. However, if the houses are far from each other or more in number, two or more BSEs are selected. BSEs are collectively and transparently selected by the entire village community such that everyone is aware of who has been selected. The BSE's family, the committee and all the members of the community have to allow the trainees to travel to India where they will be trained for six months at the Barefoot College.

Approach towards the revival of dying traditional skills of handicrafts: The Barefoot College began promoting rural crafts to address the problems of under-employment. Assistance in improving designs and techniques, the creation of marketing outlets, and access to credit have helped to restore and create new income opportunities for craftsmen and women. Training and materials provided by the College have also enabled women to work from home and this has helped them to generate income from their craftsmanship.

Today, these rural artisans produce clothing and accessories, decorative home furnishings, furniture, rugs, textiles, handmade paper products, puppets, educational toys, metalwork, and leather goods. The crafts are sold in retail shops and at exhibitions held in metropolitan cities of India, Europe, USA and Canada.

Methods adopted to communicate:

The Barefoot Communications section started in 1981, with a team of traditional and non-traditional musicians and puppeteers who are collectively known as the 'Barefoot communicators'. They began by using live and interactive music, puppet shows and street plays to communicate with the villagers, as these were more familiar to rural communities than televisions, radios or newspapers.

Barefoot communicators performed and initiated discussions on socio-economic issues and powerful themes such as drinking water, the environment, transparency, minimum wages, employment, dalit violence, untouchability, casteism, money lending, death feast, communal harmony, atrocities towards women, women empowerment and child rights. As the performances were a form of popular educational entertainment their viewers consisted of children as well as adults.

Subsequently, the communications section was expanded to include the audio-visual, screen printing and community radio sections. Today, the communications team meets all audio and visual needs of the College and its educational and developmental initiatives, by producing street plays, music, puppet shows, films, presentations, radio broadcasts, pamphlets, posters, banners, booklets, manuals, t-shirt graphics or any other art work.

Impacts:

- Through the rain water harvesting structure constructed by the barefoot architects, 48 million litres of rain water is collected in 1,150 roof top rain water harvesting tanks in nearly 1000 rural schools in 13 states, which currently benefits 25,000 children who no longer have to walk during school hours to fetch water.

- Over 100,000 people have access to solar lights in 575 villages. 5,401 schools in 16 states generate more than 530 KWs of solar energy through 7,300 individual units benefiting 11,000 families.
- So far, by the efforts of SWRC, 600 villages have been electrified and over 150 geodesic domes have been constructed.
- In a span of 25 years, the College has helped to generate solar energy worth a capacity of 819.88KWP (Kilowatt Peak), through electrification in rural villages across 16 states of India and 17 countries in Asia, Africa and South America. The college aims to provide sustainable sources of alternative energy at the grassroot level for cooking (parabolic solar cookers), lighting (solar lighting), heating (solar water heaters) and power supply (biomass gasifiers and micro-hydels).
- The efforts of the college have made the villages self-sufficient. They do not need to depend on any help from the urban society for their daily needs like medicine. People are being trained in all spheres of life as per their interest.
- Seeing the positive effects of the programmes of the college, people are becoming aware of the benefits of teaching the girl child and the disabled, hence giving them confidence to work for their living.
- The trainees are also given a stipend during the training period, hence making the programme even more lucrative.
- With the introduction of solar lighting units in the rural communities, children have been able to study even after dark. They no longer need to strain their eyes while studying with dim kerosene lamp light, thanks to the adequate light emitted by the CFL-based solar lights. This specially holds true for more than 50,000 children in India who have attended the Barefoot Night Schools after sunset because they work at home and herd livestock during the daytime.
- Poor families, whose earning hours were restricted to the daytime, have now been able to increase their income by working for longer hours in solar lighting. Sixty-one women artisans from the desert district of Barmer in Rajasthan have specially been provided with solar lanterns to be able to do intricate appliqué work on fabrics after nursing their children and doing housework in the day. The Barefoot College has provided solar energy not just to increase income but also bring a sense of financial self-reliance among women.

The Barefoot College has harnessed solar energy not only to provide light but also to create employment for the unemployable, to boost income for poor rural communities, to give a sense of well-being, purpose and confidence to Barefoot solar engineers, to save the environment by reducing carbon emissions, to prevent millions of litters of kerosene from polluting the atmosphere and to conserve thousands of trees from being cut to provide energy.

- The collective efforts of more than 1,000 illiterate and semi-literate rural men and women, across 16 states of India and 17 of the least developed countries in the world have managed to save more than 30,000 litres of kerosene per month from polluting the atmosphere and have reduced the drudgery of women across 3 continents. Mothers, grandmothers and young girls who spent hours fetching kerosene, wood, candles and torch batteries at very high costs, can spend quality time doing other productive work and studying. The money that was spent on procuring these fuels for lighting, heating and cooking can be saved or put to better use.

9.0

KEYWORDS: water harvesting techniques, indigenous knowledge, drought risk reduction, traditional low carbon techniques, community driven processes.

DABAD BHATIAN - WATER SECURITY PROJECT

SUMMARY

Supported by Unnati and Prayas the village water security initiative was started in 2003. The initiative was designed in response to the water scarcity faced by communities in Barmer where people walked an average of 1.5 km to get water. Under the initiative, a tank of 32,000 litres capacity has been constructed with a total cost of Rs. 19,283. Out of this, Rs. 3,500 has been contributed by the families.

Families were selected by the Gram Vikas Samiti or the Village Development Committee on the basis of wealth ranking. The category 'D' people were preferred under the scheme, which formed the lowest category of the BPL list. About 33 tanks have already been constructed in the region under the joint ownership of the male and female members of the families. As a result of the project, each family is able to save Rs. 3000 – 4000 since water tankers are not required any more in times of water shortage.

CONTEXT

Dabad Bhatiyan is one of the villages in the Barmer district of Rajasthan where the water security project has been implemented.

Need: The initiative was designed in response to the water scarcity faced by communities in Barmer where people walked for at least an average of 1.5m to get water.

Scale: About 33 tanks have already been constructed in the region.

Objectives:

- To solve the problem of water shortages in the area.
- To promote traditional approaches to water management and habitat construction.
- To reduce dependency on government schemes why
- To build the capacities of beneficiaries in the construction of tanks.
- To strive for women empowerment by giving them ownership rights.
- To remove social inequalities by giving equal preference to dalits; each villager can have his own well.

SIGNIFICANT HIGHLIGHTS

Technology:

- The water tanks are an improvement over traditional technology. Four kinds of technology practices are seen: tanks with lime plaster, tanks with cement plaster, tanks of PCC and tanks constructed with stone masonry.
- One of the tanks seen was 12' deep. The top was of stone *patti* while the rest of the tank was made of concrete. A 4" thick layer of soil is placed in a slope to allow the water to slip into the tank (water catchment area). These tanks require yearly maintenance. Water taken from the tank is filtered with the help of a cloth and then used for drinking.
- A hybrid variety of few plants with added zinc and other minerals have been produced by the Central Arid Zone Research Institute (CAZRI) and used as fodder.

Institution and Finance:

- Prayaas and Unnati
- Central Arid Zone Research Institute (CAZRI)

Social:

- Capacity building of beneficiaries in the construction of tanks.
- The people do not have to depend on government schemes for procuring fodder for their sheep and goats.
- Water is readily available to families even in extreme drought conditions and the people need not travel far for water.
- The empowerment of women is promoted by introducing joint ownership of the male and female members of the families.
- There is no discrimination among the dalits and others.

ENERGY, RESOURCES AND ENVIRONMENT

- Rain water can be utilised to the maximum.

CHALLENGES AND RESPONSES

Strategies: Water is required in villages in times of droughts. For this purpose, large storage areas are required with each storage area serving one family. In response to this, water tanks have been constructed.

Impacts: Due to the introduction of tanks with new designs for rainwater harvesting in every household, the water problem in the area has been sorted to a large extent. The initial design given by the government was not accepted by the people, so eventually they came up with their own design and now the tanks are being constructed in an acceptable manner. Every family now has its own water tank, sufficient enough to sustain them during a drought. Due to the experimental plants by CAZRI, sheep and goats can now be saved during droughts. The sheep and goats get enough fodder with adequate minerals.

10.0

BHANDWAD AND DEGAM VILLAGE

KEYWORDS: renewable energy, appropriate construction technology, sanitation, training, disaster risk reduction, water harvesting and recharge, carbon efficient green technology, non conventional energy, habitat based livelihoods, micro enterprises, women Self Help Groups.

SUMMARY

Bandhwad and Degam, were the two severely affected villages by the earthquake that struck Gujarat in January 2001. With funding support from the Swiss Red Cross and technical assistance from SKAT and Development Alternatives, Sewa initiated the Naya Ghar project in these two villages along with the other affected villages in Patan and Surendranagar districts of Gujarat. A total of over 3000 houses have been constructed under this programme so far; of these 50 houses have been constructed in Bandhwad and 30 in Degam village.

CONTEXT

Bhandwad is a small village situated in Radhanpura Taluka, District Patan, in Gujarat, which was severely affected in the Gujarat earthquake. The village consists of a rare minority known as the Banjariya tribals. The village is a part of the Naya Ghar earthquake reconstruction initiative of Sewa. Degam village is located in the Surendra Nagar district of Gujarat. This village was also highly affected by the Gujarat earthquake, which not only completely destroyed houses, but also made many others lives unliveable.

Need: These villages suffered enormous damage during the earthquake, which deemed most of the houses unfit to live, thus the need for large scale reconstruction grew, making necessary provisions for new housing in both the villages. Even though, non-engineered kuccha houses are highly vulnerable to earthquake, their conversion into *pucca* earthquake resistant structure was deemed as a necessity. In the case of Bhandwad, there was also a need to cater to basic needs of the nomadic tribes who have mostly remained neglected. However, these were supplemented by the creation of large scale sustainable livelihoods for the people affected by the earthquake and therefore foster conducive conditions for further development.

Scale: Under the Naya Ghar initiative, a total of about 3000 houses were reconstructed. Out of these, 50 houses were constructed in Bhandwad village for the Banjariya tribals, who are essentially gypsies. Another 30 households were constructed in Degam village.

Each house has a room, an osri (open living area), a kitchen and a toilet with sloping clay tile roof made using baked and wooden under structure. Earthquake resistant features include a lintel band, reinforcement at the corners after every 5th course. In case of Degam, the houses have been constructed mostly with local stone, giving the saline soil conditions that affect life of brick masonry. Each house has a 10' X 12' room, one 8 feet long semi open osri and one verandah in the front. In Bhandwad, local innovations have been successfully tried such as provision of a sheet of plywood, to form the base of the roof on top of the houses to prevent the roof from being blown away in case of strong winds or cyclones.

SIGNIFICANT HIGHLIGHTS

Technology: The houses were designed to suit local needs and environmental conditions, maximise the use of local construction materials, in order to cut down on the environmental impact and the cost of construction.

Costs: The basic cost of the house was Rs. 60,000 in case of Bhandwad, and Rs. 50,000 in case of Degam. Out of this, Rs. 4,000 was contributed by the beneficiary in the form of labour. The rest were provided as a soft loan by Sewa.

Concrete door and window frames, ventilators were produced by women entrepreneurs who were locally trained as a sustainable alternative compared to expensive wooden frames.

Institution

Special Technology Feature

Each new house has rain water harvesting incorporated in its design. The collected rain water is stored in an underground tank of 5000 liters capacity. This water is used for drinking purposes throughout the year. The home owners use an age old water disinfection technique of dipping a lime, filled pot in the tank which helps to kill water borne bacteria. A full tank can cater to

drinking water needs of a family of 5 people for 6 months. The houses have not only been made earthquake and cyclone resistant, but also have provisions for roof rain water collection and storage facilities. It would also have sanitation facilities: toilets and bathrooms, which were earlier unavailable. Compared to the unhygienic options for sanitation earlier, these facilities would lead to better health for the entire family. The house has electricity connections, which also doubles up as a workspace for the self–employed women.

Immediately after the relief phase, Sewa started discussions with the affected poor communities and encouraged them to form the committee called as the Naya Ghar Samiti to take charge of the entire process of reconstruction. This committee was formed to ensure that the houses that are constructed suit the needs of the local people. The committee comprised of 7 women and 4 men who received a 15 day training to enable them to take responsibility for the reconstruction taking place in their village.

Institutional Sustainability

After the completion of the reconstruction, the Naya Ghar Samiti in Degam has now taken the form of SHGs engaged in assembly and the repair of solar lanterns. The lanterns are sold to salt workers in the village as well as outside. These lanterns are useful to them during their migration to remote salt pans in the Rann of Kutch where they are completely cut off from the world and have no electricity connections. Local innovations have been made to the lanterns such as for recharging mobile phones and operating small music players.

In addition to the Naya Ghar Samiti, there are SHG groups in these villages with about fifteen to twenty women members in every group. Each woman in these groups manages to save about 20 rupees per month. Through these SHG groups, Sewa can act as a guarantor for the women to take loans which is especially helpful for the groups of women who are wives of the salt workers, as these workers need about 50 to 60 thousand rupees to start their work, and the women SHG at the moment cannot afford to give such a huge loan.

These SHG groups are not just a means of savings, but also act as a platform through which women can solve their problems collectively. Some time ago, Degam village had problems with drinking water as their old well had dried up. To fix this problem, all the women went to the district level officer together and ensured that they got a new bore well.

In Bhandwad, the women's SHGs producing building elements are a part of Sewa Nirman. This roup has been engaged in the production and supply of precast elements for construction (assembly) of toilets and bathrooms under the Total Sanitation Campaign of the Government. This group has also recently started the manufacturing of low energy cement blocks for construction. A group of 9 women members can make up to 900 bricks per day. These bricks are sold at Rs 1.5 per brick.

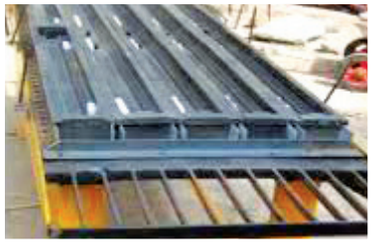
CHALLENGES AND RESPONSE

Some of the challenges faced during the reconstruction works under the Naya Ghar initiative and the measures adopted to resolve them are given below:

Land rights registration: Members of the community had to agitate to get their land rights. There was initially opposition from the local Panchayat members. The beneficiaries however later went and met the TDO/ DDO at the taluka level. Finally the land was registered in the name of the women members.

Loan: Arranging loan for members was a difficult task. The formation and successful functioning of self help groups paved the way for Sewa to grant and facilitate bigger loans to the needy.

Design: The design of the houses under the Naya Ghar initiative of Sewa was an important facet of the programme, as the design had to suit the local needs. The original design though was good, it was only after surveying with the villagers that some modifications had to be made to suit their needs in a more efficient manner. For instance, a 10' X 10' room was modified into a 10' X 12' one as the original specifications were thought to be small. The design also needed to take into account that the houses had to be disaster proof and low energy, along with being low cost. Finally the house was made in Rs. 50,000.



ENERGY, RESOURCES AND ENVIRONMENT

Naya Ghar, an initiative is participatory in nature and involves the local people in the initiative. Whatever material that could be salvaged from the original site, has been used in reconstruction helping decrease its costs. Low carbon bricks have been used to cut down the environmental impacts of the construction process.

The design and construction has been carried out keeping in mind the local climatic conditions. In view of the prevailing water scarcity in the region and salty groundwater conditions, rainwater harvesting has been incorporated. Further adding on, plywood double ceiling has also been incorporated that helps keeping the roof intact in case of cyclones, and also maintain the cooler interiors during summers.

Alternate sources of energy have been encouraged as a part of this initiative. The women self help groups working in solar lamp assembly and repair have a significant role in the reduction of energy use. These lamps have been immensely beneficial to the salt workers. These workers initially used kerosene lamps, that could be quite unhealthy and also dangerous in their particular context and moreover, they cost a lot. For the solar lamps the user doesn't have to pay anything after the one off cost, and for any repair work they can get it done within their own village. Each lamp costs around Rs. 3300 and has a profit margin of around Rs. 200 to 300. A group of around 5-6 women manufacture these solar lanterns, and it results in an average sale of 25 - 30 units per month. This was set up with a revolving fund of Rs. 50,000 loaned to the SHG by SEWA.

Marketing: To market the solar lamps the women were assembling a strategy that had to be evolved. Sewa thereafter targeted the Saltpan workers. In these villages where the lamps were being assembled, a large number of villagers were salt workers, who needed a cheaper and a safer system of lights, than the Kerosene lamps they were using. Now with the marketing help of Sewa, the sale of these lamps have not just benefited the women assembling them, but also the salt workers who have got a cheap and a reliable source of energy.

Savings: Initially getting the women to save was a difficult task and Sewa was the first initiative of saving money in a bank in Ahmedabad. This money had to be collected by going house to house, as none of the women were taking an initiative. It is only once the women understood the benefits of saving that these funds were transferred to a local bank. For creating this awareness Sewa had to constantly talk and engage the women to help them understand the importance and need of savings.

Rehabilitation: After the earthquake, the needy did not get grants from the Government for rehabilitation, as the rich grabbed the opportunity. There were instances when some people who actually had only one house in their name before the earthquake claimed four. Moreover, the people with Kuccha houses did not receive enough funds to rebuild their houses, and this was another step in further deteriorating the position of these people. This is where Sewa came into action, selecting women who were in desperate need for housing, helping rehabilitate, providing aid to people who did not get any help from the Government.

Politics: In the beginning, the process of rehabilitation in these villages, faced problems among the village panchayat and some of the local leaders. This led to a conflict in what the leaders and the local people were saying. The problem escalated to the extent that Sewa had to threaten to stop reconstruction work unless people came to a consensus. However, as a result of this intervention, the Panchayat, other leaders and the villages, all united to work together.

Quality checks: The rapid construction activity following the reconstruction procedure was faced with the challenge of improper construction and inferior quality of materials. This was taken care of, by the quality assurance committee comprising of four members.

Strategies: The Sewa's prime approach is to rebuild community assets, strengthen and stabilise old livelihoods, as also to develop new sources of livelihood. The construction related training (that of masonry, carpentry, and production of construction items) is a part of the latter. Sewa believes that in order for the poor to come out of poverty it is important that they be organised, encouraged to build assets, and can access capacity and skill building trainings and social security simultaneously. To reach out to the grass root level, Sewa helped the participating communities to address the issue at a basic local level. Dialogue and engaging with the people of the village not only helped to understand what they need, but also to resolve their issues to carry on the work without unnecessary interruptions and controversies. Another important strategy was to make people understand the power of unity, which could eventually harness the basic understanding needed for community welfare.

Process: It was understood by Sewa that the affected poor needed work not just aid, in order to recover from the effects of the disaster. Thus, enabling its members to rebuild their houses was one of the foremost priorities of Sewa. It began approaching various National and International agencies for support. At the same time, Sewa began organising an action plan for the affected poor in order to enable them to voice out their needs and demands. An important step was to meet the affected members and poor again and again to convince them of Sewa's noble intentions and credibility. This resulted in the formation of the Naya Ghar committee.

The project began in July 2001, with overall coordination in the hands of Mahila Sewa Trust and grass root implementation in the hands of the newly formed Naya Ghar Committees. The earthquake had proved that local construction techniques and skill did not prevent houses from collapsing during the earthquake. This was a clear indication of the urgent need to improve on both, construction technologies and construction skills. SRC with help from SKAT, Swiss Solidarity, and Development Alternative in close coordination with field based Sewa construction engineers, decided to develop a 'Basic Construction Training Manual' for trainers. SRC also conducted the various trainings for masons for knowledge development and skill improvement. The process of training ranged from the basic to the highly technical. SRC on the other hand, conducted training in masonry in three phases at the district level itself. Perhaps, seeing the non availability of carpenters in the local area, further encouraged Sewa to train those who were unemployed and involve them in the housing reconstruction process. The idea of promoting cadre of technically oriented barefoot women, who could self handedly carry out the production of such items at the local level, was also promoted by Sewa to make product cost effective and generate sustainable means of income generation for women. Nearly 200 women from the Anternesh, Bakutra and Gadsai villages attended a six month long workshop that acquainted them with the basics of carpentry, bar bending, tiling and plastering. Communities were given basic trainings to make concrete blocks, there after brick houses were constructed in the 2nd and 3rd phase of the SRC project. Soon after the training, Sewa once again encouraged those members interested in using the above mentioned training methods for income generation, through groups.

The first step towards sustainability was the information group formed, by 15 identified women from Bakutra .The women were then taken to a construction material production center at Jhansi in Madhya Pradesh, similar to the one they wanted to start at Patan. After the initial hiccups, these groups of women became an inspiration for the entire region and have been very successful. The project has been in implementation for nearly 4.5 years. In this period the masons enabled Sewa to reconstruct 3000 houses in Patan, 2500 in Surendranagr and 1500 in Kutch district of Gujarat. Today, Sewa has a trained workforce of nearly 1400 masons, whose lives and livelihoods have become considerably secure, owing it to Sewa's depth in vision and understanding the local needs.

Impacts: Reconstruction efforts especially that are based on an empowerment approach, very often result in satisfactory rebuilding of homes, as well as lead to improved capacities and confidence within the community, with regard to design, planning and management of development interventions. Moreover, in case reconstruction effort includes some degree of technical capacity building, such as for material production or construction itself, building materials and service enterprises can be developed in the future. Reconstruction can perhaps, not only lead to construction of safe housing stock, but also in creation of income opportunities, even for the future when the construction ends.

This needs to be adequately understood and incorporated in the design of development, as well as reconstruction programmes. Sewa's work received appreciation from all directions. The members were ecstatic; they had either learnt or improved upon their skills, in order to have a *pucca* house in the near future, and a source of earning income. The Government too, had initiated a reconstruction programme and the Government engineers often cited Sewa's houses as ideal examples for designs, as well as skilled workmanship. The skills of the masons soon spilled over to get them in other Government projects to build houses, overhead and underground water tanks, schools and other Government buildings to repair work.

The major impacts of the programme are listed below:

Capacity building: Sewa Nirman members gave 'on the job' training in masonry to the beneficiaries, who were contributing to the Naya Ghar initiative in the form of labour. Some of these have permanently taken up masonry as a full time employment activity. Many Sewa trained masons from Gujarat were called to Kashmir

after the recent earthquake there, to build earthquake resistant structure like they had done in Gujarat.

Employment: The solar lamp training given to the women have helped them gain regular income. The village consists of majority of salt workers, and initially the salt that was baked in the village was only for household consumption, but training given to them by Sewa helped them make salt worthy of industrial use and this helped them earn more, as the demand from industry is greater. In fact, through this initiative Sewa in total helped 10,000 out of 30,000 salt workers in the district. The reconstruction process however, also required trained masons, carpenters and other artisans who were trained as part of the reconstruction programme and are well employed today. The artisans have also formed a group that is now registered as a vendor with the State Government to supply prefabricated toilets.

Better quality of life: As in the present, the over all situation is quite different. Migrations have reduced with skilled masons getting work for reconstruction in their own villages itself. Children, who were forced to work as labourers alongside their parents earlier, now have a chance to be educated, get access to nutritious food, improve their standard of living, lead a relatively less stress free livelihood and many other related aspects that have contributed to the improved quality of life style of people in the region.

Renewable energy supply increased: Through the assembly of solar lamps in these localised areas, the accessibility and usage has considerably increased, as these lamps in the long run proved to be quite beneficial and economical to the salt workers. In fact, the success of the solar lamps is such that the salt workers now say that they want to buy the panels and use them to drive their bikes, thus saving on diesel costs.

Unresolved Issues

- Through the Government listing, only the very poor were listed for *pucca* houses, and this was manipulated as well, thus there are still kuccha houses in these villages.
- Sanitation is a sector which still needs attention; this is mostly due to the existence of the kuccha houses in the villages. Most of the houses do not have a separate toilet.
- Not all the women take initiative and derive benefit from the training given to them. For instance, about 15 women were given training in solar lamp assembly and repair, but only 5 or 6 women have made it a source of regular income.

11.0

KEYWORDS: knowledge sharing, village information services, community development process, participatory rural appraisal.

KABRAU SETU KENDRA, BHACHAU

SUMMARY

Setu is a term that means 'bridge'. It emerged as a network of nodal points for facilitation, in order to provide much relief and rehabilitation process in Kutch after the 2001 earthquake. As an information providing system, Setu has evolved from a material management node, to an institution coordinating and facilitating development interventions and promoting community based disaster preparedness. The wider objective of Setu is to respond to the needs of the community, by providing essential backward and forward linkages. The current focus areas are Panchayat, education, health and special groups.

CONTEXT

As part of the rehabilitation efforts after the earthquake of 26th January 2001, Kutch Nav Nirman Abhiyaan (KNNA) developed setus across the Kutch district of Gujarat to act as a facilitator in the relief, rehabilitation and development processes. There is one such setu situated in Kabrau, Bhachau taluka.

Need: In response to the damages caused during earthquake of 2001, cluster level groups were developed hat swung into action for need assessment, to ensure equitable distribution of relief materials. These groups also facilitated emergency medical relief provided by various international agencies, as well as collection of data in terms of death, destruction, and property damage. The efforts of Setu were soon recognised by the Government of Gujarat and were then mandated as Earthquake Rehabilitation Support Centres.

Scale: The Setus are spread across talukas/blocks of Kutch district, namely, Bhuj, Anjar, Bhachau and Rapar. There are 18 setus in Kutch district acting as facilitators and change catalysts catering to the needs of 360 villages, i.e. approximately 40 per cent of the total villages of Kutch region.

Objectives: Since the Gujarat earthquake rehabilitation, Setu has expanded its reach and evolved into a capacity building organisation, which aims to empower local communities to determine the course and pace of their development. It acts as a link between the village community and various development agencies.

Setus have intervened in three strategic phases after the earthquake, the following have been the objectives in each phase:

Relief phase - 2001

- Needs assessment, community surveys.
- Facilitation of relief supplies.
- Conduct field surveys of people with injuries.
- Facilitating setting up of gram samitis for reconstruction.
- Policy advocacy of rehabilitation policies, through pertinent observations, of grass root realities and their analysis.

Rehab phase 2001-2005

- Promoting seismic resistance features in housing and infrastructure reconstruction and monitoring.
- Grievance re-dressal.
- Facilitate construction of semi-permanent and permanent shelter.
- Coordination with 66 NGOs for rehabilitation in various sectors.
- Creation of funds for providing monetary support to vulnerable families and "innovation/ bridge" fund.
- Identification of 194 youth from setu villages for non-masonry skill up-gradation training in construction practices for promoting earthquake resistant reconstruction in urban areas.
- Creating role models in education, health, and drought proofing: initiating development activities.

Development Phase 2005-onwards

Some of the activities in this current phase are:

- Capacity building of Panchayat for local self governance.
- Interventions in education: creating cadre of community teachers and setting up of alternative schools and activating the village education committee.
- Interventions in health: creating cadre of community health workers.
- Activating connectivity of all setus with the district hub at K-link, setting up information kiosks at two centres.

- Interventions focussed on farmer groups and salt pan workers.

SIGNIFICANT HIGHLIGHTS

Institution: With its inherent capacity to network and synergise resources, Abhiyaan initiated the setting up of various sub-centres for effective, timely and equitable disbursement of relief. Government of Gujarat mandated these sub centres as Earthquake Rehabilitation Support Centres, in order to support facilitation and monitor mechanisms for the reconstruction and rehabilitation of the affected villages. Known as setus, these cluster level village information centres, acted as a link between the various actors involved in the rehabilitation process, i.e. local Government, village community, NGOs and donor agencies. Technical support for information management through software development has been provided to Setu through Kutch Local Information Kendra.

The role of Setus has been changing throughout the various phases of recovery. This change of role has been based on setus having emerged as a human resource team, living and working with a cluster of 15-20 villages and supporting communities in their developmental initiatives. With this already established network of the Setus, Abhiyaan's focus has been on working towards fulfilling capacity building needs at two levels:

- At the Setu level: to provide inputs in skills, concepts and also understanding of the area to help the Setu staff to become effective facilitators.
- At the village community level: to provide necessary support to the Setus, so that they are able to provide necessary skills, conceptualise and provide area understanding inputs to the communities, with the objective to build their capacities.

Each Setu identified one or two gram preraks (a social worker who has an interest to work within village community and have characteristics of an ideal worker) from within the cluster of villages they work in. Based on discussions with communities, issues/topics were listed to be incorporated in the training programme.

The Setus have also taken the task of establishing Panchayat, responsible for comprehensive development of the village while maintaining accountability. As a strategic intervention, the Setus have started involving the Panchayats from the initial phase of identifying community needs and seeing through the implementation of sustainable solutions while addressing class-caste-gender differences. The Panchayats are encouraged to understand and uphold values of social justice and equity, so that all the community members benefit from the developmental programmes for the village.

Out of the 26 Panchayats, 18 Panchayats have prepared village plans for undertaking village development activities, using Participatory Rural Appraisal (PRA) techniques.

The capacity building activities in the identified 26 villages targeting 168 Panchayat body members are addressing:

- Rights and obligations of Panchayat body members.
- Development, Leadership and Governance.
- Improving the understanding of Panchayati Raj Act.
- Understanding Government structures and Schemes.
- Better Financial Management.

Key innovations by SETU include:

- Coordination with NGOs to avoid duplication.
- Recovery of Taxes.
- Village Development Activity.
- People's Participation.
- Formation of rules by Panchayats for the betterment of villages.
- Computers for Education.
- Repaying Debts.
- Activating theme based sub-committees.

Social: The setu operates on a 'bottom up' approach for ensuring effectiveness of their services. They serve to link the most marginalised, not only with their entitlements, but also help in ensuring that the people are educated

and aware of the quality of the entitlements, as seen in case of post earthquake reconstruction. A Setu is accountable to the community it serves.

CHALLENGES AND RESPONSE

Strategies

- Networking of local NGOs.
- Understanding the crucial role of information collection and provision.
- Capacity development of staff and volunteers.
- Working with Panchayat members and building their capacities.
- Holistic approach to development.

Process: In 1998, a devastating cyclone struck the area around Kandla port. In view of the emergency, 14 local NGOs came together to form the Kutch Nav Nirman Abhiyan (KNNA). KNNA's membership has since then grown to over 30 NGOs. Initially, 80 volunteers were trained as social workers, to facilitate redevelopment, however, when the earthquake occurred in 2001, these volunteers were prepared to respond to the emergency, by the means of community mobilisation activities. In response to the felt need of NGOs involved in earthquake relief work, 33 sub-centres were formed for coordination and management of materials. The role of sub-centres was highly valued and these emerged as important functional nodes.

As the relief phase drew to a close, it was realised that the sub-centres could also help facilitate design, planning and implementation of reconstruction work. As a result, the sub-centres were developed into setus (bridge) with the help of funding support from UNDP and SDC. The State Government also gave recognition to these sub-centres as Earthquake Rehabilitation Support Centres. The objectives of the Setu therefore evolved to:

- Information management
- Stakeholder's coordination
- Grievance redressal
- Advocacy

The Setu operates on a 'bottom up' approach for ensuring effectiveness of their services. They serve to link the most marginalised and the underprivileged, not only with their entitlements, but also help in ensuring that the people are educated and aware of the quality of the entitlements, as seen in the case of post earthquake reconstruction. It would also be interesting to note that the accountability of the setu lies with the community.

Impacts: The intervention by Setu in the Kutch region of Gujarat, illustrates how a local value chain can be generated using output of one value chain, as the input of the subsequent other. Setu means 'bridge' that works as a binding force between community and Government and supporting agencies. A variety of support services are extended at the local level, by involving both, the land acquired people and the landless. It illustrates how a holistic approach rather than a sectoral approach, that helps in enhancing the livelihoods of the disaster victims and the vulnerable.

Setus have facilitated the smooth implementation of the relief, rehabilitation and development activities. They are also closely working with the gram Panchayats and building their capacities to undertake development.

12.0

KEYWORDS: post disaster reconstruction, sanitation, open defecation free, community driven process, panchayat-led action.

MAYAPUR VILLAGE

SUMMARY

Post the earthquake of 2001, the village saw reconstruction activity led by the RSS. This reconstruction activity transformed the village and the villagers, who since then are undertaking development activities in the village. Pertaining to these activities, the village won the Nirmal Gram Award in 2008 and 2009. This village has also been selected as Gokul Gram under the Government of Gujarat scheme.

FACTS

Need: The devastation that followed the earthquake of 2001, called for immediate reconstruction in the village. The disaster triggered the entire development process in the village, which later continued even after the reconstruction process was over.

Scale: The village consists of a total of 115 households, out of which 12 belong to the Below Poverty Line category. Almost all of the villagers rely on agriculture and animal husbandry as their primary source of livelihood.

Objectives: Following the disaster, the main objective of the initiative was 'appropriate housing for all'. Other than reconstruction of houses for all, other development issues like sanitation, education, water conservation, infrastructure development, etc. are being taken up by the Panchayat.

SIGNIFICANT HIGHLIGHTS

Technology: In terms of technology adopted for reconstruction, each house consisting of two rooms, a toilet and a veranda was constructed with concrete blocks; on the other hand, the roads are also built using concrete material. There is a sewage line for every row of houses that is connected to a septic tank at the community level. The village has telephones and Internet connections. The Internet is however being significantly used by the villagers for online payment of bills.

Institution: The primary highlight of the project is a united Gram Gabha led by an active Panchayat. The village has seen samras for the last 35 years, which is essentially a consensus on the Gram Panchayat election without any support from the Government. This has earned the village an award of Rs. one lakh by the Government of Gujarat for five years.

Another key role player in the reconstruction process has been the RSS which funded the reconstruction of houses. The implementation of reconstruction works was also undertaken by them. Women of the village play an integral role in the development process. There are three women SHGs working actively in the village. Availing loan from the SHG, one of the members has started a modern 'chakki' which is functioning very well.

Social: It is a socially well-knit community. The village has a united Gram Sabha and a proactive Gram Panchayat. The members take part in all exposure and training programmes provided by the government. The Gram Sabha is regularly held, because of which the village has been awarded a grant of Rs. one lakh by the Government of Gujarat. There is complete transparency in the development processes; all material procurement accounts are discussed in the Gram Sabha every 10-15 days. The process acts like a form of social audit where each villager knows how the money is being spent.

The village has a Water Committee which looks after the issues related to water supply. The village has piped water connections for supply in each household with a central overhead tank to store water. Each household pays an annual fee of Rs. 120 for water supply. Education is provided free of cost to every child in the village. Social evils such as consumption of alcohol and tobacco, and gambling have been banned in the village.

ENERGY, RESOURCES AND ENVIRONMENT

The village satisfies all the four prerequisites for the Nirmal Gram Puraskar namely self cleanliness, clean environs, 100 per cent ODF and wastewater treatment. In order to maintain such environment in the village, a cleanliness drive is organised every month where 12 women and 12 men are randomly selected and given the duty to clean the whole village. The campaign was

started by the Panchayat members, who themselves cleaned the village for the initial two months and succeeded in setting an example. A garden called 'panchvati' has also been developed in the village. Cutting of trees is banned in the village.

CHALLENGES AND RESPONSE

Strategies

1. In order to streamline the development process, the community has adopted a sectoral approach to development wherein they target pressing issues of one sector at a time. This contributes towards the overall development of the village. For instance, after initial focus on the house reconstruction, other sectors were later taken up for development.
2. In order to bring about behavioural change in the community, door-to-door awareness campaigns were undertaken by the Gram Panchayat.

Impacts: The reconstruction activity in the village resulted in mobilising of the community and provided an opportunity for the village and the villagers to make progress towards integrated development. Taking an example of safe sanitation, before the earthquake there were no toilets in the village, but after the earthquake due to the reconstruction efforts, the Panchayat sanitised the entire village, made it completely open, defecation free and received the Nirmal Gram Puraskar. Likewise, other sectors including water supply, environment, education, health, etc. have been worked upon after the initial task of house reconstruction.

The reconstruction works however, have also inculcated strong leadership skills in the Panchayat members, who now proactively participate in the development process.

Unresolved Issues

1. The village has a long term plan to set up a community level bio gas plant.
2. The Narmada Canal, which is a major source of water supply for the village, has recently been banned for them. This is despite the fact that the village has license to use the canal. This issue has led to police intervention, and is still on an ongoing process.
3. After class VII the drop-out rate among girls (60 per cent) is much higher, than the boys (5 per cent) as there are no higher education facilities available within the village and the villagers find it unsuitable to send their girls to study in another village.

13.0

LOW ENERGY TOILET CONSTRUCTION

KEYWORDS: water and sanitation, cost effective construction technologies, open defecation free village, participatory development.

SUMMARY

The Environment Health Improvement Programme (EHIP) of Aga Khan Planning and Building Services – India (AKPBS-I) was initiated in 50 villages of rural Gujarat in 2007, with the overall goal to establish a sustainable community managed integrated system for water supply, sanitation and hygiene promotion. EHIP ensures access to sanitation and hygiene to a population of 83,000 residing in 50 villages spread over 4 blocks in Junagarh and Patan districts of Gujarat.

The intervention consists of installation and maintenance of sanitation units, improvement of village water supplies, construction of water harvesting systems, and continuous monitoring of water quality.

EHIP has come a long way, as statistics convey that in the beginning of this intervention; only 47 per cent of the households neither had toilets nor bathrooms.

Nanikhodiyar is one of the villages in Keshod Taluka of Junagarh district, where the EHIP is being implemented. Besides the community engagement process, an interesting highlight of the intervention is the use of pre cast toilets and bathroom units, perhaps the purchase of which is being facilitated through the programme in combination with the Total Sanitation Campaign of the Government.

FACTS

Context: AKPBS-I is working in Junagarh and Patan districts of Gujarat for the much required promotion of hygiene, besides improving access to safe water and sanitation through their Environment Health Improvement Programme (EHIP). Nanikhodiyar is one of the villages in Keshod Taluka of Junagarh district where EHIP is being implemented.

Need: At the start of EHIP, 47 per cent of the households residing in the four blocks of Junagarh and Patan districts of Gujarat neither had toilets nor bathrooms.

Scale: The programme was initiated in 2007, covering 50 villages spread over four blocks of Junagarh and Patan districts of Gujarat. The village under study (Nanikhodiyar) has 1800 people residing in 375 houses.

Objectives: The overall goal is to establish a sustainable community managed integrated system, for water supply, sanitation and hygiene promotion. The specific objectives of EHIP are to:

Enable and mobilise rural communities to establish, operate and maintain water supply, excreta disposal and environmental sanitation infrastructure in a sustainable manner for over 50 villages.

Promote positive sanitation and hygiene practices among individuals and households for better health status, to provide a better security, most of all, to respect the privacy and dignity of women and girls.

Build capacities of community based organisations to manage and advocate for sustained water supply, sanitation infrastructure, and strengthen internal systems of democracy, equity, inclusion and governance.

Increase the institutional capacity of AKPBS-I to implement programme, conduct research, and advocate for sustainable community-managed water supply and environmental sanitation policies.

SIGNIFICANT HIGHLIGHTS

Technology: The technology adopted under this initiative is the prefabricated toilet panel. Each toilet is a 6 feet high cubicle and has 19 T and F shaped prefabricated concrete panels, with reinforcements that are interlocking. These toilets nonetheless can be easily assembled within 2 hrs and can be ready to use. The pan is connected to a soak pit which is 4 feet deep and 4.5 X 4.5 feet wide. The toilet super structure however costs Rs. 1300, with the door costing about Rs. 600. The roof of the toilet is also a prefabricated panel. The joints imbibed between the toilets are filled in by PCC, although the internal plastering is optional. The total cost of per unit with soak pit is approximately Rs. 4900, about 40 per cent less as compared to Bela stone/brick masonry/conventional construction. In order to further reduce the cost, the doors can be made out of tin.

In addition to being low-cost, these pre cast (RCC) units are user-friendly and easy to handle. However in comparison to conventional construction works; these panels can easily be transported in an auto rickshaw to

the respective village; whereas construction of the pre cast RCC unit can be completed within five hours as against 5 – 6 days in a conventional method; time spent by the beneficiary is minimal, thus saving on opportunity cost of time; and by being a folding unit it can be shifted anywhere, or even after installing it can be dissembled and reinstalled.

The village also has a sewage system wherein the waste water is taken to a natural depression 200 m away from the village boundary.

Institution: AKPBS limits its role to support coordination and linkages. The entrepreneurs act as the subordinate link between the AKPBS and the beneficiaries. The role of AKPBS is to create awareness among the people, and transfer technology to the entrepreneur. This is a credit based model; only when the toilet is installed at the beneficiary's house, AKPBS issues the payment to the entrepreneur. Masons are specifically trained in the assembly of the toilet block by AKPBS. The beneficiaries directly approach the entrepreneur, underlining the need based approach of the model.

In Nanikhodiyar the Panchayat was an institution to reckon with. Although, the Sarpanch had very clear ideas regarding the progress of the village, the sanitation aspect was the pressing issue, not only to maintain cleanliness and hygiene, but also to ensure the dignity of women in the village. Most of the ideas coincided with the goals and objectives of AKPBS, leading to complete acceptance, implementation and success of the programme in the village. Facilitating the process of toilet construction the Panchayat motivated the people to work together in order to contribute and lend their hand in all household activities. A three tier financial contribution system was devised wherein the richest people in the village would contribute Rs. 200, people below this level will contribute Rs. 100 and the next level will contribute Rs. 50, subsequently the poorest people in the village would contribute just the labour.

However, as part of the external assistance, Rs. 3200 was contributed by AKBPS and Rs. 2200 by Government in case of BPL families and Rs. 1200 in case of APL families. The village also progressively developed a community based monitoring system once toilets were built in the entire village; as a measure of strictness, a fine of 500 rupees was levied on people going out to defecate in the open. Nanikhodiyar village has been a recipient of Nirmal Gram Puraskar as well.

The savings system in the village is impressive. The Sarpanch claimed that people save 90 per cent of their income, as a result of which all the houses in the village are built comprising of *pucca* materials.

Social: The purpose of any sanitation project is not just the construction of toilets, but bringing about social and behavioural changes in the society. The Panchayat promoted the idea of toilets as having a three pronged advantage; they not only improves cleanliness, and reduces the overall spread of diseases in the village but also save people's time and preserves the dignity of women. They did not enforce the use of toilets by force although there was an official fine in place. In the mean time, innovative ways were devised to bring about the change; with children playing a vital role in changing the mindsets of people. They were instructed to spill the water that the villagers were carrying to defecate in the open in order to discourage them for going out and instead adopting the use of toilets.

Power of collective action could be seen in timely construction of toilets. The Panchayat indicated that he village could possibly become a Nirmal Gaon only because everyone worked together in unity. Working collectively especially while purchasing the units reduced the unit cost and transportation cost as well.

ENERGY, RESOURCES AND ENVIRONMENT

The installation of sanitation units, improvement of village water supplies, construction of water harvesting systems and continuous monitoring of water supply, ensures not only that the villages are being sanitised and provided with adequate infrastructure, but also that the water is used judiciously in the villages. This is of great significance considering in this particular area where there is already an issue of water scarcity.

CHALLENGES AND RESPONSE

Strategies: In implementing the programme of pre-

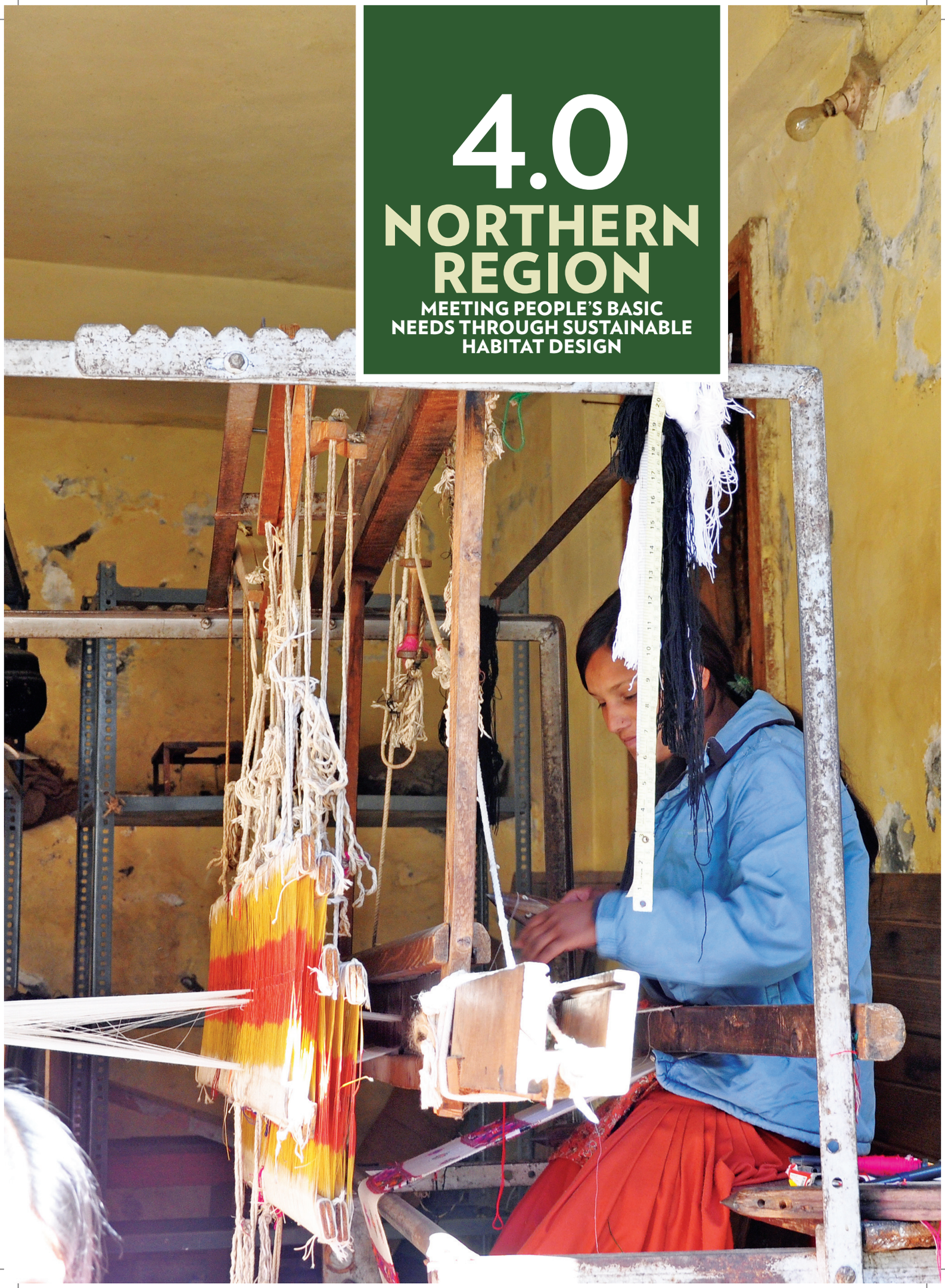
cast toilets and sanitation in the villages, 80 per cent of the villages were easy to cover, but the rest of the 20 per cent were difficult to access. This is mostly pertaining to the social and economic condition of these 20 per cent people. The fact of the matter being that these people usually cannot afford to have toilets and bathrooms in their houses, or they may not even have a house on their name. The design of the toilet was also such that for some of the households the whole toilet and bathroom was more than they could actually afford. To address this issue the organisation in collaboration with the entrepreneur came up with the option of having a tin or a bamboo roof according to what would ideally suit the villagers need, instead of a pre-cast one. To further reduce the cost the material for the toilets were ordered only when 5-6 toilets were to be constructed, so as to cut down the transportation cost per unit.

Working in the sanitation sector in villages was difficult as it did not feature as a priority for Government officials and also villagers did not see any intrinsic benefit and potential in this project. Thus, the motivation to do this work was built through awareness programmes and promotion of low cost models that the villagers could afford.

Impacts: The initiative of creating awareness through various campaigns and promotions resulted in total Sanitisation in Nanikhodiyar village, indicating an overall progress of the village. It also helped in developing capacities of the people to work and bargain collectively.

Unresolved Issues

- Maintenance of these toilets and bathrooms is a big challenge. If only the village leaders are strong and exert considerable control, these structures can be maintained, otherwise it can result as a big problem.
- Quality of the structures at the moment is only maintained through complaints by the villagers. Any thing beyond this is a problem, as the organisation does not monitor the entrepreneur. These complaints are passed on to the entrepreneurs and request them to be alert and careful.
- The village does not have a proper working waste treatment facility in place.



4.0 NORTHERN REGION

MEETING PEOPLE'S BASIC NEEDS THROUGH SUSTAINABLE HABITAT DESIGN

Local development initiatives in the Northern region focused on building the self sufficiency of the communities by reducing their vulnerabilities to the environment by building better habitats through employing appropriate hill habitat and development initiatives.

The Northern Region of the Lok Awaas Yatra covered the wet hilly Himalayan region, the states of Himachal Pradesh and Uttarakhand. High altitudes leading to difficult geographical and extreme climatic conditions characterise the region. Access is a challenge and solutions lie in innovative use of local resources for sustenance and livelihood. Fig. 1 describes the key strategies for development initiatives that were covered in the North region as part of the Lok Awaas Yatra.

Local agencies have responded to the regional challenge with development solutions that aim for self-sufficiency. An environment conscious approach especially with regard to local infrastructure development and introduction of sustainable habitat technologies supported by employment generation activities (which included training programmes and community involvement at scale) and collaboration efforts (with the community, non-governmental and government agencies) was seen across the northern *yatra*.

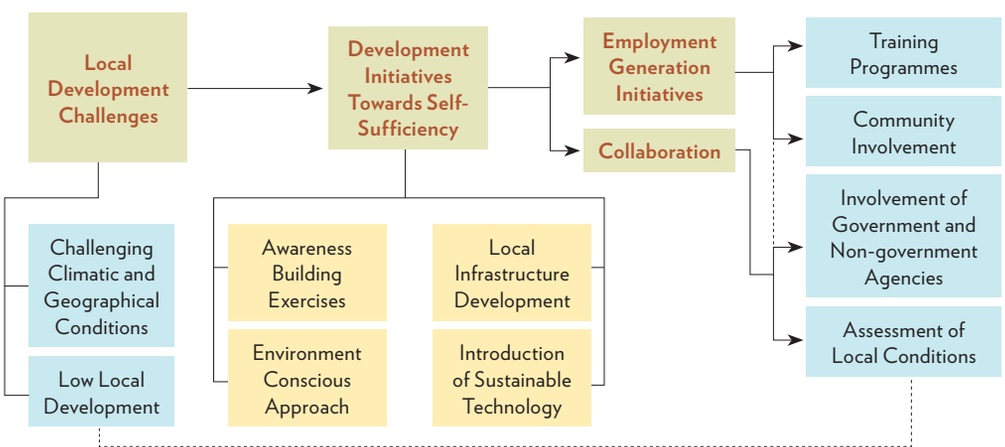
BALANCING HABITAT DEVELOPMENT AND ENVIRONMENT CONSERVATION

Challenges in accessibility, inadequate employment opportunities and low development indices have made the region vulnerable despite its rich natural resource base. Increasing landslides, flash floods and earthquakes are affecting the built habitat. The region is also a hot spot with respect to biodiversity and climate induced impacts. Thus its position is unique and interventions here require a careful balance of community development and environment conservation.

Habitat development is a resource intensive activity as it is based on extraction of natural resources and disturbing indigenous ecology. Least impact solutions for construction, water, sanitation and energy reducing impacts on the natural resource base have been characteristic of the cases studied. The technological and management models for habitat development was also factored in, reducing dependence on plains and/or urban centres thus increasing self sufficiency and affordability.

Green building construction: Central Building Research Institute in Roorkee, located in Uttarakhand has been the oldest centre of design and development of environment friendly construction technologies. Its Rural Technology Park provides an excellent

Fig 1: Key Strategies for Development Initiatives that were Covered in the Northern Region



Uttarakhand lies in a multi-hazard prone region with a pre-eminent earthquake risk. Himalaya, the youngest mountain chain of the world is also geo-dynamically most active. Earthquake, landslides and other mass movement activities are the most common hazards of this terrain. Though hazards such as landslides are predictable and timely intervention can mitigate the loss of property and life. But, earthquakes are unpredictable and when struck, within few moments of its occurrence can cause huge damages in terms of life and property. The region, in last decade had witnessed two medium intensity earthquakes (Uttarkashi earthquake in 1991 and Chamoli earthquake in 1999) causing heavy loss of property and life. The state is amongst the most seismically active parts of India in which tremors of magnitude 5.5 or more have been a regular occurrence since 1900. The fact that this region lies in the "Central Seismic Gap" of the Himalayas implies that the region continues to have potential danger of future great earthquakes that may even be of the magnitude 7.5 Richter or more.

demonstration of cost-effective and ecofriendly habitat technologies. Some synthesis are presented in table 1.

The efforts of the Government of Himachal Pradesh to promote a 'carbon neutral state' has led to many interventions in the housing and infrastructure development that focus on reducing the energy and resource footprints of the built mass. The Himurja building in Shimla epitomises the practical approach of the Government towards promotion of renewable energy. The building is an excellent example of solar passive design and integration of renewable energy system for heating.

To further the use of sustainable technology in the region, the government has been taking steps to increase awareness and to bring forth green construction, renewable energy technologies. At Sundernagar, the Appropriate Technology Research, Development and Promotion Centre (ATC) set up in 1995 by the State Council for Science, Technology and Environment is mandated with research and development and promotion responsibilities for context relevant habitat solutions. Testing, monitoring and evaluation of technologies has helped developed the necessary understanding within the Centre of contextual relevance of some technologies over many others. Description of some of the major technologies introduced by the ATC is given in table 2.

Further, the Council of Science Technology and Environment is taking many parallel initiatives to create awareness amongst communities about the carbon footprint of their development actions, promotion of decentralised solar and micro-hydel projects, solar passive construction and waste utilisation such as plastics in roads and flyash in cement. The *yatris* discussed actions being taken at community level to reduce carbon footprints of village development initiated under a State wide programme called 'CLAP for Himachal'.

While these technologies have been seen across the *Yatras*, in the north, not many instances of application of these technologies were seen. A comprehensive model near Dehradun was a result of an initiative by the Doon School and HESCO in Fatehgram Village near Dehradun, where an environmentally conscious approach to development has been followed - from the use of appropriate material for habitat upgradation, to the upgradation of traditional watermills as a sustainable green source of domestic level electricity (Fig. 2). Through these means, the intervention served as practice based environmental education experience for school students.

Green energy status: Beyond housing, the dependence of communities for energy on the forest resources was addressed in the interest of eco security in the case of the Great Himalayan National Park (GHNP). Community level micro-hydel development is one such initiative. Surveys of all the local water mills (locally called *gharat*) of the Tirthan Valley have been carried out and certain mills have been identified for generating electricity. These water mills are capable of generating electricity up to four kilowatts. Society for Biodiversity Tourism and Community Advancement (BTCA) has entered into institutional tie-up with WWF India for conversion of traditional water mills in the Tung Village of the Ecozone of the GHNP into a picohydel project. In addition, other renewable energy options are being promoted. Solar heating and lighting is being used in office buildings of GHNP and solar lanterns are subsidised at the community level.

Large scale use of biogas plants for cooking was another environment friendly technological feature in the region. In fact on account of biogas being a green, efficient fuel option and as an alternative to cooking gas, biogas has been taken up at the household level in a big way in Sahaspur. Many poor families have shifted from *chulhas* to biogas energy sources for cooking. The *chulhas* can be very polluting and unhealthy to the

Great Himalayan National Park (GHNP) was created in 1984 in the Kullu region of Himachal Pradesh as an effort towards protection of the Himalayan ecosystem that comprises of rare plants and animals. Spread over an area of 1171 square km in the upper Beas region, GHNP comprises of watersheds of Jiwa, Sainj, and Tirthan rivers. The park is a major source of water for the rural and urban centres of the region with four major rivers of the area originating from glaciers in the park. Local communities living nearby are dependent on the GHNP for lumber as well as non-timber forest produce (NTFP) such as honey, fruits, nuts, flowers as well as fuel wood. In this context, there was a great need to prevent the excessive exploitation of the Park resources, and to develop strategies for sustainable development of the communities living nearby. Thus, some of the major initiatives taken in the region were – technological up-gradation of the water mills, introduction of alternate energy sources and waste collecting and composting.

person who is cooking while the energy from biogas plant is environment friendly and helps in creation of manure for the fields apart from providing high grade fuel source. The Kumao Karigar Samiti - a mason's guild promoted by Pan Himalayan Grassroot Development Foundation has been responsible for providing services for construction and maintenance of biogas plants across the state of Uttarakhand.

The Foundation provided the institutional backbone to the entire effort- from getting the masons trained to facilitating a subsidy for the household. As the initiative found acceptance, a SHG - Kumao Karigar Samiti was formed, which has been carrying out construction of biogas plants. The organisation also helps in providing loans from UREDA to households that are interested in the construction of biogas plants. Subsidy upto Rs. 10,000 is being given to the families, depending on their financial condition. No middle man is involved between the beneficiaries and the loan providing agency.

GHNP-BTCA work towards environment friendly development by way of promoting responsible eco-travel and developing ventures associated with tourism which are beneficial to local communities and tourists alike.

In Fatehgram environmentally conscious approaches were employed which led to the reconstruction of huts using concrete blocks, connection of gharats to power supply, and construction of toilets with soak pits and provisions for rainwater harvesting.

Sustainable use of water in the region was a matter of concern, and in almost all the cases efforts to this effect were taken. The construction of cluster level water tanks connected to existing water sources have also been seen in the region along with the installation of water pumps. In some places such as in Naura, check dams have been constructed to improve ground water level along with large ponds on panchayat land for collection and storage of rainwater. Gharat up-gradation however has been by far the most popular and was seen across many initiatives of the region such as in the GHNP, Fatehgram and in Sunder Nagar.

Waste management: Himachal has been the first State in India to systematically address the concerns of non-biodegradable wastes. The ban on plastic bags across the State has been supported by use of existing waste plastic in roads as mentioned earlier. Cloth bags are encouraged across both rural and urban communities. In Shimla and also at the GHNP, biowaste management was a standard practice. Waste is collected from households, businesses, shops, hotels etc. and recycled. Organic waste is composted while plastics etc. are sold to the local municipality.

Gharat upgradation however has been by far the most popular and was seen across many initiatives of the region such as in the GHNP, Fatehgram and in Sunder Nagar. A major focus of this intervention as in many others was addressing seismic vulnerability of the housing stocks.

REDUCING VULNERABILITY TO NATURAL DISASTER

The region's vulnerability to earthquakes came into focus after the Uttarakashi earthquake in 1991. Many efforts to understand why buildings fail and appropriate measures to strengthen the housing stock since then have resulted in detailed guidelines for earthquake safety of buildings in the Himalayan regions. Besides seismic safety design in new buildings, retrofitting existing housing stock was studied by the Yatris. Simple techniques were observed that contributed to making

Table1: Synthesis of Eco habitat Technologies

Technology	Description	Features	Potential for Scale-up
Pit pour flush latrine	This is a continuous system based on treatment of sludge in underground pits. The water content seeps into the soil and the solid matters are retained and subsequently decomposed in the pits into dry and odourless manure for use in fields.	■ Low-cost continuous process ■ Environment friendly ■ Good quality **end of the process** manure ■ Pits can be made using bricks or ferrocement rings ■ Totally eliminates manual handling of night soil	Suitable for all areas where water table is at least 5m below ground level and soil is not too rocky to dig pits.
Fire Retardant Thatch Roof	A 60 cm high lining of 7 cm thick bricks in cement mortar around mud houses to protect erosion of plinth by splashing of rainwater. Protection of traditional mud houses with a plaster of non-erodible bitumen stabilised mud or by ferrocement. Improved method of tying thatch roof panels between bamboo strips with steel wire and protection of the roof by a layer of non-erodible bitumen stabilised mud or by ferrocement against fire and rain.	■ Imparts high resistance to thatch and mud houses against fire and rain water ■ Increases life of houses by about 5 to 10 times ■ Wall and roof surfaces can be colour washed to improve looks ■ Easy to adopt this system by training and demonstration	Suitable for all areas of medium intensity rain where mud and thatch houses are traditionally being built.
Pre-cast Concrete Funicular Shells for Roofs and Floor	Building components for the construction of roofs, walls, stairs, sun-shades, man-hole covers, WC slabs, sewage pits, flooring/ roofing tiles etc. are pre-cast on ground and later lifted and assembled using manual labour and/or lifting and hoisting machines.	■ Can be cast using simple moulds or by using machines ■ Skilled and semi-skilled labour can be deployed in the production ■ Economical as lesser material is required ■ Centering and shuttering is reduced to a minimum. ■ Ferrocement products are light in weight, possess high strength and have better serviceability ■ Help in achieving cost efficiency ■ Used in the construction of thousands of buildings all over the country during the last 25 years.	Depending upon the availability of local materials, geo-climatic conditions and market demand building components can be selected for production in almost any part of India.

buildings safe against earthquakes at a low cost.

The main principle behind making a building seismic-resistant is to tie the three major components of the building – the foundation, the superstructure and the roof, to each other, so the building acts as one entity, while maintaining a certain amount of ductility within the structure. The first step in retrofitting is to repair all cracks and weakened structural elements of the building. Next, all vulnerable joints are identified and techniques designed to ensure their safety. Retrofitting is primarily done by means of making reinforced bands on the surface of the wall at various levels, such as sill, lintel, roof, etc as per the needs of the region. The bands are made on both sides of a wall and are tied together by means of a transverse steel bar binding together the reinforcement on both sides. In areas where the wall seems weak, small headers are created on the surface of the wall, acting as small, individual binding elements. Special emphasis is laid on strengthening of corners and joint details in *verandas*, etc.

The advantages of retrofitting are many.

- Reconstruction means first demolition and removal of debris, and then reconstruction. Each step costs money.
- Retrofitting means making small changes to only to

Table 2: Technologies Promoted by the Appropriate Technology Research, Development and Promotion Centre, Himachal Pradesh

Technology	Description
Solar Passive technologies	Himachal Pradesh falls in cold and cloudy zone with the exception of districts of Lahaul and Spiti, Kinnaur and Pangi region of Chamba districts that fall in the cold desert region. The region therefore requires intense heating and in lower reaches appropriate cooling solutions also. Passive Solar Building Technology is an environmentally sound and economically viable technology in which the site planning and movement of sun is considered in the arrangement of building components so as to collect maximum solar heat, store it and distribute it within the building.
Green House Technologies	Green House is usually a framed structure covered with a transparent material, large enough for a person to walk inside and carry out culture operations in which crop may be grown under condition of partial to fully controlled environment. Use of UV stabilised film filters out harmful ultra-violet rays. The carbon-dioxide released by the plant at night is trapped inside. This raises the carbon dioxide level available to the plants during the day time by about 5-10 times contributing to faster improved plant growth and faster maturing of crops. Use of water is optimised due to reduced evapo-transpiration and about 40-50 per cent of water can be saved.
Climate responsive Solar Passive Designing	Solar Passive Housing Technology is used for heating as well as cooling of buildings. During harsh winters some regions have a minimum temperature of about minus 30 degrees. Hence, the cold climatic region requires intense solar passive heating features and the region above 2000 meters of altitude to 3000 meters require moderate heating features. Average winter temperature in this region vary between 10-15 deg. C. The region below 2000 meters of altitude requires both cooling and heating solar passive building features.

some components/parts of a existing structure.

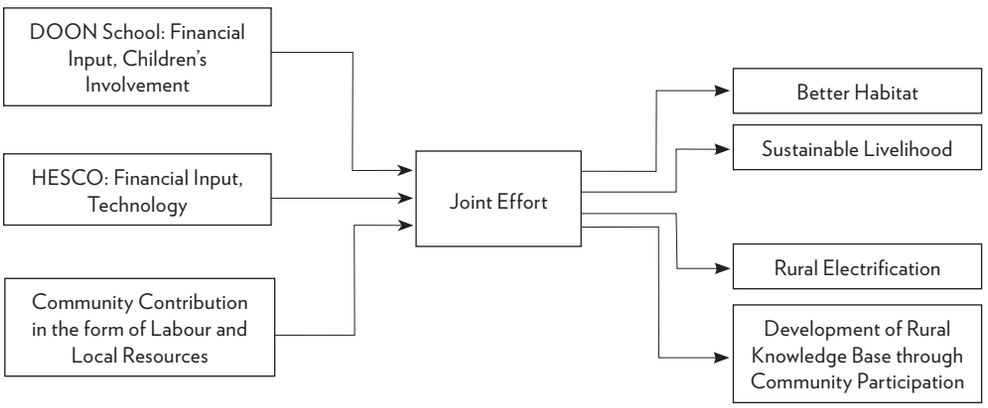
- Retrofitting is much cheaper than reconstruction.
- Retrofitting is faster than reconstruction.
- Retrofitting means all the conveniences created within the building are not lost. Reconstruction means re-doing all that.
- Retrofitting can be done in phases - only one or more parts of the house at a time. Hence, its use can be continued and economically it is more manageable.
- Finally, it ensures long term safety against future earthquakes for most number or people with least amount of money.

However, despite the significant advantages of the retrofitting technology, it has not been widely accepted as a suitable alternative to constructing a new building to ensure seismic-safety. This is due to inadequate promotion and demonstration of the techniques. Moreover, not only is there a dearth of trained masons for the replication of these technologies, there are only a few organisations engaged in retrofitting. There is also a lack of awareness of the practice and a certain apprehension about its advantages. Even though building retrofitting guidelines for both engineered and non-engineered constructions have been developed

The Appropriate Technology Research, Development and Promotion Centre is geared around carrying out testing, monitoring, evaluation and demonstration of Appropriate Hill Technologies as well as creating awareness and providing facilities for demonstration, training, research and development.

The main feature of a Deenbandhu Biogas Plant is the fixed underground digester chamber, constructed with a layer of bricks and an additional layer of cement mortar forming the roof above. Connected to the underground chamber is an inlet tank /mixing tank, through which manure is fed into the plant. The manure then ferments separating the slurry from the methane gas, which rises and collects at the top of the digester tank, and is released through the gas outlet pipe. The slurry passes into the outlet tank where it is ejected from the plant and can be used as fertiliser on the field.
(Source: Grassroots India).

Fig 2 : Collaborative Efforts by Doon School and HESCO for Local Habitat Development.



by research organisation and have government endorsement, these have not been brought into practice at a large scale.

COLLABORATION

Collaboration between governmental and non-governmental agencies has been a significant feature in the development activities of the region. Whether it means habitat development by improving the living conditions, use of solar passive technologies, up gradation of traditional water structures, conservation efforts, or generation of livelihoods, each have been carried forward with a spirit of collaboration and harmony between the two types of agencies for long term community benefits creating improved infrastructure, employment opportunities and increased awareness about low impact and disaster resilient development.

The case of Fatehgram, a village near Dehradun is possibly the best example of collaboration in the region. In a joint venture, the children of Doon School and management contributed in the form of human resource, skill, partial financial support while HESCO contributed in technology planning and partial financial input. Approximately Rs. 1 lakh was spent every year for five years. Doon School contributed Rs. 50,000 per year. HESCO arranged for the rest. Students have been involved in all steps of village development. Their immediate involvement was in drawing demographic socio-economic planning through base line survey. The activities that followed depended upon priorities emerging through status survey.

Community structures have also been constructed that are used mainly for student shelter for their periodical visit. Community contribution has been in the form of labour and local materials. With little financial support spread over a gradual period of time, assets have been created to empower poor families.

In the case of Sahaspur, for the implementation

RETROFITTING

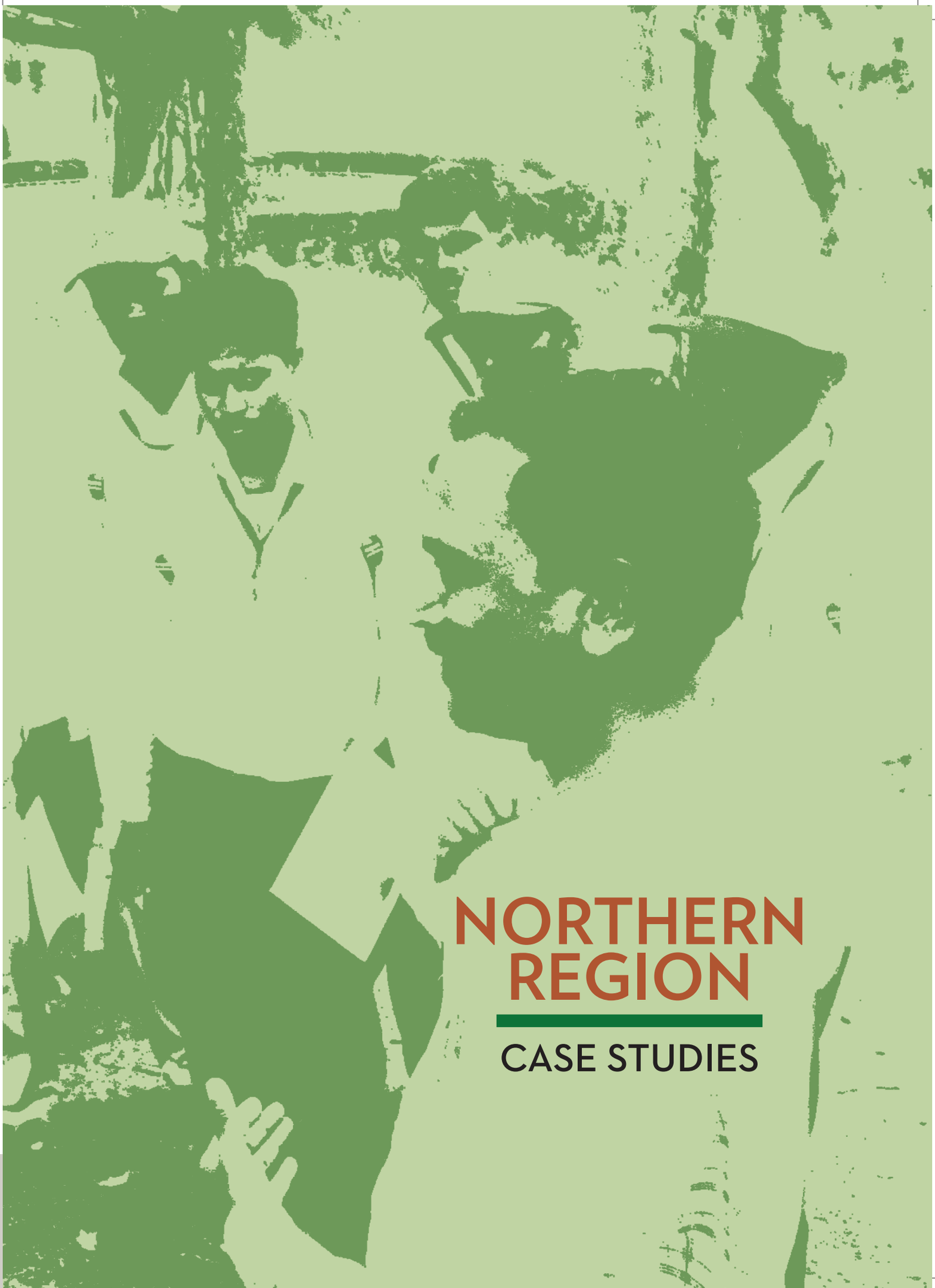
- Retrofitting can be applied to all types of buildings, even for a traditional structure built with locally available material and skill. Also, commonly observed load bearing masonry structures, existing mixed type construction observed in the region or newly built structures using reinforced cement concrete (RCC) systems that do not conform to earthquake safety norms laid down by codes can be retrofitted.
- Buildings that appear to be severely damaged on account of delamination or collapse of the masonry walls can be retrofitted and restored for safe living.
- Retrofitting of existing building is a cost effective, less time consuming and easier to adapt appropriate technology option than rebuilding. It can be done in phases, depending upon the availability of funds, beginning with making a part of the house safer for immediate occupation.
- Retrofitting helps in minimising load on local resources by eliminating the need for constructing a building from scratch. The building can be made earthquake-safe with minimal use of materials and saves time, costs and materials. Infact retrofitting can be completed within 10-20 per cent of the cost of a new construction at the current rates. Thus, there is tremendous savings in terms of reduced energy-footprint of the building.

This initiative is a part of the Government of India's 'National Biogas and Manure Management Programme (NBMMP)' of the Ministry of New and Renewable Energy (MNRE) that has the following objectives:

- To provide fuel for cooking purposes and organic manure to rural households through family type biogas plants
- To mitigate drudgery of rural women, reduce pressure on forests and accentuate social benefits
- To improve sanitation in villages by linking sanitary toilets with biogas plant

of the biogas model into the village community, collaborative efforts as well as community participation, by way of skill development of the local community to install biogas units have been seen. The Taluka has adopted household level biogas plants in a big way with the help of Kumaon Karigar Samiti and Uttarakhand Renewable Energy Development Agency (UREDA). Charba village is adopting biogas technology for the purpose of cooking gas fuel.

Naura village located in district Kangra, Himachal Pradesh is yet another example of convergence of various actions to achieve total sanitation. The village had problems such as open defection, low groundwater level, mismanaged solid waste and lack of drainage. As a result of efforts made by the Gram Panchayat in increasing awareness about cleanliness and improved household sanitation. All households now have toilets. In recognition of this achievement, the village was awarded the Nirmal Gram Puraskar and cash prize of Rs 10 lakhs. This objective of making the village Open Defecation Free (ODF) has been achieved through local leadership, awareness creation and encouragement from State government. The Gram Sabha had a two-pronged approach, develop infrastructure (hardware), while improving working with existing community groups to increase awareness among people. With the support of *mahila mandals*, *anganwadis* and common people the percentage of households with toilets went up from 30 per cent to 100 per cent.



NORTHERN REGION

CASE STUDIES

1.0

KEYWORDS: innovation in appropriate technologies for rural hilly contexts, outreach of solar passive technologies, promoting improvements in local habitat related practices

GOVT. POLYTECHNIC, SUNDERNAGAR

CONTEXT

Himachal Pradesh is rich in forest resources. The state is wholly mountainous with altitudes ranging from 350 meters to 6,975 meters above mean sea level. However, due to the high altitude many of the far away areas are still not well connected to the rest of the state which imposes limitations on movement of goods and people

Need: Difficult geography and extreme climate are constant reminders of the need for appropriate environment friendly solutions to help people meet their energy requirements without harming the delicate living environment.

Scale: The green habitat technologies as mooted by Appropriate Technology Centre (ATC) are relevant throughout the hilly reaches of the State. The Centre has demonstrated green alternate habitat technologies in cold desert region of districts of Lahaul and Spiti, Kinnaur and Pangi region of Chamba Distt.

SUMMARY

Spread over 55,673 sq km, Himachal Pradesh is known for its natural beauty and abundance of perennial rivers. The high altitudes also signify weather extremities characterised by severe winters and very little sunshine. However nature is bountiful with high green cover and round the year rivers although access to these is restricted in many places. The state is also dotted with many areas that are isolated in far away areas. Inorder to meet their needs, communities living in such areas rely heavily on whatever is available locally.

In such a context ATC was mooted as a key instrument for research and development of appropriate context relevant solutions as well as propagate them. The ATC, an Appropriate Technologies Research Development and Promotion Centre, was set up at Govt. Polytechnic Sundernagar in 1995 by the State Council for Science Technology and Environment, where an extension centre was functioning since 1989.

The Center's objectives include carrying out testing, monitoring, evaluation and demonstration of Appropriate Hill Technologies as well as creating awareness and providing facilities for demonstration, training, research and development.

The technologies propagated include solar passive and cost effective green construction technologies, agricultural technologies, earthquake resistant construction, Ferrocement technologies, cost-effective sanitation technologies, and low cost green energy solutions.

Some of the technologies that have been contextualised and successfully propagated include:

- Improved water mills (*gharat*)
- LDPE pond for rain water harvesting,
- Hand maize seller,
- Low cost green house
- Solar passive housing technologies
- Improved and energy efficient room heating Bukhari besides improvements in agriculture implements

SIGNIFICANT HIGHLIGHTS

Institution: The practical solutions oriented approach has helped deliver appropriate solutions to those who need it. Testing, monitoring and evaluation of technologies has helped developed the necessary understanding within the Centre of contextual relevance of some technologies over many others.

Technology

Solar passive technologies: Himachal Pradesh falls in cold and cloudy zone with the exception of districts of Lahaul and Spiti, Kinnaur and Pangi region of Chamba districts that fall in cold desert region. The region therefore requires intense heating and in lower regions appropriate cooling solutions also. Passive Solar Building Technology is an environmentally sound and economically viable technology in which the site planning and movement of Sun is considered in the arrangement of building components so as to collect maximum solar heat, store it and distribute it within the building.

Green house technologies: Green House is usually a framed structure covered with a transparent material, large enough for a person to walk inside and carry out culture operations in which crop may be grown under condition of partial to fully controlled environment. Use of UV stabilised film filters out harmful ultra-violet rays. The carbon-dioxide released by the plant at night is trapped inside. This raises the carbon dioxde level available to the plants during the day time by about 5-10 times contributing to faster improved plant growth and faster maturing of crops. Use of water is optimised due to reduced evapo-transpiration and about 40-50per cent of water can be saved.

Climate responsive solar passive designing: Solar Passive Housing Technology is used for heating as well as cooling of buildings. As per climatic classification Himachal Pradesh falls in cold and cloudy zone, except Lahaul and Spiti, Kinnaur and Pangi region of Chamba district that lie in cold desert region. During harsh winters this region has minimum temperatures of about minus 30 degrees. Hence, the cold climatic region requires intense solar passive heating features and the region above 2000 meters of altitude to 3000 meters require moderate heating features average winter temperature in this region vary between 10-15 deg. C. The region below 2000 meters of altitude (or planer Himachal) requires both cooling and heating solar passive building features.

Social: The outreach into the communities has helped improve livelihoods of the most far to reach communities.

Unresolved issues: The Centre is an excellent example of what is possible in a difficult terrain in terms of promotion of green approaches to habitat development. Institutional approach towards mainstreaming of green approaches will be able to further the approach to reach more number of communities.

2.0

KEYWORDS: green habitat technologies, cost effectiveness, outreach and mainstreaming of technologies

CENTRAL BUILDING RESEARCH INSTITUTE (CBRI), ROORKEE

CONTEXT

CBRI has been working as a world class knowledge base for providing solutions to almost all areas of Building / Habitat planning and construction including building materials, construction technology, fire engineering and disaster mitigation construction.

At CBRI, the *yatra* participants were given an orientation on CBRI developed materials and construction technologies, their use in model habitat projects and the ongoing CSIR-800 RSWNET programme.

SUMMARY

The Central Building Research Institute, Roorkee, India, has been vested with the responsibility of generating, cultivating and promoting building science and technology in the service of the country. Since it's inception in 1947, the Institute has been assisting the building construction and building material industry in finding timely, appropriate and economical solutions to the problems of materials, rural and urban housing, energy conservation, efficiency, fire hazards, structural and foundation problems and disaster mitigation (Source http://www.cbri.org.in). At the Rural Technology Park (RTP) which is located within the Institute campus, cost effective green habitat technology have been demonstrated

SIGNIFICANT HIGHLIGHTS

Institution

The Institute has 13 Research and Development divisions of which Rural Buildings and Environment is one of them. The Rural Buildings and Environment Division has been conducting studies on rural housing and is engaged in the development of appropriate construction technologies, improve traditional houses, new technologies for low cost houses and other buildings and environmental improvements. Disaster mitigation for housing in cyclone affected areas including relief and rehabilitation and training to various organisations involved in rural development are some other areas of work.

Technology

CBRI is well acknowledged as a leader in the field of developing alternate green technologies. Some of the other technologies developed are- flyash brick, clay flyash bricks, coir- CNSL board, coir-cement board, sisalana panels, EPS door shutter, brick making machine, high draught kiln, vertical shaft lime kiln, sand lime brick plant, concrete block making machine, Partially-precast flooring/roofing systems, RC plank, Channel units, Ribbed slab, L-panels, Waffle units, Brick panel

The following are some of the technologies that have been show cased at the RTP:

i. Pit pour flush latrine: This is a continuous system based on treatment of sludge in underground pits. The water content seeps into the soil and the solid matters are retained and subsequently decomposed in the pits into dry and odourless manure for use in fields.

Salient Features

- Low-cost continuous process
- Environment friendly
- Good quality end of the process manure is produced
- Pits can be made using bricks or ferrocement rings
- Totally eliminates manual handling of night soil

Scaling up: Suitable for all areas where water table is at least 5m below ground level and soil is not too rocky to dig pits.

ii. Fire retardant thatch roof

- A 60 cm high lining of 7 cm thick bricks in cement mortar around mud houses to protect erosion of plinth by splashing of rain water,
- Protection of traditional mud houses with a plaster of non-erodable bitumen stabilised mud or by Ferrocement.
- Improved method of tying thatch roof panels between bamboo strips with steel wire and protection of the roof by a layer of non-erodable bitumen stabilised mud or by Ferrocement against fire and rain.

Salient features

- Imparts high resistance to thatch and mud houses against fire and rain water
- Increases life of houses by about 5 to 10 times,

- Wall and roof surfaces can be colour washed to improve looks
- Easy to adopt this system by training and demonstration

Scaling up: Suitable for all areas of medium intensity rain where mud and thatch houses are traditionally being built.

iii. Pre-cast concrete funicular shells for roofs and floor: Building components for the construction of roofs, walls, stairs, sun-shades, man-hole covers, WC slabs, sewage pits, flooring/roofing tiles etc are pre-cast on ground and later lifted and assembled using manual labour and/or lifting and hoisting machines.

Salient features

- Can be cast using simple moulds or by using machines
- Skilled and semi-skilled labour can be deployed in the production.
- Economical as lesser material is required.
- Centering and shuttering is reduced to a minimum.
- Ferrocement products are light in weight, possess high strength and have better serviceability.
- help in achieving cost efficiency.
- Used in the construction of thousands of buildings all over the country during the last 25 years.

Scaling up: Depending upon the availability of local materials, geo-climatic conditions and market demand building components can be selected for production in almost any part of India.

Social

The outreach activity of CBRI is a critical skills transfer link for green technologies. The Institute also helps to support government and non-government agencies in creation of permanent facilities for trainings and display.

Unresolved issues

Greater commitment from the industry towards these technologies is needed to cover critical gaps for mainstreaming of these technologies.

3.0

KEYWORDS: decentralised green energy, community outreach and involvement

GREEN ENERGY AT THE DOORSTEP

CONTEXT

Despite rapid urbanisation within Dehradun District of Uttarakhand, people in the rural areas still continue to be self reliant within a joint family living pattern living close to their farms and with their own animal yards.

Charba Village located in Sahaspur Taluka of the district is one such village with a higher than average number of productive homestead livestock.

Need: Dehradun district is witnessing large scale urbanisation and a rise in population. There is widespread industrialisation and a consumptive lifestyle is on the rise, although it is generally observed that people in rural areas still enjoy a carefree and self sufficient lifestyle.

Scale: At the time of the site visit, about 100 households within the taluka have adopted biogas plants.

SUMMARY

On account of being a green, efficient fuel option, biogas is seen as an alternative to cooking gas. The Taluka has taken to household level biogas plants in a big way with the help of Kumaon Karigar Samiti (a Self Help Group) and Uttarakhand Renewable Energy Development Agency (UREDA). Charba village is adopting bio- gas technology for the purpose of cooking gas fuel. This type of gas is environment-friendly and saves on renewable energy. In that light the promotion of biogas is supported as a part of the Government of India's National Biogas and Manure Management Programme (NBMMP). This initiative is a part of the Government of India's 'National Biogas and Manure Management Programme (NBMMP)' of the Ministry of New and Renewable Energy (MNRE) that has the following objectives:

- To provide fuel for cooking purposes and organic manure to rural households through family type biogas plants
- To mitigate drudgery of rural women, reduce pressure on forests and accentuate social benefits
- To improve sanitation in villages by linking sanitary toilets with biogas plant
- Biogas is produced when organic materials, such as cattle dung, are digested in the absence of air, in 'Biogas Plant'. The gas composition is as follows: about 65 per cent methane, about 34 percent carbon dioxide and traces of other gases, such as hydrogen sulphide and ammonia.

Following models of biogas plants are the approved models for widespread promotion:

SIGNIFICANT HIGHLIGHTS

Institution: In an effort to promote biogas in a means to promote energy security of the households within the state of Uttarakhand through green alternatives, in the initial phase the entire effort was spearheaded by 'Pan Himalayan Grassroots Development Foundation'. The Foundation provided the institutional backbone to the entire effort- from getting the masons trained to facilitating subsidy for the household. As the initiative found acceptance and the initiative was to be done at scale, a Self Help Group "Kumao Karigar Samiti" was formed, which has been carrying out construction of bio- gas plants. The organisation also helps in providing loans from UREDA to households that are interested in the construction of Biogas plants. Subsidy upto Rs. 10,000 is being given to the families, depending on the financial condition. No middle man is involved between the beneficiaries and the loan providing agency.

Technology: A domestic biogas unit is a digesting chamber where manure, from both cows and humans, ferments to provide biogas, through the release of methane. In village Charba, the 'Deenbandhu Model' biogas plant used has a fixed underground digester chamber, constructed with a layer of bricks and an additional layer of cement mortar forming the roof above. Connected to the underground chamber is an inlet tank also sometimes called the "Mixing Tank", through which manure is fed into the plant. The manure then ferments, separating the slurry from the methane gas which rises and collects at the top of the digester tank, and is released through the gas outlet pipe. The slurry passes into the outlet tank where it is ejected from the plant and can be used as fertiliser on the field.

Construction of biogas plants has resulted in environmental friendly energy source and a good alternative to non-renewable sources of energy. The

MODEL	CAPACITY
KVIC Floating Drum Type Biogas Plants having digester made of bricks or stones	1 to 10 cubic
KVIC Type Biogas Plants with Ferro cement digester	1 to 10 cubic metre
KVIC Type Biogas Plants with Fibre Glass Reinforced Plastic (FRP) Gas holder	1 to 10 cubic metre
Deenbandhu Model (i) Brick masonry (ii) In ferrocement with in-situ technique	1 to 6 cubic metre
Pre-fabricated RCC fixed dome model	2 and 3 cubic metre
'Flxi' model Bag digester type plant made of rubberised nylon fabric manufactured by Swastik Rubber Products Ltd., Pune.	1 to 6 cubic metre

The main feature of a Deenbandhu biogas plant is the fixed underground digester chamber, constructed with a layer of bricks and an additional layer of cement mortar forming the roof above. Connected to the underground chamber is an inlet tank (labelled on diagram as "Mixing Tank"), through which manure is fed into the plant. The manure then ferments separating the slurry from the methane gas which rises and collects at the top of the digester tank, and is released through the gas outlet pipe. The slurry passes into the outlet tank where it is ejected from the plant and can be used as fertiliser on the field.

biogas plants consists of three components: a container, which holds the cow dung, a digester (or fermentation tank), which also holds the gas and a waste product container. Digester reactors are constructed from brick, cement and concrete.

Social: Many poor families have shifted from *chulhas* to biogas energy sources for cooking purpose. The *chulhas* can be very polluting and unhealthy to the person who is cooking food while the energy from biogas plant is environment friendly and helps in creation of manure for the fields apart from providing high grade fuel source.

Environment: The energy source generated from the biogas plants is 'green', generated from a renewable energy source. It helps to cut down on the cost of non-renewable sources of energy such as commercially available LPG.

Unresolved issues: Even production of 1 cu m of biogas needs 2-3 cattleheads/25 kgs of dung at the household level. Many of the families sell milk yield to commercial dairies, that don't often give a fair price, in some ways taking away the financial incentive of keeping milching cattle from the families.

4.0

KEYWORDS: decentralised green energy, community outreach and involvement

FATEHGRAM

CONTEXT

While the country is taking strides towards rapid development, there are rural communities that continue to suffer. Often there is lack of awareness or sensitivity towards the structural reasons behind issues plagueing this section of the society. Practical involvement of children as an exposure to rural parts towards development will have several advantages. On the one hand it will help bring the much needed support to the most needy of the society living in desperate conditions, it will help build awareness towards rural intricacies, build understanding of rural development strategies and promote a prosperous future for the rural areas.

Work done over five years in collaborative mode between students- community and the facilitating agency will begin to have the desired impact on the lives of people who are considered to be living at the edge of the society.

Fatehgram is one such small resettled community in Dehradun district which has achieved self sufficiency through a unique model with the help of institutional and community support to extend services and create livelihoods opportunities for 65 persons in 9 households.

SUMMARY

Fatehgram, a small village near Dehradun, is a resettled village where the landless were relocated by the Gram Panchayat. The village has achieved self-sufficiency, thanks to a unique model. Three years ago, Doon School and Himalayan Environmental Studies and Conservation Organisation (HESCO) an NGO in Dehra dun, got together to adopt Fatehgram, a sleepy, non-descript village on the outskirts of Doon valley. Their efforts are now paying off.

Nearly 65 villagers of nine families in Fatehgram have benefitted from the programme with development and construction of roads, low cost sanitation, backyard farming and also value addition in local resources and education for the children of the village. Students of the Doon school studying in Class XI and XII along with trainers from HESCO have been regularly visiting the 'adopted' village. They teach the villagers to make bricks, earthen pots, incense sticks, candles and bakery products inorder to bring about economic self-sufficiency.

SIGNIFICANT HIGHLIGHTS

Institution: In this joint venture Doon School children and management contributed in the form of human resource, skill, partial financial support while HESCO contributed in the form in Technology planning and partial financial input. Community contribution has been in the form of labour and local materials. With little financial support spread over a gradual period of time, assets could be created to empower the assetless families.

Students have been involved in all steps of village development. Their immediate involvement was in drawing Demographical Socio-economical planning through base line survey. The activities that followed

AREAS	PARTNERS
Survey and report of villagers	School Children
Village Approach Road	Community and Children
Nursery (Fruits/grain/fuel/ fodder)	HESCO-Children-Community
Watermill for power generation	HESCO-Community-DOON School Community-School
Sanitation -4 Toilets -5 Bathroom -6 Potable Water	Community Children HESCO
Water harvesting	Community/HESCO
Value addition(Local Resources)	HESCO/School/ Community
Low cost construction/ improvement of House	Children/Community
Resource Education/Cultural	HESCO/Community / Children
Agricultural/Horticultural/ Seed improvement	Children/Community

depended upon priorities emerging through status survey. Community structures have also been constructed that are used mainly for student shelter for their periodical visit. Students visit the village on Saturday, Sunday or on holidays with their Teacher as per their convenience.

Technology: Under the initiative, existing huts were reconstructed with concrete blocks and most of them finished in cement plaster. Thatch roof was replaced in places along with replacement of termite eaten wooden members. In addition, the following initiatives were undertaken:

- Two existing gharats were upgraded and linked, collectively providing upto 2.5KW of power each, enough for 50 bulbs of 100W each for the last 3-4 years. This has benefited around 12 families of the village.
- Sheds equipped with tin drums were provided for lantana briquetting.
- Toilet along with soak pits were constructed along with provisions for Rain water harvesting.
- A half-kilometre approach road to the village was built while a 400-m irrigation channel was repaired.
- Each family living below the poverty line, in consultation with students and HESCO, are now engaged in several income generating activities. One of the families wanted a fish pond while another wanted to start a plant nursery. Students pitched in for both ventures, helping them out while the school provided funds. One of the families has been trained in bee-keeping and thus has been provided with two boxes of bees.

Social: The families in the villages have attained self sufficiency and economic independence. The women in the village are involved in various kind of livelihood generation system, with their male counterparts. The village has gained a societal status among the neighbourhood villages. This village also generates income for helping their other poor village counterparts.

Although a joint initiative of Doon School, HESCO and community and the School deserved major credit in this initiative. Approximately Rs one lakh spent every year in the task for five years. Doon School contributed Rs. 50,000 per year. HESCO arranged for the rest of Rs. 50,000. Community contribution has been in the form of labour.

Environment: The entire approach has been environmentally conscious from the use of appropriate material for habitat upgradation, to upgradation of traditional watermills as a sustainable green source of domestic level electricity. Through these means, the intervention served as practice based environmental education experience for the school students

CHALLENGES AND RESPONSE

Strategies: It has been joint effort between institution and community. Inorder to achieve a self sufficient village, the Doon School and HESCO provided financial inputs, students as human resource and technology combined with community contribution in the form of labour and local resources

Process: Initially when HESCO identified the village three years back, they came to the village for constructing a water mill to generate livelihood. However when they saw the condition of the village, which was in a very poor status, they decided to resettle the village. The NGO took the help of Doon School and with the help of the community; they resettled the village and worked towards their holistic livelihood system.

Impacts: A joint effort between the institution and community, has not only resulted in transformation of a dying village into a vibrant one, the village has attained societal status among the neighbourhood village; and attained self sufficiency and economic independence.

5.0

KEYWORDS: sustainable development, community participation, ecotourism, integrated development

GREAT HIMALAYAN NATIONAL PARK

SUMMARY

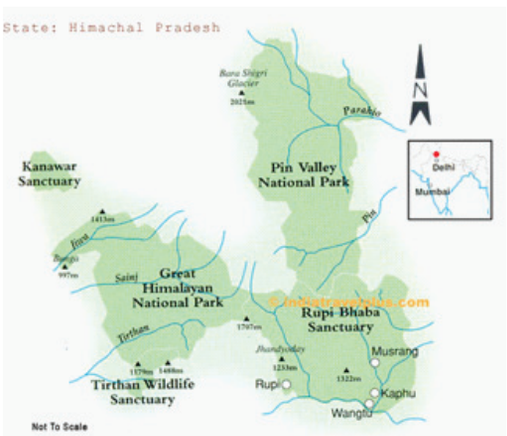
Great Himalayan National Park (GHNP) is an ecologically significant area with rich and diverse biogeography starting from an altitude of 1700 meters above M.S.L to the highest peak approaching almost 5800 meters. Together with Society for Biodiversity Tourism and Community Advancement (www.btca.org.in), a local NGO and Sunshine Himalayan Adventures (www.sunshineadventure.com)- a private eco tour operator the management of GHNP works on issues in consideration of the carrying capacity as well as reducing human impacts by involving the community . This collaborative works on training local people and developing various ecotourism products. Advocacy is done through international informal platforms like Friends of GHNP (www.greathmalayannationalpark.com) that contributes to its website, and managing the GHNP blog.

CONTEXT

GHNP was created in 1984 in Kullu region of Himachal Pradesh in an effort to protect Himalayan ecosystem that comprises of rare plants and animals. Spread over an area of 1171 square km in the upper Beas region, GHNP comprises of the watersheds of Jiwa, Sainj and Tirthan rivers. The park is a major source of water for the rural and urban centers of the region with four major rivers of the area originating from glaciers in the park. Local communities living close to GHNP is dependent on GHNP for lumber as well as non-timber forest produce (NTFP) such as honey, fruit, nuts, flowers as well as fuel wood.

Need: In order to prevent excessive exploitation of the park resources and also to enable Eco zone villagers to meet their needs, GHNP management developed strategies for sustainable development of villages in the critical Eco zone.

Scale: The park has a buffer area extending from the western periphery of the park which has been classified as the Eco development project area (EPA) or Eco zone. This Eco zone has an area of around 326 square km and about 120 villages with a total population of 16000 households.



SIGNIFICANT HIGHLIGHTS

Institution: With a commitment towards preservation of this ecologically fragile area, ecotourism is being promoted. Fuelled by the zeal to create new models of ecotourism SHA and BTCA have a unique and exclusive relationship under the guidance of the park management.

This approach enables local villages to benefit from preservation of the wilderness.

Technology: Most of the buildings in the Ecozone of GHNP are made of local materials such as wood, stone, and mud. This blends well with the environment and contributes to environment sustainability. Other sustainable technology approaches are also being promoted such as the upgradation of traditional water mill, vermicomposting, small scale cultivation of herbs and exotic flowers etc.

Social: Capacity building of local communities: BTCA has been working to build the capacity of local communities by way of trainings on advanced mountaineering, first aid, rescue, cooking, communications, trekking procedures etc. funded by the park administration. As a result, the ecotourism program boasts of a strong team of well trained local community members who are meaningfully employed

in tourism.

52 SHG's with women memebers have been formed that are involved in jam making, production of juices, extraction of oils from apricot trees etc. Krishi Vigyan Kendras have been set up for providing assistance. Futher use of vermicompost has helped increase crop yield.

Skills upgradation: The youth are involved in ecotourism activities and are engaged in anti-poaching activities during off-season. With a view to minimising the environmental impact of tourism, ecotourism team offers well structured packages of mountaineering, bird watching, wildlife and trekking tours in the core zone of the national park. In addition, around 20 soft adventure and nature based activities are offered in the buffer-zone.

Environment: Technological upgradation of water mills: Surveys of all the local water mills (locally called gharat) of the Tirthan Valley have been carried out and certain mills have been identified for conversion for generating electricity. These water mills are capable of generating electricity up to four Kilowatts. BTCA has entered into institutional tie-up with WWF India for conversion of traditional water mill in the Tung Village of the Ecozone of the GHNP into a pico hydel project.

Alternate energy sources: Solar heating and lighting is being used in office buildings of GHNP. Solar lanterns are subsidised at the community level and use of cloth bags encouraged.

Waste collection and composting: Waste is collected from households, businesses, shops, hotels etc and recycled. Organic waste is composted while plastics etc are sold to the local Municipality.

ENERGY, RESOURCES AND ENVIRONMENT

GHNP-BTCA work towards enviornmental friendly development by way of:

- Promoting responsible eco-travel and developing ventures associated with tourism which are beneficial to local communities and tourists alike
- Lobbying against large hydel projects in the ecozone
- Increasing conservation awareness through street theatre
- Promotion of traditional cropping practices
- Promotion of green house cultivation
- Revival and promotion of local handicrafts
- Providing initiatives to manage waste and to reduce plastic waste generation through setting up of water refilling systems and garbage management in villages.
- Provide technical assistance to watershed management activities.
- Promoting a culture of Reduce, Reuse and recycle

CHALLENGES AND RESPONSE

The greatest challenge has been to promote livelihoods while maintaining the delicate ecological balance. This is being addressed through skill building among the youth and women SHG members. Upgradation of gharats has been another means of promoting sustainable livelihoods.

6.0

KEYWORDS: promoting development of renewable energy sources, enabling sustainable development

HIMURJA

SUMMARY

Himurja office building in Shimla epitomises practical approach of the agency towards promotion of renewable energy. The building is an excellent integration of solar passive architecture in office buildings in cold regions that get clear sunlight. In addition, Himurja has successfully propagated technologies such as solar heating, solar photo voltaics and micro hydel projects. Making use of numerous small rivers and streams, upto 5MW power plants are being supported by Himurja.

CONTEXT

Himurja is the Himachal Pradesh Energy Development Agency with office building located in the state capital Shimla. The agency was set up by the government of Himachal Pradesh for promotion of renewable energy sources within the state. The agency has laid particular thrust to promotion of solar energy and small scale hydro- electric power.

Need: Apart from resplendent natural beauty, the state has abundance of perennial rivers and plenty of sunshine. Approaches that make innovative use of solar passive and active measures virtually negate the need for additional space conditioning systems thus meaning a more energy conscious approach. Such approaches contribute to state endeavour's towards becoming the first carbon neutral state of India.

Scale: Besides mainstreaming alternate solar passive techniques in buildings, the agency has set up a goal of producing 500 MW electricity through small hydel projects by the end of 2014 through sector participation.

SIGNIFICANT HIGHLIGHTS

Institution: As the state nodal agency for new and renewable energy, Himurja plays a pivotal role in achieving renewable energy targets within Himachal Pradesh, streamlining and helping refine the various procedures and processes in order to minimise the bottlenecks towards implementing the state policies in renewable energies. The Himurja building was done by Department of Science and Technology.

Technology: Located in a cold and cloudy climatic zone, Himurja building is considered to be one of the most energy efficient buildings in India with integrated technologies making use of solar passive design elements and renewable energy systems. With a requirement to be heated throughout the year but more so during the cold winters, the building design incorporates solar passive means of heating.

- The plan of the building and the form allows for maximum penetration of the sun.
- Air heating panels have been incorporated as an integral part of the south face of the building providing effective heat gain in the entire building. The staircase is made use of as a means of distributing heated air throughout the building. The staircase also contributes to ventilation within the building during heat buildup in summers.
- Double glazed window with proper sealing are used to minimise infiltration.
- Specially designed solarium has been created on the south face to increase solar heat gain.
- Windows and light shelves have been carefully integrated in order to ensure effective daylight distribution
- Solar water heating systems and solar photo-voltaic system have been integrated into the building.

Social: The climate in most part of the state requires heating for most part of the year. Therefore functional demonstration of solar passive technologies serves to promote the technologies within the State.

Unresolved issues: The upper floor of the building tends to get overheated during summer months. The photovoltaic system of 1.5 kWp meets the energy demand for lighting whenever required, however there is dependence on artificial lighting during cloudy days.

7.0

INTEGRATED HABITAT DEVELOPMENT BRINGS RECOGNITION

KEYWORDS: integrated habitat development , strong Panchayat led action with peoples participation, leveraging of government schemes.

SUMMARY

Spread over seven square kilometers, till a few years ago Naura was like many other villages in the region- chronic water shortages, widespread open defection and lack of sanitation, no particular solid waste system and complete lack of drainage. The widespread drinking water scarcity had issues related to topography such as low groundwater level due to the village being situated on a hilly area and consequent high runoff.

The Gram Sabha had a two pronged approach- develop infrastructure (hardware), while improving working with existing community groups to increase awareness among people. With the support of *mahila mandals*, *anganwadis* and common people the percentage of households with toilets went up from 30 per cent to 100 per cent.

Other initiatives have included community level rain water harvesting tanks, waste collection and segregation, construction of community toilets, paving of internal village roads with drainage channels on either side for disposal of waste water and rain water runoff.

CONTEXT

Naura village is located in district Kangra, Himachal Pradesh. The village had problems such as open defection, low groundwater level, mismanaged solid waste and lack of drainage. As a result of efforts made by the Gram Panchayat in increasing awareness about cleanliness and improved house hold sanitation, all households now have toilets. In recognition of this achievement, the village was awarded the Nirmal Gram Puraskar and cash prize of Rs. 10 lakhs

The objective of making the village Open Defecation Free (ODF) has been achieved through local leadership, awareness creation and encouragement from state government.

Need: Integrated habitat development addressing the most urgent issues of safe drinking water and sanitation.

Scale: Gram Panchayat of Naura

SIGNIFICANT HIGHLIGHTS

Institution: The Gram Sabha realised that provision of amenities had to be done together with promoting hygiene awareness among people inorder to have the desired improvement in hygiene conditions.

Involvement of established community institutions such as *anganwadis* and *mahila mandals* was sought inorder to create hygiene awareness. Street ate solid waste a Rs. 500 fine has been imposed on all those who do not use dustbins to dispose of the trash. *mahila mandals* continue to play an active role in maintaining cleanliness. The Panchayat continues to hold meetings at the cluster level, encouraging, recognising and appreciating the efforts being put in. Almost all houses in the village are now connected by means of paved roads with drainage channels.

Waste generated from the village is segregated. Bio-degradable waste is being decomposed to produce manure for agriculture while plastic waste is being collected and sent to the public works department (PWD) to be used in road construction.

Bank interest earned from the prize money is being used for maintenance of cleanliness in the village.

Technology: Cluster level water tanks have been constructed connected to existing water source. Where there is a major loss of level, water pumps have been installed.

In order to improve ground water level, check dam has been constructed on a nearly stream and large ponds constructed on panchayat land for collection and storage of rain water.

Social: Creation of community infrastructure by the Gram Panchayat has generated opportunities for employment generation at the local level. Besides, stitching and tailoring trade trainings have been imparted to the women in the village. Development of community centre has helped to provide a space for large community gatherings and meetings.

Unresolved issues: On the road to progress, the village is en-mass giving up on traditional construction practices and is whole-heartedly embracing the 'new' and '*pucca*' construction comprising of burnt brick and RCC. It is seen to be believed that houses made of mud construction with bamboo under structure roofing that are more than 100 year old and being used actively as houses that are cool in summers and warm in winters.

8.0

RESISTANCE OF BRICK AND STONE MASONRY SCHOOL BUILDINGS

KEYWORDS: cost-effective retrofitting, seismic resistance, reducing carbon footprint

SUMMARY

Retrofitting as a process is a means to reduce earthquake vulnerability of existing buildings. It can be applied to all types of buildings, be it a traditional structure built with locally available material and skill, commonly observed load bearing masonry structures, existing mixed type of construction commonly observed in the region or newly built structures using Reinforced Cement Concrete (RCC) systems that do not conform to earthquake safety norms laid down by codes. Even the buildings that appear to be severely damaged on account of delamination or collapse of the masonry walls can be retrofitted and restored for safe living. Retrofitting of existing building is a cost effective, less time consuming and easier to adapt appropriate technology option than rebuilding. It can be done in phases, depending upon the availability of funds, beginning with making a part of the house safer for immediate occupation.

CONTEXT

Uttarakhand, lies in a multi-hazard prone region with a pre-eminent earthquake risk. The region, in last decade had witnessed two medium intensity earthquakes (Uttarkashi earthquake in 1991 and Chamoli earthquake in 1999) causing heavy loss of property and life. The state is among the most seismically active parts of India in which tremors of magnitude 5.5 or more have been a regular occurrence since 1900. The fact that this region lies in the 'Central Seismic Gap' of the Himalayas implies that the region continues to have potential danger of future great earthquakes that may even be of the magnitude 7.5 Richter or more.

Need: The central Himalayan state, is well known as multi-hazard prone state. Himalaya, the youngest mountain chain of the world is also geo-dynamically most active. Earthquake, landslides and other mass movement activities are the most common hazards of this terrain. Though hazards such as landslides are predictable and timely intervention can mitigate the loss of property and life. But, earthquakes are unpredictable and when struck, within few moments of its occurrence can cause huge damages in terms of life and property.

Scale: The need for earthquake retrofitting of existing building stock is an emergent and urgent need where the cost should be counted in saved lives and not in terms of the money spent today

SIGNIFICANT HIGHLIGHTS

Institution: Not only is there a dearth of trained masons for unsupported replication of these technologies, also there are only a few organisations engaged in retrofitting. There is also a lack of awareness of the practice and a certain apprehension about its advantages. Even though guidelines have been developed by such organisations along with the government for its use for all kinds of constructions, these guidelines have not led to development of technical resources that can be brought into civil engineering and architectural design practice.

Technology: The main principle behind making a building seismic-resistant is to tie the three major components of the building – the foundation, the superstructure and the roof, to each other, so the building acts as one entity, while maintaining a certain amount of ductility within the structure.

In the absence of essential elements like bands embedded while laying the brickwork of the wall, such tying elements need to be fitted on later.

The first step in retrofitting is to repair all cracks and weakened structural elements of the building. Next, all vulnerable joints are identified and techniques designed to ensure their safety. Retrofitting is primarily done by means of making reinforced bands on the surface of the wall at various levels, such as sill, lintel, roof, etc as per the needs of the region. The bands are made on both sides of a wall and are tied together by means of a transverse steel bar binding together the reinforcement on both sides. In areas where the wall seems weak, small headers are created on the surface of the wall, acting as small, individual binding elements. Special emphasis is laid on strengthening of corners and joint details in

verandas, etc.

The advantages of retrofitting are as follows.

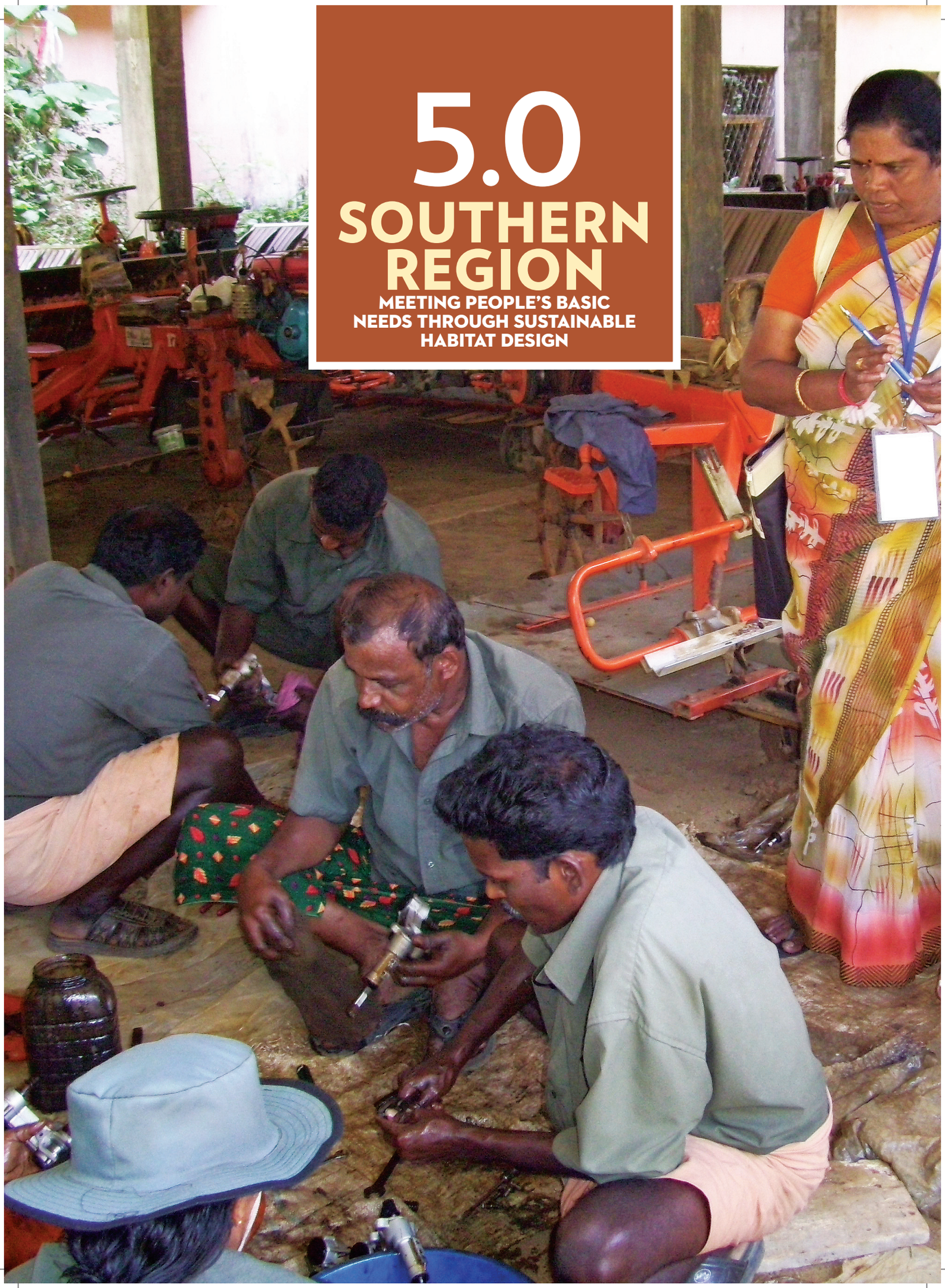
- Reconstruction means first demolition and removal of debris, and then reconstruction. Each step cost money.
- Retrofitting means making small changes to only to some components/parts of a existing structure.
- Retrofitting is at least five times cheaper than reconstruction.
- Retrofitting is faster than reconstruction.
- Retrofitting means all the conveniences created within the building are not lost. Reconstruction means re-doing all that.
- Retrofitting can be done in phases - only one or more parts of the house at a time. Hence, its use can be continued and economically it is more manageable.
- Finally, it ensures long term safety against future earthquakes for most number or people with least amount of money.

Social: The technology has not been widely accepted as a suitable alternative to constructing a new building to ensure seismic-safety. This is due to inadequate promotion and demonstration of the technology.

Environment: Retrofitting helps in minimising load on local resources by eliminating the need for constructing a building from scratch. The building can be made earthquake-safe with minimal use of materials and saves time, costs and materials. Infact retrofitting can be completed within 10-20 per cent of the cost of a new construction at the current rates. Thus, there is tremendous savings in terms of reduced energy-footprint of the building.

5.0 SOUTHERN REGION

MEETING PEOPLE'S BASIC NEEDS THROUGH SUSTAINABLE HABITAT DESIGN



The major thrust in the Southern region was towards provision of sustainable habitat conditions especially post tsunami to potentially provide a basis for new livelihood opportunities reducing dependence on rain-fed agriculture.

The Lok Awaas Yatra in the South explored habitat projects across the states of Andhra Pradesh, Tamil Nadu, Puducherry and Kerala. A large number of projects were coastal in character and were initiated in the aftermath of the tsunami, highlighting the theme of 'build back better' with focus on regional cultural, social and ecological response to reconstruction of lives and livelihoods. Besides these, the southern *Yatra* explored large social housing interventions in Andhra Pradesh and Kerala and panchayat led interventions in Tamil Nadu.

A key characteristic of the Southern region cases was the strength and capacity of local institutions – public sector, panchayats, community groups and Civil Society Organisations (CSOs). Institutional arrangements and support structures, especially in Kerala and Andhra Pradesh were seen to be responsible for the continued and growing habitat interventions in the states. This was reflected in the reconstruction interventions also, where CSOs worked through collaborative arrangements with institutional actors to re-build sustainable habitats post the tsunami disaster.

BUILDING BACK BETTER

The large scale damage to infrastructure and housing stock as a consequence of the Indian Ocean Tsunami gallivanted action across the coastal belt with the government, civil society and international funding support to rebuild lives and livelihoods. Analysis of damage revealed high vulnerability of coastal communities to extreme climatic events such as floods, and cyclones. The tsunami had affected more than 2.5 million families across the eastern coast and there was a need for more than 1.5 million houses to be reconstructed.

Not only was the concern that people needed to be housed rapidly and safely, but also that these habitats would lead to improved quality of lives. Many of the projects were driven by the concern that rapid and large scale reconstruction would create negative environmental impacts on local resources such as soils for bricks. Reconstruction projects in Tamil Nadu, Puducherry and Kerala addressed the issue related to reducing risks through safe planning and construction practices; responding to the local contexts of climate, house designs, soil conditions, cultural and social concerns; they looked at issues of participation in planning, design and construction especially the inclusion of women and vulnerable groups and demonstrated environmental and social responsibility in terms of introduction of ecofriendly materials and technologies in construction, sanitation and energy and building capacity of communities, with skilled artisans creating new economic opportunities.

Thus we find, local enterprises making fly-ash bricks, artisans trained in safe construction practices and women SHGs engaged in nurseries for the new habitations in Karaikal. The Yatris saw Ecosan toilets promoted in Musiri in Tamil Nadu and careful planning of habitations beyond the Coastal Regulation Zone with streets organised in curvilinear manner and tree plantation to act as wind breaks in Karaikal.

Besides the extreme event of the tsunami, floods and cyclones are a regular feature of the region. In Kogampattu, a small village at the Puducherry – Tamil Nadu border, floods disrupt connectivity every year when river banks flood over. Kalvi Kendra, a local NGO supported habitat for 75 families and economic development for 350 families through local building material production and transportation systems.

Kuthambakkam village in Tamil Nadu used to be notorious for illicit arrack and communal violence. Over the past fifteen years the village made much progress in many areas of human life with housing playing a significant role.

RESOURCE EFFICIENT AND COST EFFECTIVE CONSTRUCTION

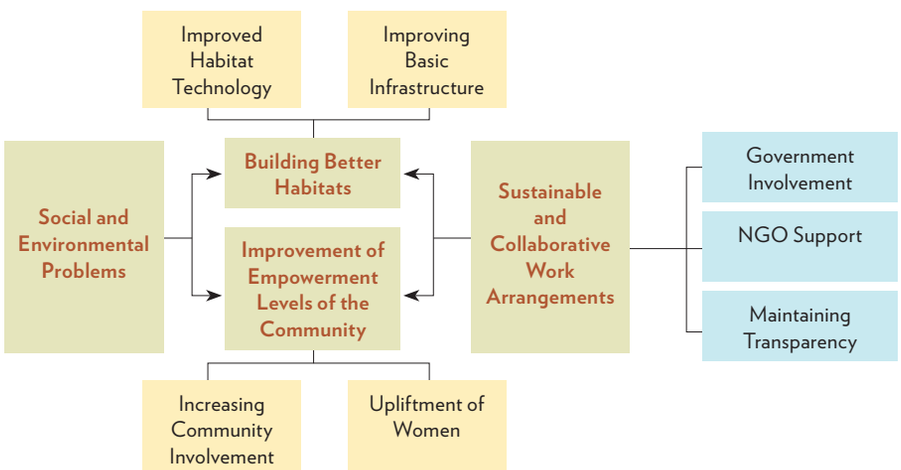
Environmental responsibility and economic considerations guided many of the projects that were studied in the South, both reconstruction and other social housing initiatives. Besides, a focus on low energy, low resource use for construction and water and waste management systems, cost effectiveness has been looked at through improved designs, shared plinths and common walls, using construction techniques that use less materials and local production of materials.

In the INDIRAMMA project, the flagship housing programme of the government of Andhra Pradesh, 'twin house' with shared walls and shared plinths have helped reduce material and labour costs. Each 21 sqm house has a room, a kitchen and a toilet with one wall shared with its neighbour and the other side available for expansion.

The Kuthumbakkam village development in Tamil Nadu has successfully used stabilised compressed earth blocks in the twin houses. This has brought down the embodied energy component of the house by almost 50 per cent while providing economic opportunity to local youth in the production of the building material. Filler slab roofs and waste granite in foundations further brought down the material intensity of houses. Similarly, the Karaikal Reconstruction Project supported by the Swiss Red Cross and managed by Development Alternatives has Locally produced fly-ash bricks used in rat-trap bond masonry effectively using industrial waste, saving precious agriculture soils from brick making and reducing the material component in the walls by 20 per cent, while providing thermal insulation. This development also saw roof rain water harvesting in all houses and effective waste water management from kitchens and toilets.

Development Alternatives, under a Memorandum of Understanding with the Government of Puducherry undertook the initiative to reconstruct permanent houses in three villages of Karaikal region, in Puducherry. The initiative was supported by the Swiss Red Cross and was carried out in three villages of Karaikalmedu, Kottucherrymedu and Kilinjalmedu within Karaikal, which is one of the four regions of Puducherry.

The SEVAI ECON center and housing promoted by them in Trichiurapalli demonstrated many new technologies such as the ferrocement roofing shells and upgraded traditional construction systems. A very strong component of the SEVAI intervention is local livelihood creation through building material production. The Ecosan toilets have been an attempt at innovative sanitation that creates hygiene as well as provides useful manure for the fields. The Ecosan Community Compost Toilet (ECCT), the first of its kind in the country was constructed in Saliyar Street on the banks of the river Cauvery in Musiri, Tamil Nadu. The ECCT commissioned in April 2006 continues to serve approximately 500 families. It is an optimum solution for high water table regions where twin-pit systems and septic tanks do not work well. The project was undertaken by the Scientific Committee on the Problems of the Environment (SCOPE) with the help of



Kuthambakkam continues to make efforts towards green development and has introduced energy efficient battery powered bicycle as a means of personal transport.

WASTE, a civil society organisation from Netherlands and the state government of Tamil Nadu. The aim was to improve sanitary conditions while at the same time prevent pollution of the Cauvery river.

IMPROVING BASIC INFRASTRUCTURE

The projects visited in the southern *Yatra* have gone beyond basic housing and sanitation (read toilets), efforts have been extended to include community infrastructure such as roads, drains, community buildings and processes for their maintenance, thus addressing a total habitat. Benefits are visible as in Musiri, where improved health conditions are directly attributed to the Ecosan. Research Center for Banana has infact shown that urine directed from the Ecosan toilets has a highly beneficial effect on the Banana plantation and has the potential of large scale savings in fertilisers if this is scaled up. Storm water drains and porous pavements along with road side plantations and electricity connections were visible in Karaikal as in most reconstruction initiatives in the southern *Yatra*.

Access to electricity and electricity production to generate revenue has been a successful innovative experiment by the Panchayat of village Odanthurai in Coimbatore district of Tamil Nadu. All houses have a connection. The village Panchayat has procured a 350 kW wind turbine installed at a distance of 100 km from the village. The wind turbine sells electricity back to the grid and generates revenue for village development activities. This innovative collaboration amongst the Gram Panchayat, Suzlon Energy pvt. Ltd., Tamil Nadu Electricity Board and the Central Bank of India is an excellent example of delivery of basic development services in an ecological manner with a win-win for all stakeholders. The village has gone many steps ahead to improve the village infrastructure. Seven overhead tanks linked to a borewell provide piped water supply to every home. Drinking water is purified, making it bacteria free using a treatment plant that runs on electricity generated by a biomass gassifier run by a women's collective. The funds for the capital investment were sourced through the Rajiv Gandhi National Drinking Water Mission. Solar lamps light up the streets at night and some of the houses are connected to bio-digesters for treatment of the human waste. This extremely

Technologies and Techniques Propagated by the SEVAI Technology Centre

- Roof slab made using R.C.C. filler slab with Mangalore tile infill.
- Traditional Sand filling technology is used in foundation trenches with stone filling at edges.
- The toilet structures are constructed out of precast ferrocement panels providing playful aesthetics to the finished product.
- Water filtration is done by means of low cost sand filtration system.
- Reduce plinth area by using thinner wall concept such as 15 cms thick solid concrete block wall and innovative use of compressed earth blocks in place of burnt brick.
- Concrete or steel section frames or use of brick arches instead of RCC lintels as spanning options for openings.
- Ferrocement channels are favoured in SEVAI's work contributing to an overall cost savings of 30-40 per cent.

ECOSAN TIOLETS

The Ecosan system is built on a raised plinth above ground level. The toilet has two attached chambers, which are used in turn for depositing human waste. When the first chamber is filled up with faeces, it is closed for 6 months to a year through a process of dehydration helped by ash or sawdust etc. sprinkled becomes a good soil conditioner and is used as compost in the agricultural fields. In the meantime the second chamber is filled up. Alongside there is a urine outlet. The wash water goes through a pipe into a vertical filter to Canaindica plant, which eats up the waste dissolved in the water while there is ground water recharge. The urine from the toilets is collected separately in a tank and taken to nearby farms for cultivation of paddy, banana and sugarcane, after appropriate dilution. Therefore, Ecosan is a closed loop between sanitation and agriculture. However, inorder for this to work, it is important that no water is running down in the chambers where faeces are collected. The Ecosan toilet can earn Rs. 36,000 in 20 years along with the fact that it is cheaper, easier and ecofriendly to construct.

Kuthambakkam village had widespread social ills and communal violence. Mr Elango, a native, wanted to initially address the problem of social disharmony in the village. For this he contested the Panchayat election thereafter took up leadership responsibilities as Panchayat Leader. 'Twin houses' helped to build understanding among people from different castes to live together in harmony. Based on lessons learnt from various sources, Mr Elango drew up a detailed five-year plan for integrated development of Kuthambakkam. This was thoroughly discussed among the village community at ward and street levels, before implementation.

futuristic village development stands a shining example for *gram swarajya*.

COMMUNITY EMPOWERMENT AND ENGAGEMENT FOR DEVELOPMENT

In the southern *Yatra*, as in the others, community engagement formed a vital force that drove village development. In all the projects that the *Yatra* visited, whether led by civil society organisations, panchayats or public sector programmes, developing community ownership was a priority. This extended from increasing / ensuring people's engagement from decision making and contributions for the habitat development and maintenance to creation of alternate livelihoods that were linked to village development. Mobilisation, training, capacity building and continued engagement with community processes has therefore been a key aspect of the projects.

In the INDIRAMMA programme, cost effective, environment friendly building materials are sourced from local Nirmithi Kendras, where training of local work force has been an integral part of the programme. A large number of local artisans and others have found opportunities for income generation in this sector. In order to increase participation and acceptance of the programme, *gram sabhas* were organised across the state to explain house specifications, construction systems and materials that would be promoted. Even though the INDIRAMMA has worked on a saturation mode of 'housing for all', measures have been taken so that the most vulnerable, living in temporary structures are taken care of at the earliest and included through the gram sabha process. This initiative has subsequently continued to put transparency and beneficiary participation at the center of its strategy.

In Kongampattu, the community with supervision and technical input from the partner and Habitat for Humanity (HFH) managed reconstruction. A Project Management Committee (PMC) which included village leaders, homeowners and partner and HFH staff was formed for procurement of construction materials, monitor the physical progress of the construction and ensure quality construction. Once the construction was commenced, homeowners provided labour during construction of the house as sweat equity.

Kuthumabakkam village, in Tamil Nadu has demonstrated how habitat development can actually lead to social harmony. Under the Samathvapuram scheme of the State Government, village community was encouraged by the Panchayat to come together and 50 twin houses where dalit and non-dalit families now live next to each other in peace and harmony. The village development plan conceived through active gram sabha processes identified and constructed village infrastructure such as roads, overhead water tanks, bore-wells, storm water drains. The village converted the Indira AwaasYojna as people' own yojna and brought in contributions to convert old and dilapidated houses of all the poor into *pucca* homes. The village now boasts of being the first 'hutless' village in India.

This focus on 'people's participation' was seen in the reconstruction interventions also. In Kogampattu, community SHGs supported by Kalvi Kendra undertook house construction and further, worked to make success the evening school for children where each family pays Rs. two per month for a future fund to pay volunteers to serve the school. A community based disaster management fund has been created wherein savings for a future disaster are managed. The village supported by the NGO set-up a disaster risk reduction initiative with a focus on human life protection, infrastructure development, agriculture insurance, livelihoods, savings, information systems and awareness.

CPI(M) supported initiative in Clappana Gram Panchayat mobilised entire communities for reconstruction by raising public funds from donations, and a mass education programme on reconstruction and safe housing setting up a community based quality assurance system. Transparency in technical and financial systems and also in selection of vulnerable

At one point of time, there was 1800 block making units operational all over the state producing Flyash-Lime-Gypsum blocks to meet the material shortage. Workforce shortage was addressed by means of training of 4500 masons during the course of INDIRAMMA.

families shifted the paradigm from charity to social justice. Village committee of beneficiaries supported by party workers supervised material storage, purchase, access, loading, unloading and transportation of materials, payments to workers and water and power for construction. The outcomes are evident in the quality of habitat and the satisfaction of the residents.

The Karaikal Project similarly, devised institutional systems with community engagement at various stages of the project. The village reconstruction committees (VRCs) promoted participation of the community in design selection, construction supervision and information dissemination. The resultant outcome is culturally responsive, creates a hierarchy of open and covered spaces, pedestrian and motorable roads with needs of men women, youth, children as well as the disabled catered for. Large scale training of artisans and contractors included creating space for youth in trades such as electricians and plumbers.

The strength of women collectives has been recognised amply as seen in all the southern projects. INDIRAMMA programme has ensured that allotment of homes is in the name of women in case of a married beneficiary to strengthen this process. *Mahila Samakhayas* are avenues for recruitment. In fact women's self help groups are the backbone of the housing credit given to families in Andhra Pradesh. Women's enterprises in building materials production were seen across the South, in Kerala where the Jeewom's women's unit took a giant leap of faith and proved its mettle in providing services for reconstruction along the Kerala coast and training large numbers of women masons in Kanyakumari after the tsunami.

IMPROVING TECHNICAL SKILL BASE

Training, skill building and technical support systems were a hallmark of the southern *Yatra* projects. The impacts of the Laurie Baker Building Centre that has set up a sustainable training system are visible not only in Kerala but in many projects and initiatives across the southern states. Trained artisans drive quality and make it easy for improved construction technology to be acceptable and mainstreamed so that new housing stock is safer and more sustainable. From INDIRAMMA project in Andhra Pradesh to Panchayat led initiative at Kuthambakkam and Odanthurai, the SEVAI projects

UP-LIFTMENT OF THE MARGINALISED THROUGH ECOSAN TOILETS

In Musiri village, due to the dire need expressed by the women, ECOSAN toilets were built. This initiative is a key development that has led to upliftment to a section of the society that was engaged in handling human waste, besides providing hygienic sanitation to people. The Gram Panchayat manages the toilet. A 'User Card' is issued to every user who gets registered, on which number of usage per day is marked. The user gets paid 10 paise for every use of the toilet, paid at the end of the month. The provision of financial incentive, however small, has helped to ensure that there is social acceptance of the initiative.

Karaikal	The village nurseries that provided all the plants for the new settlements were managed by women's groups from the three villages providing them with a source of income.
Odanthurai	Self Help Groups run by women are not only sustaining themselves but are also contributing to the community. The most successful of these is the 'packaged drinking water' SHG run by 12 local women. This packaged drinking water plant was set up by the help of State Govt. and with a cost of 20 lakhs of which Rs 5 lakhs are from State government funds and the Bank as a loan provided the remaining 15 lakhs. The entire loan amount has been repaid.
SEVAI Technology Centre	▪ 20 women are trained every 2 months and these women then run their own SHGs. ▪ SEVAI Shanthi Matriculation Higher Secondary School is providing education to approx. 3000 children from surrounding regions. ▪ Generating awareness about ecofriendly construction techniques.

SEVAI Technology Centre, Trichy Tamil Nadu	■ Involved in upgrading Habitat Technology and promotes sustainable livelihoods and women SHGs by providing training in ecofriendly construction techniques ■ Participated in the construction of the state government's Samathuvauram housing projects ■ Projects also supported by international agencies like DESWOS, Germany and Swiss FPV and FdnF
Odanthurai, Coimbature, Tamil Nadu	■ Demonstrated Habitat Development through local action, creation of community infrastructure and promotion of sustainable development ■ Housing projects supported by the governments: Indira Awaas Yojana and Schedule Tribe Housing Scheme ■ At present close coordination between the district administration and the village through the formation of the Village Poverty Reduction Committee (VPRC) set up by the state government and the Gram Panchayat
Kuthambakkam, Thiruvallur, Tamil Nadu	■ Village Panchayat believed in the Habitat – Livelihoods model for socio-economic transformation of the village from a poor unsafe environment to a socially and economically thriving one. ■ Village Panchayat joined hands with the 'Trust for Village Self Governance' (TVSG) ■ Housing constructed under the Indira Awaas Yojana
Musiri, Trichy, Tamil Nadu	■ The first ECOSAN Community Compost Tiolet (ECCT) was built in the region to prevent further pollution of the Cauvery while providing hygienic sanitation facilities to the people ■ Project Implemented by Scientific Committee on Problems of the Environment (SCOPE), Trichy ■ Aided by WASTE, Netherlands ■ Compost produced has been used under the UNICEF –SEI project to see its effect in growing Bananas
INDIRAMMA (Integrated Novel Development in Rural Areas and Model Municipal Areas), Andhra Pradesh	■ Implemented by the Andhra Pradesh State Housing Corporation Ltd
Karaikal, Puducherry	■ Development Alternatives under a Memorandum of Understanding with the Government of Puducherry undertook reconstruction in three villages of the Karaikal region post the Tsunami of 2004. 909 houses were built. ■ Initiative supported by the Swiss Red Cross
Kangampattu, Puducherry	■ Local NGO Kalvi Kendra, supported by international organisation Habitat for Humanity built 75 disaster safe model houses with full contribution from the local community.

in Tiruchirapalli and reconstruction initiatives in Puducherry and Kongampattu initiative of Kalvi Kendra have all integrated the components of skill building. At SEVAI the Econ center provides continuous training support, the Karaikal intiative in Puducherry trained over 70 artisans and 25 local engineers and 7 local contractors. It linked up with the local building centre to ensure that training systems could be continued. Kerala of-course has a long tradition of skill building, starting with the Quilon building centre and the Laurie Baker building centre. Jeewapoorna women's society, as mentioned earlier took a step further to bring women into this hitherto male dominated sector.

Another characteristic observed was the strong technical interface of all initiatives. The SCOPE initiative in Musiri Project brought in scientific approach to sanitation, the reconstruction projects in Karaikal and Kangampattu along the east coast and Clappana Gram Panchayat on the west coast brought expertise in the form of architects, structural engineers and others who worked in association with the community groups to simplify technical concepts and explain complex safe

VILLAGE COMMITTEES

Karaikal: Village Reconstruction Committee (VRC) was formed and community parks and community centre created for recreation and gathering purposes. A VRC was constituted to represent the families in the planning, design of physical reconstruction and selection of technology process in a participatory manner. The VRC had 6 women and 4 men as members; the VRC is now a part of the development process.

Odanthurai: The village also has Village Poverty Reduction Committee (VPRC) that has been set up by the state government and the gram panchayat. It aims to ensure economic well being of all the families, eradicate poverty through bringing in improvements in income levels to such an extent that there are no below poverty line families in the village.

construction techniques in simple forms. Numerous simple to use technical literature such as posters and wall paintings were used and there was a genuine effort to enhance people's levels of technicity. This has paid off in a more informed and aware community that effectively engages for their development.

INSTITUTIONAL SUPPORT SYSTEMS AND COLLABORATIONS

The strength of community institutions was matched and supported by public institutional systems across the southern projects. Collaborations across actors and leveraging complementary capacities was seen in most projects. INDIRAMMA initiative in Andhra Pradesh has set up a state wide process of gram sabha based selection of beneficiaries, materials production and skills delivery through Nirmithi Kendras, SHGS engagement for accessing housing credit and the state machinery in monitoring and tracking the 'saturation' approach for *pucca* homes for all. Although questions still remain on credit repayments and complementary livelihoods, quality concerns at a few places, but overall it indicates a political will, bureaucratic focus along with systemic approach to a long term process.

Similarly, both at Odanthurai and Kuthamakkam, we see the strength of Panchayats in ensuring a long term people oriented planning and a system process to integrate public schemes as per local requirements. With strong gram sabha processes and visionary Panchayat members, these villages have set in place long term sustainable development processes.

In Kerala it was the backbone of the strong panchayat that CPI(M) could mobilise village relocation and then engage with the community to select beneficiaries, house designs and supervision processes for construction.

There are different actors and stakeholders in the habitat process, these need to come together at different times of life of a project and in different ways to provide support and services over a long period in the process of habitat development for sustainability. Public sector agencies as in Andhra Pradesh have been able to converge central and state schemes for pooling resources, set up state wide financing, e-governance mechanisms, defining outcome indicators and setting guidelines and mechanisms for monitoring and tracking. They also played a large role in bringing various actors to work together. Nirmithi Kendras across the state have provided materials and skills at reasonable rates, community groups and local enterprises. Women's groups have been linked with banks for financing of housing and civil society actors are engaged in mobilising and supporting the habitat development. E-governance system for making payments linked with internet banking and 24x7 toll free call center help-line for registering complaints that are addressed within a given time frame are institutional mechanisms that other state governments are also emulating.

The southern *Yatra* thus brings forward very succinctly components of a eco-system wherein sustainable rural habitat processes can foster and grow.

The process of implementation of the Provision of Housing under the INDIRAMMA Programme to maintain high levels of transparency and integrity Additional Engineer (AE) visits all villages once a fortnight as per a pre-drawn programme. Fixed day in each village every fortnight.

- The AE conducts verification of houses and records in the monitoring book.
- Beneficiaries meeting is organised. List and entitlements read out in open.
- Dy EE cross checks at least 10 per cent. Thereafter, online payment is confirmed.
- Disbursement is only through individual accounts. Transition period of 45 days. Pay slips distributed in the village by AE.

MULTIPLE ORGANISATION COLLABORATIVE EFFORTS IN KARAIKAL POST THE TSUNAMI

The Swiss Red Cross and Swiss Solidarity, in collaboration with Development Alternatives, took the initiative to reconstruct permanent houses in the Karaikal region. The project is designed to provide an appropriate response to the reconstruction and rehabilitation needs of 909 families in the three villages (430 in Karaikalmedu, 320 in Kottucherrymedu and 159 in Kilinjalmedu). Solid waste management was overlooked by INTACH. Community contribution was restricted to construction supervision (after training) and establishing the Fly-Ash Bricks plant. People were given livelihood support too by payment of wages for their work in constructing the houses.

During the course of construction, MoU was entered into with NLC (Neyveli Lignite Corporation) for procuring fly ash free of cost from their thermal plant and making use of that in making mud blocks. As a result, over 80,000 tons of waste from NLC was recycled, and five fly ash block making enterprises set up. The low lying sites were filled up through lobbying with the government albeit with a lot of delays, site edge protection of the sites was undertaken by retaining walls and edge plantations.

Kuthubakkam Village Panchyat: To facilitate the process of soci-economic transformation through the habitat-livelihood combination, in 1996 the Panchayat joined hands with "Trust for Village Self Governance" (TVSG), a registered charitable trust founded by Mr. R Elango. He connected rural development models across India- from Anna Hazare's watershed management in Maharashtra to Dr Parameshwara Rao's wasteland development in Andhra Pradesh, Dr Karunakaran's Gram Swaraj movement in Madhya Pradesh, to Dr M.P.Parameswaran's Swadeshi movement in Kerala. Link up was done with several universities working on relevant/appropriate rural technologies such as the Central Food Technology and Research Institute (CFTRI), Mysore and Central Mechanical Engineering Research Institute (CMERI).

Environmental and socially responsible approaches in technology and management supported with capacity development and engagement of community, material and skill availability through enterprises, resource centers and training in a facilitatory environment of strong Panchayats and state institutional system.

SOUTHERN REGION

CASE STUDIES

1.0

KEYWORDS: improving access to alternative low energy and low cost building technologies; participatory, transparent and gender sensitive processes; local materials

COSTFORD AND THE LAURIE BAKER CENTRE FOR HABITAT STUDIES

SUMMARY

COSTFORD was formed on 15th March 1985 and was guided by their late Chairman, Padmasree Dr. Laurie Baker with head office at Ayyanthole, Thrissur. Costford operates from twelve sub centers spread over Kerala. It has a very large construction programme which includes many projects for government as well as private clients. They have carried out massive rural development projects of Central and State Government agencies. Collectively COSTFORD has realised about 20,000 buildings within Kerala.

COSTFORD's mission is multi-faceted and includes:

- Promoting local level planning and development for empowering communities
- Encouraging multi-disciplinary technical support teams
- Supporting study of vernacular architecture along with research and development in architectural design and construction technology
- Serving as a conduit for transfer of technology appropriate for climate, culture, and resources
- Fostering human resource development at all levels with special attention to women
- Publishing and distributing educational material related to its philosophy and technologies
- Conducting seminars, workshops, exhibitions, training programmes, and site visits.

COSTFORD's very visible presence in Kerala is the thousands of buildings it has designed and constructed for over a quarter of a century. There is special emphasis on providing cost-effective, energy efficient housing, especially in rural areas, along with rehabilitation of urban slums. The organisation, with thirteen centres in Kerala, creates and implements design and construction strategies sensitive to indigenous building practices, environmental considerations, and integration of appropriate modern technology.

COSTFORD demonstrated its architectural paradigms in social context with the help of following three places:

1. Laurie Baker Centre for Habitat Studies: a training facility for low-cost based habitat work.
2. Slum rehabilitation Centres, Karimadom
3. International Institute for Social Entrepreneurs (IISE): Also known as Braille without Borders.

CONTEXT

COSTFORD is a not for profit voluntary organisation of scientists, technologists, educationalists, professionals and social workers and has been mainstreaming cost effective and energy efficient construction systems that Laurie Baker developed. These systems include Rat Trap bonds in brick masonry, filler slab roofing system and use of low energy binders such as lime instead of cement.

While mainstreaming low energy and low cost technologies for building construction has been a prominent theme, this is done while adopting participatory, democratic, transparent and gender sensitive processes.

SIGNIFICANT HIGHLIGHTS

Technological: COSTFORD believes in the Baker principle that the design and construction techniques used must be either indigenous to the local architecture or a more refined form of it. It is because these techniques, methods, and use of materials date back centuries and are most apt for that particular place. Some examples include:

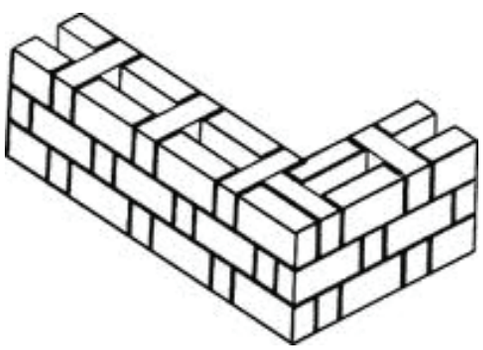
Rat-trap bond: The Rat trap technique uses bricks on edge with a cross brick between each and produces a 9-inch thick wall with an insulating air cavity in between thereby reducing the number of bricks used by 25 per cent, reducing the mortar used (1:8 mix), and the overall cost. The strength achieved is that achieved in a wall achieved by means of a Flemish or English bond. Plastering of such walls is generally not required due to the aesthetic appearance of the resulting walls. Furthermore, the cost of painting is also saved. However

as the sizes of the bricks vary, so only one surface of the wall can be even. The other face (generally inner) can be smoothened by patch pointing.

Bamboo: Use of bamboo is quite extensive both as a local material and generally in building construction as shuttering, scaffolding, roofing, piles, filler material and much more.

Bamboo in lime concrete can be used for foundations, especially in the sandy areas along the seacoast. It is resistant to seawater and remains intact whereas other types of foundations tend to disintegrate/crack with shifting sands. For places where stones and bricks are not available, foundation for mud walls can be of moist soil with layers of split bamboo reinforcement inserted. However it needs experience to identify good quality bamboo and it is difficult to calculate the exact strength of slabs with bamboo reinforcements.

Jali wall: Creative bricklaying is a defining visual characteristic of COSTFORD buildings with varied arrangements providing natural ventilation instead of costly and environmentally damaging air conditioning. Jali walls also provide privacy, security, cost reduction in the need for windows while improving aesthetic appeal.



Use of built in furniture: Much of the furniture used by COSTFORD is built-in. These are either of brick or rubble masonry raised above floor level. Raised rubble masonry with finished surface can be used for sitting or made like tables or even beds. Brick furniture is generally finished with a red or black oxide layer. To make it interesting, tiles are fixed to these oxides to form an integrated design pattern. Bay windows, outdoor seating spaces, loft beds, study tables, etc are common examples of cost saving built-in furniture.

Recesses and buttresses in walls are used as shelves, almirahs and cupboards. Common thoughts behind this built-in furniture are that, after constructing houses and buildings, clients are left with very little money to buy costly furniture, so these built-ins save money and also provide strength to the walls.

Institutional: COSTFORD continues to thrive as a not for profit agency and is supported by Department of Science and Technology (DST); Ministry of Rural Development, Govt. of India; the department of local Self Government, Government of Kerala and Housing and Urban Development Corporation (HUDCO).

Social; Continued large scale application of appropriate technologies is contributing towards improvement of living conditions and fulfill housing need of large sections of poor. The process of housing provision is a huge opportunity towards skill building in these technologies among the poor. Buildings are thereby not only low cost but also constructed in concordance with the local religious, social and cultural patterns of living.

Environmental: By means of judicious use of naturally obtainable building related resources and judicious use building materials, maximum utilisation of resources is ensured.

2.0

KEYWORDS: state commitment to rural housing, transparency, online monitoring and e-governance

INDIRAMMA FOR A SLUM-FREE ANDHRA PRADESH

SUMMARY

In order to promote integrated development of villages, Andhra Pradesh Government decided to undertake development of villages and town with an intention to saturate certain identified basic needs of the people and the village/town infrastructure in an integrated manner. INDIRAMMA (Integrated Novel Development In Rural Areas and Model Municipal Areas) is the flagship housing programme of the Government of Andhra Pradesh launched in 2006 as a 3 year programme with the resolve to adopt saturation approach inorder to achieve a hut free, slum free state. It is managed by Andhra Pradesh State Housing Corporation Limited.

CONTEXT

The implementing agency of INDIRAMMA, Andhra Pradesh State Housing Corporation Ltd (APSHCL) was established in 1979 in the wake of the Diviseema cyclonic storm that caused severe damage in two coastal districts of Andhra Pradesh for taking up permanent houses in rural and urban areas .

Need: At the time of launch of the INDIRAMMA Programme during 2006-07, in Andhra Pradesh there were 47 lakh rural households and 13 lakh urban households without a permanent house. INDIRAMMA programme sought to provide permanent house to each of these families.

Scale: INDIRAMMA programme aimed at recognising 'housing' as a basic right and has been active in 60000 habitations and urban wards within Andhra Pradesh. Since its launch INDIRAMMA has had an allocation of Rs 5000 cr per year through state budget right upto 2008-09.

SIGNIFICANT HIGHLIGHTS

Institutional: The INDIRAMMA programme is implemented by the nodal government institution for housing in the state. Demand of housing is saturated by leveraging funds. After exhausting available Central plan Schemes , the remaining units are being taken up under State Plan Schemes. In order to maintain transparency, e-governance system was adopted and

Map not to scale

a fully functional online monitoring mechanism set up wherein anyone can view the exact status of a particular beneficiary application or disbursement as the case may be. Registration is deemed complete once online registration is complete.

Within the saturation approach, a clear criterion for selection of beneficiary in rural and urban areas has been adopted. The house is sanctioned in the name of the woman beneficiary. The beneficiary constructs the house on self help basis and there is no involvement of contractor. Other institutional measures undertaken within INDIRAMMA are:

- Cement supplied at concessional rates through negotiated price arrangement with cement companies
- Nirmithi Kendras strengthened for supply of building material at reasonable rates
- Waiver of Seignorage charges on sand and quarry material for INDIRAMMA housing
- All details are maintained online in the public domain to maintain transparency.
- E-Governance system adopted facilitates making payment which is linked with Internet banking system, helps monitor house-wise progress and follow up complaints. No middlemen involved in disbursement
- While upscaling the programme, the shortage of staff was addressed by means of outsourced technical staff for field work
- 24 x 7 Call centre toll- free helpline set up to take complaints and these are monitored at the highest level
- State Monitoring Unit set up in Hyderabad under direct control of the Chairman and Managing Director (CMD).
- State Monitoring cell established – to enquire into such issues through Third Party Agency or Special Officers

Technology: The Programme has made technology choices inorder to promote cost effective environmental technologies. This has been one of the enabling mechanisms of such a large scale programme. Material shortage of brick and wood was met with strengthening of Nirmithi Kendras. At one point of time, there were 1800 block making units operational all over the state producing Flyash-Lime-Gypsum blocks to meet the material shortage. Workforce shortage was addressed by means of training of 4500 masons during the course of implementation of INDIRAMMA. Door frames, window frames, sand-cement blocks have been manufactured in Nirmithi Kendras. Infact 99 per cent of all INDIRAMMA houses have RCC door-window frames.

Houses with shared wall and shared plinth- 'Twin houses', have been permitted to reduce cost of construction. A total plinth are of 210 sq ft is thus achieved that includes one room, kitchen and W.C.

Social: Under the INDIRAMMA Programme, all Self Help Groups (SHGs) within a village come together under the Village Organisation (VO), the apex body in the village.

The initiative has continued to put in place measures to promote transparency and ensure beneficiary participation. At the start of the first phase of the Programme, Gram Sabhas were planned in the selected Gram Panchayats giving details of the specific activities to be taken up in the village under the programme. All INDIRAMMA houses given in the name of a woman beneficiary of the BPL married couple. During the course of implementation, in certain instances, the field staff are recruited through Mahila Samakhyas.

Environmental: With a total of 6.4 million houses at different stages of construction within INDARAMMA, promotion of environment friendly alternate technology in the construction of social housing at such extensive scale has positive environmental implications besides creating opportunities for manpower training in environmentally appropriate technologies, besides being a major force behind creating acceptance towards these technologies.

GOAP Loan:	Rs.17,500/	Rs 35,000/
GOAP Subsidy:	Rs.13,200/	Rs 6,000/
Beneficiary Contribution:	Rs. 500/	Rs 2,000/
Sub-Total	Rs. 31,200/-	Rs 43,000/-
Bath cum Toilet:	Rs. 3,050/	---
Addl Loan:	Rs.20,000/-	Rs 30,000/-
Grand Total:	Rs.54,250	Rs 73,000/-

ENERGY, RESOURCES AND ENVIRONMENT

Strategies: The saturation approach and the overwhelming budgetary support from the State Government received together with standardised unit cost and implementation framework set the pace for state wide success of the programme .

E-governance system in this case has been well developed and well supported and the e-platform very well developed. From the time of online registration of the beneficiary, each stage in the process is updated realtime and can be accessed remotely on the website. Each stage payment during the process of construction is also updated online. Together with internet banking system and a strong field staff presence brought transparency into the system and enabled smooth running of the INDIRAMMA programme.

INDIRAMMA has been an effective vehicle for building large scale acceptance of alternate technologies. Capacity building efforts were local and provided technical support to bring into the mainstream technologies such as RCC door and window frames.

Process: INDIRAMMA Monitoring Committees are formed at different levels upto the village to conduct survey, identify eligible beneficiaries, and for successful implementation of the Programme. In addition, District Level Officers monitor programme as Mandal Special officers and ensure that overall implementation is proceeding as per targets set.

Disbursement of payment is made on the basis of the actual progress on site and the transfer of payment is done through online banking into the beneficiary account in banks or post offices.

The process of implementation is as follows:

- Additional Engineer (AE) visits all villages once a fortnight as per a pre-drawn programme on a fixed day in each village every fortnight.
- The AE conducts verification of houses and records in the monitoring book.

ELIGIBILITY CRITERIA FOR HOUSING:

- Living in temporary (hut) and not having a permanent house
- Below Poverty Line (BPL)
- Not benefitted in earlier schemes
- Having possession certificate of a house site
- SC/ST families will be given priority in allotment of IAY house

	Rural	Urban
Cement 50 bags	7,500	7,500
Payment	26,750	35,500
Supplementation	20,000	30,000
Total	54,250	73,000
Addl Loan:	Rs.20,000/-	Rs 30,000/-
Grand Total:	Rs.54,250	Rs 73,000/-

- Beneficiaries meeting is organised. List and entitlements read out in open.
- Dy EE cross checks at least 10 per cent. Thereafter, online payment is confirmed.
- Disbursement is only through individual accounts. Transition period of 45 days. Pay slips distributed in the village by AE.

IMPACTS

As on 30.11.2010 33.24 lakh houses have been completed under INDIRAMMA while 13.62 lakh are under progress. Total corresponding expenditure under INDIRAMMA has been 12,389 cr. This amount has been transferred to people through e-governance system of INDIRAMMA.

CHALLENGES AND RESPONSE

For a project of this size, among the biggest challenges is maintaining transparency in financial transactions. Leakages in such cases will result in non-completion of housing on ground. The e-governance system made it possible wherein records of all beneficiaries are available online. This in turn has boosted people's trust in INDIRAMMA.

Efforts at addressing shortage of building material were met by strengthening of building centers and training of masons.

Unresolved Issues: While the programme has been successful in certain areas, it has not been able to take off in some of the coastal districts.

3.0

KEYWORDS: swomen's empowerment, skill building, sustainable livelihood, capacity building.

JEEVAPOORNA WOMEN MASONS SOCIETY (JEEWOMS)

SUMMARY

Many women masons took up work in construction due to dire need, as their husbands were unsupportive or dismissive. Most of them started as helpers to male masons. It was only when JEEWOMS intervened - with the aim of training those women who had an interest in learning a higher order of construction work to earn better livelihoods - did the women start training in masonry. They were initially trained in latrine construction, and slowly graduated to making cement blocks and house construction.

CONTEXT

JEEWOMS was started under the Socio Economic Unit Foundation (SEUF) in 1989 to address shortage of skilled masons for construction work in the Thrissur district of Kerala. Registered in 1995, the society trains and equips women to become skilled masons and build houses.

Continuous involvement of women in all construction works by the way of assistance to the male masons, especially in the building of the low-cost two-pit latrines, sparked the idea of skill building among women construction workers. The fact that the design of the latrines was very simple and quite identical and easy to master served as a further encouragement. Additionally, there is unmet need for trained masons as most of the male masons have been migrating for Gulf countries. JEEWOMS successfully identified and capitalised on this as an opportunity.

Over the years, 1300 women have been trained in Thrissur district in cement block-making, pre-fabricated door and window frames, paving tiles and flower pots and have further been involved in tsunami reconstruction in Tamil Nadu bringing greater recognition to JEEWOMS.

SIGNIFICANT HIGHLIGHTS

Institutional: JEEWOMS is a result of conviction in the equality of men and women construction workers. The experiences of JEEWOMS have proven that social training has a key role in altering gender relationships at construction sites. Social training helps to instill necessary skills to deal with unavoidable circumstances at worksites. The training was especially useful in the beginning as mentioned, when the male masons were creating trouble in the women's work. The society was attuned to the needs of these women, and one of the basic ones was confidence. A by-product of this need was the introduction of the churidaar and coat as the dress code for masonry work. With the churidaar (which is actually a salwar - loose fitting trouser and kurta – long top) with a coat over the kurta, women were able to work effectively as well as maintain their dignity while providing a boost to their confidence levels.

JEEWOMS Centres were located strategically in places where women could access them easily. Out of the women trained over the years, senior members of the group who can no longer perform masonry work due to age and related health problems have been involved in managerial and finance related work within JEEWOMS. This has helped in maintaining financial independence for these women.

Technological: The women in JEEWOMS were trained in construction technologies at two levels. The first is technical training on different kinds of masonry work such as cement blocks, pre-fabricated door and window frames and MCR and flooring tiles, along with doing actually construction work.

The other level is the social training, wherein women were taught skills in negotiation management and team building.

For the technical training, the women were provided with manuals which contained data and instructions on diagrams and materials. This meant that the women trained had to have a basic education level where they could at least read basic Malayalam.

Social: All the women who were trained did not continue with the work due to family commitments. Therefore a questionnaire was developed and circulated at construction sites together with application form.

The basic criteria set by the society for the training are:

i. Women have to be married

ii. Under 45 years of age

iii. From Below Poverty Line (BPL) families
iv. Their children, if any, should be more than 3 years of age
v. Women in greater need of extra income were preferred
vi. Previous experience as mason helpers

It was therefore realised that some women may have the calibre to perform but cannot read and write. After talking to the women the society made an exception in some cases. Most women were motivated to take up the training by exemplifying the benefits of skill development. The training was for 60 days out of which three days were reserved for social training.

As a means to support the women the society provides them with a stipend as well as food and drinking water at the training sites. The women who were trained were encouraged to register for health insurance and identity cards, in which the institution aided them. For this, of course, the certificate of completion of training provided by the society proved useful. Acquiring credit on their own, without their husbands support also became easy once the women had completed their training.

CHALLENGES AND RESPONSE

The Society found certain aspects of training challenging. Firstly, women had to be convinced that they could do the work that the men were doing. Also, coordinating with the timings of the women proved to be challenging considering they had household responsibilities also. Therefore arriving at a consensus regarding the timings was a challenge. It is only after the training was over and the women started earning, that they adjusted to the new timing systems. During the training, a stipend aided in encouraging the women to take it up as it provided them with a means to sustain their households. And thirdly, in the initial stages, a lot of women were trained who did not carry on with the work. This however was addressed by establishing a criterion for training.

Another challenge was in terms of the societal notions regarding women masons. Demonstrating that the women could do this work effectively was extremely difficult. In fact initially any construction done by the women would be broken down by the male masons as they felt threatened by women. . The women had to face a constant tirade of verbal abuse for a while. It is only after people took notice the quality of work achieved by the trained women that the physical and emotional hardship started to stop.

Trade unions posed problems for the income generation activities of the women especially in the case of loading and unloading material. In Kerala, these activities come under the purview of the state trade union, and they are carried out by men. In the case of the making of prefabricated cement block and MCR tiles, the women would not be allowed to load the trucks with the finished products, which could aid them in earning an extra income. The society had to intervene and negotiate with the union, to enable the women to carry out this work.

UNRESOLVED ISSUES

A major issue that seems to be unresolved is the pride attached to the work. Although the women were happy to do the work and defined themselves with masonry,

they do not want to involve their children in the same sector saying that the work is very difficult and that they want a better life for their children. Linked somewhat to this issue is the absence of young women at the society. Most of the women working with the society as masons seem to be involved in production of construction material and are above the age of thirty five. Younger women are not keenly taking up the vocation, although trainings for Kudumsari's (women groups) and a Panchayat block had been conducted. The society is now aiming to involve some of these women full time at their production centres, to enable the continuity of these centres.

Another issue that seems to be unresolved in the production centres are the erratic electricity problems thus causing major disturbances in production.

4.0

BUILDING HOUSES, CHANGING LIVES- KONGAMPATTU

KEYWORDS: disaster safe housing, community participation

SUMMARY

Habitat for Humanity is a global non-profit organisation dedicated to the elimination of poverty housing and homelessness around the world and in making simple decent and affordable shelter a matter of everyone's conscience and action. Habitat invites people of all backgrounds, races and religions to build houses in partnership with the lower-income/vulnerable families in need of housing. Habitat for Humanity has built more than 300,000 homes in over 3000 communities globally and has housed more than 15 lakh people in safe, decent and affordable shelters.

Habitat for Humanity India began its operations in 1983 in Khammam, Andhra Pradesh. The Habitat for Humanity India has its National Office located in Mumbai with Habitat Resource Centers (HRC) established in New Delhi, Chennai and Bangalore and Mumbai that implement and broaden the reach of programmes. The HRCs work in partnership with corporate, government and non-governmental organisations in building houses for the underprivileged and marginalised. Habitat delivers its programme through Habitat Resource Centers, which provide cost effective house design, project supervision and other supports for the successful implementation of the projects by the NGO partners and Habitat affiliates.

Kongampattu is a small village at Puducherry- Tamil Nadu border comprising mainly of 350 dalit families. The village is heavily flooded every two years or so as it lies very near to the river banks. Not only this, even the road connecting the village to mainland gets damaged disrupting connectivity to the village.

Kalvi Kendra in partnership with Habitat for Humanity (HFH) built 75 disaster safe model houses, (measuring about 340 sq.ft)

Each house has a three feet plinth as protection against floods and has a living room, bedroom, kitchen and one toilet-cum-bathroom. Volunteers from all parts of the country took part in building these houses.

CONTEXT

Kongampattu is located in Villupuram District of Pudducherry. An innovative model of community development is demonstrated with the help of Kalvi Kendra, a local NGO ensuring economic development for 350 families of the village and houses for 75 families.

SIGNIFICANT HIGHLIGHTS

Technological: Permanent houses were constructed and adequate provision made in the design in order to ensure durability of the building. Access was provided to the roof of the houses as a risk reduction measure.

Institutional: Housing construction was undertaken by community Self Help Groups supported by Kalvi Kendra, the local partner NGO. The Rs. 20000/- loan provided by HFH on a 5 year loan repayment plan under which a monthly installment of Rs. 370/- per month is paid to Kalvi Kendra which in turn transferred the money to HFH.

Temporary roads within the settlement were laid with funds from NREGA.

Since intervention by Kalvi Kendra, every child in the evening school pays Rs 2 per month. This was never collected before, but now contributes to 'Future Fund' to pay for the services of the volunteers teaching at the school.

Community disaster fund has been created wherein every family contributes some amount of money as per their ability in order to sustain them in times of disaster. The reconstruction was managed by the community with supervision and technical input from the partner and Habitat for Humanity. Project Management Committee (PMC) was formed for procurement of construction materials, monitor the physical progress of the construction and ensure quality construction. The PMC included village leaders, homeowners, Partner and HFH staff. Effective material management in terms of purchasing steel and cement in bulk. Agreements were made for regular supply of bricks from the brick chambers at the agreed price right through the construction period

Social: The target community comprised principally of marginalised and oppressed communities in low lying areas. The Self Help Group also acts as a pressure

group for defaulters to make timely repayment of loan.

With support from the community, in addition to building houses Kalvi Kendra also started evening school for children. The Kongampattu community (along with Kalvi Kendra) initiated Disaster Risk Reduction initiative with thematic foci on human life protection, infrastructure development, agricultural Insurance, livelihoods and savings, information and awareness. Volunteer teams were formed within the themes.

CHALLENGES AND RESPONSES

While housing was the need among the entire community, it was difficult initially to prioritise on the basis of vulnerability. Chances of duplication of beneficiaries was there initially as initially people tried to get additional house in the name of their relatives.

However once the construction was commenced, homeowners provided labour during construction of the house. This is termed as sweat equity and helped further cost optimisation as well as an opportunity for the family to actively participate in the construction process. The homeowners provide unskilled labour such as shifting materials to the construction site, water curing, sand filling, cleaning the construction site and safeguarding the construction materials etc.

The loan repayment process is also community led under which there is enough peer/community pressure on the defaulters to pay the loan on time.

5.0

FROM RECONSTRUCTION TO SUSTAINABLE DEVELOPMENT

KEYWORDS: habitat reconstruction, participatory processes, structural safety, environmentally friendly construction technologies, knowledge and skill building

SUMMARY

The tsunami that struck the Eastern coast of India in December 2004 devastated the lives of coastal communities, penetrating inland upto 3 km in the southern and eastern coastal areas causing immense losses to lives and infrastructure.

Development Alternatives, under a Memorandum of Understanding with the Government of Puducherry undertook the initiative to reconstruct permanent houses in three villages of Karaikal region, in Puducherry. The overall objective of the project was to carry out reconstruction of houses with basic amenities and provide community infrastructure and facilities in an environmentally and socially sustainable manner. In doing so, the project sought to reconcile hopes and aspirations of people with the objectives and guiding principles of donor agencies within development frameworks set out by government agencies. The initiative was supported by the Swiss Red Cross and was carried out in three villages of Karaikalmedu, Kottucherrymedu and Kilinjalmedu within Karaikal which is one of the four regions of Puducherry.

909 houses were constructed each with a plinth area of 407 sq. ft including staircase block in a plot of 800 sq. ft. Land and basic infrastructure of roads, drains, street lighting, water supply was provided by the government. 70 artisans, 25 local engineer and 7 local civil contractors were trained in safe construction practices; 18 youth were trained in construction trades of electricians and plumbers and placed with local contractors. The local building centre was engaged as part of a systemic effort for long term knowledge and training supports.

The Swiss Red Cross and Swiss Solidarity, in collaboration with Development Alternatives, took the initiative to reconstruct permanent houses in the Karaikal region. The project is designed to provide an appropriate response to the reconstruction and rehabilitation needs of 909 families in the three villages (430 in Karaikalmedu, 320 in Kottucherrymedu and 159 in Kilinjalmedu). Solid waste management was overlooked by INTACH. Community contribution was restricted to construction supervision (after training) and establishing the Fly-Ash Bricks plant. People were given livelihood support too by payment of wages for their work in constructing the houses. These houses were made using ecofriendly and low cost construction techniques like Rat Trap bond method which not only lessens the number of usage of overall bricks by 20 per cent but also provides insulation and Stone Patti roofs which are cheaper in cost.

CONTEXT

Massive tsunami of December 26, 2004 caused widespread devastation and affected 2.5 million people on the eastern coast of India. Such was the rapidity of its onset and intensity that it gave little time for people to escape from the high waves causing an estimated 18000 deaths.

Need: There was an urgent need to rebuild lives and livelihoods of those affected by the disaster.

Scale: More than 150,000 houses needed to be reconstructed. Various government and non-government agencies extended a helping hand in rebuilding permanent shelters and help with rehabilitation of livelihoods.

Development Alternatives with support from Swiss Red Cross carried out the Sustainable Reconstruction Initiative in three tsunami affected villages. A total of 909 houses were constructed.

SIGNIFICANT HIGHLIGHTS

Institutional: Institutional mechanisms were set up at different stages of the reconstruction process as per the needs of the project. Professionally conducted habitat design of the project promoted participation of the community. The resultant outcome responds to the local cultural beliefs and lifestyles, creates internal hierarchy of open spaces, pedestrian as well as motorable streets. The project considered the needs of women, men and children in the family with regard to the use of the house both for living and livelihood activities thus creating ownership.

Land and basic infrastructure of roads, drains, street lighting, water supply was provided by the government. Village Reconstruction Committee (VRC) was formed and community parks and community centre created for recreation and gathering purposes.

During the course of construction, MoU was entered into with NLC (Neyveli Lignite Corporation) for procuring fly ash free of cost from their thermal plant and making use of that in making mud blocks. As a result, over 80,000 tons of waste from NLC was recycled, and five fly ash block making enterprises set up.

The low lying sites were filled up through lobbying with the government albeit with a lot of delays, site edge protection of the sites was undertaken by retaining walls and edge plantations.

Institutional anchoring to further safe construction was provided by way of training of 70 artisans, 25 local engineers and 7 local civil contractors. The local building centre was engaged as part of a systemic effort for long term knowledge and training supports.

Technological: The design and construction of houses was done to ensure safety and sustainability. Priority in construction technology selection was laid on environment friendly materials such as Rat Trap bond in brick masonry as well as fly ash block masonry, thus reducing overall brick consumption by 20 per cent along with improved thermal insulation.

The roofing was done using local stone. UNDP shelter guidelines for Tamil Nadu were adhered to and pile foundation were used in view of the local soil conditions. The roads were made curvilinear to reduce the impact of storm and water. They are also sloped to help the water flow in case of excess flooding. The pavements are porous to help in recharge of water.

Social: A Village Reconstruction Committee was constituted to represent the families in the planning, design of physical reconstruction and selection of technology process in a participatory manner. The VRC had 6 women and 4 men as members, the VRC is now a part of the development process.

Opportunities for livelihood creation and income enhancement as a direct outcome of the reconstruction process was capitalised upon and made available to all the families. Many of the families did not take this option as they were culturally not inclined towards construction related jobs. For the families who participated, building material production enterprises have led to sustainable livelihoods. Training was done for making low cost fly-ash bricks, repair works and construction. Construction using local masons has ensured economic benefits and youth trained in construction related trades have been placed with contractors for jobs. In addition, the village nurseries that provided all the plants for the new settlements were managed by women's groups from the three villages providing a source of income. The solid waste collection and management service introduced later is working on the principle of income generation through service delivery.

6.0

KEYWORDS: decentralisation, Sustainable Livelihoods, Habitat upgradation, Convergence, Capacity building

WHEN PANCHAYAT TAKES A LEAD

SUMMARY

Kuthambakkam village in Tamil Nadu used to be notorious for illicit arack and communal violence. Over the past fifteen years the village made much process in many areas of human life with housing playing a significant role. Till 1996, except the centre of the village that is largely inhabited by upper caste families, the condition of all other habitations inhabited by dalits (lower caste people) was deplorable- the village had no basic infrastructure of roads, water supply, drainage and sanitation facilities. Open defection was common practice. More than 40 per cent of the population lived in huts with palm leaf thatch as roofing over mud walls. Typically, the small huts had an area of less than 200 sq. ft. A small entrance door was the only source of natural ventilation and lighting. Together with poor sanitation, lack of domestic hygiene and no permanent source of income, living conditions of dalits seemed irrecoverable. There was little hope for the future as majority of the people depended on low and seasonal income from agriculture.

CONTEXT

Where: Kuthambakkam village in Thiruvallur district of Tamil Nadu, 31 km from Chennai.
What: Integrated village development through local leadership and community participation
Who: Gram Panchayat, Kuthambakkam
For whom: *Pucca* houses for a population of 5190 of which 52 per cent are dalits.

SIGNIFICANT HIGHLIGHTS

Technological: With a commitment towards habitat upgradation, technically viable alternatives were assessed and successfully implemented for house construction. For instance, Compressed Earth Blocks (CEBs) were chosen for their cost effectiveness and greater capacity for local income generation as compared to burnt bricks.

Waste pieces of granite in good shape from nearby industries were used in the foundation of houses. Inorder to meet the demand for a flat roof, RCC filler slab was used which was later modified to increase cost savings. Twin pit toilets were constructed for their time-tested effectiveness. At a later stage, stainless steel covers were introduced in the design to cover the defecation hole so that the toilet also served as a bathroom.

Kuthambakkam continues to make efforts towards green development and has introduced energy efficient battery powered bicycle as a means of personal transport

Institutional: The village panchayat was convinced that Habitat- Livelihoods combination could catalyse socio-economic transformation with the belief that it would not only lead to 'housing for all' but also lead to creation of sustainable livelihoods.

To facilitate this process, in 1996 the Panchayat joined hands with "Trust for Village Self Governance" (TVSG), a registered charitable trust founded by Mr. R Elango. He connected rural development models across India- from Anna Hazare's watershed management in Maharashtra to Dr Parameshwara Rao's wasteland development in Andhra Pradesh, Dr Karunakaran's Gram Swaraj movement in Madhya Pradesh, to Dr M.P.Parameswaran's Swadeshi movement in Kerala. Link up was done with several universities working on relevant/appropriate rural technologies such as the Central Food Technology and Research Institute (CFTRI), Mysore and Central Mechanical Engineering Research Institute (CMERI).

Under Government of India's scheme of "Innovative stream of rural housing and habitat development", 200 houses were upgraded/constructed over a period of three years. Apart from housing, new livelihood avenues were opened up for the villagers through production of building materials and construction. TVSG supported the Panchayat through process design. Self Help Groups were formed for various enterprises comprising of 350 families. The village now has a website http://www.modelvillageindia.org.in

Social: The community was fully involved in the decision making process of infrastructure development as a primary stakeholder. A Village Development

Plan was developed by the people, initiated by the panchayat and priority needs identified. Infrastructure such as roads, overhead tanks and borewells, cost effective storm water drainage were created. The Panchayat turned the housing programme as people's own, upgraded old huts and carried out construction of new houses through Indira Awas Yojana (IAY). The process of house construction was used as a tool for promoting social harmony among the upper and lower castes. The Samathvapuram scheme of the State Government was used to construct 50 twin houses that were allocated to dalit and non-dalit families in such a manner that every alternate house was occupied by Dalit family. Improvement in habitat and ownership of durable shelter brought about marked improvement in self esteem of landless labourers.

Housing construction process opened up livelihood opportunities for SHGs for instance in the production of compressed Earth Blocks (CEBs)

The efforts have led to not only rid the village of many ills but inturn empower the community. The empowerment and resolve is evident in the way the people of Kuthambakkam Panchayat have taken up the case against a Solid Waste Management Plant which would have effectively converted the catchment area of Chembarambakkam lake, a major source of drinking water to Chennai, into a garbage dumping ground potentially polluting drinking water supply to Chennai. The village has filed a Public Interest Litigation and has been mobilising public opinion and scientific community to this issue. More information on this issue and Panchayat action is available online on - https://sites.google.com/site/kuthambakkam

CHALLENGES AND RESPONSES

Kuthambakkam village had widespread social ills and communal violence. That in itself was viewed as an opportunity for social change in the village by Mr Elango. The initial challenge of trying to end caste differences among the people living in the same village was addressed by Mr Elango by seizing the opportunity to contest Panchayat election and thereafter take up leadership responsibilities as Panchayat Leader. 'Twin houses' helped to build understanding among people from different castes to live together in harmony. Based on lessons learnt from various sources, Mr Elango drew up a detailed five year plan for integrated development of Kuthambakkam. This was thoroughly discussed among the village community at ward and street levels, suitable alterations made and thereafter accepted.

7.0

MOVING FROM RELIEF TO REHABILITATION

KEYWORDS: resource mobilisation, social equity, sustainable habitat

SUMMARY

Kerala suffered extensive tsunami damage in three of the southern districts, Kollam, Alappuzha and Ernakulam. The waves were three to five metres high and the tidal upsurge affected 250 kilometres of the Kerala coastline and ingressed between one to two kilometres inland. As the region has no previous history of tsunamis, the entire region was ill prepared. In all 24.70 lakh people were affected and as many as 6,280 houses destroyed within Kerala.

CONTEXT

The CPI (M) was in the forefront of organising relief for the community immediately after the 2004 tsunami in Kerala. Creating a humane space together with rebuilding the houses that were destroyed was an important activity as well as to introduce cost effective technologies.

A total of 69 houses were built for beneficiaries in Aalappad Gram Panchayat of Kollam District of which 10 are in-situ houses. 59 of these were reconstructed at a new location with an area of about 430 sq.ft at a per unit cost of about Rs 2.3 lakhs. The rest of the 10 in-situ reconstruction houses were constructed at Rs 3.5 lakhs each.

SIGNIFICANT HIGHLIGHTS

Technology: The demonstration house was constructed using cost effective technologies, brick walls without plastering, filler slabs and load bearing foundation instead of concrete piling.

Low-lying areas of the sites were filled with 6' of soil and certain plots were raised by further 1.5' in order to avoid future water-logging. The earth for filling was not dug locally but brought from outside against the local practice of sourcing it from the nearby area which in turn aggravates local level water logging. Substantial parts of masonry were not plastered thus saving on scarce resources and making it cost-efficient also. The sunshades were cast as filler slabs thus making saving on expensive concrete. For grey water management, leach pit lined with dry masonry filled with brick bats and covered RCC slabs are provided along the bath room and kitchen sink.

The project paid equal attention to overall village habitat development as well. The access roads to the clusters were provided by the concerned gram panchayats while the internal roads were laid with cement concrete and integrated with drainage covered with RCC slabs. The embankments and drainage were constructed using funds provided under MP Local Area Development (MPLAD) scheme. Water supply and power were ensured by State utilities through metered lines. The compound wall, benches and swings were provided using MPLADS.

Financial: Resources were raised by the Party from the public. Rs 95 lakhs were raised through bucket collections from the Kollam District on 1st and 2nd January 2005. All members were requested to donate a minimum of Rs 100. All elected members of local governments were requested to donate one month's allowance and the cooperatives of party members as per their financial position. Rs 1.12 crores were collected as the relief fund by the Deshabhimani Daily, the mouth piece of the party. As a result of this convergence in efforts, the total fund mobilisation including bank interest was Rs 2, 09, 65,438.

Social: Saplings were given to all families along with the keys at the time of handing over the houses promoting greening of the immediate environment. The covered sit-outs of the houses at the entry of the house have acted well by providing social spaces besides being effective in reducing heat gain during summers. This effort has paid off well.

Such measures also stand testimony to the commitment and beliefs of Habitat Technology Group, largest NGO in the country dedicated to shelter sector, and CPI (M). Besides, elevation of the houses is pleasant and blends with the environment for the 59 relocated houses. There is general acceptance among the beneficiaries for the house and the surrounding environment is well looked after.

Environmental: Construction guidelines developed by the Govt. of Kerala were followed by the implementing agencies. The attitude of adherence to quality was instilled in local masons and families and reinforced

with notes in vernacular specifying critical details for earthquake-resistant construction. The resultant construction has contributed to reduction in risk of future natural disasters considerably.

Institutional; The experience of CPI(M) can be replicated by any other political party in an emergency that is committed to ensuring justice in rehabilitation and wants to change the rehabilitation paradigm from charity to social justice. Every possible measure was adopted for ensuring that the best was made available to the community in a transparent manner. This increased the credibility of the organisation. In addition, they set standards for construction and initiated a mass education programme on quality monitoring which had a positive impact on the overall effort. At each construction site, the costs of materials purchased were made known to the concerned and there was a routine offer for any one willing to source and supply similar materials at a lower cost or of better quality. This practically eliminated the usual allegations of graft and created a role model.

ENERGY, RESOURCES & ENVIRONMENT

This project demonstrates the potential for leveraging by local stakeholders at the time of crises. The party was able to capitalise on it's presence in Kerala. For instance the then Mayor of Cochin and the current MLA helped them to negotiate purchase of sanitary and electrical materials from state level distributors at reasonable prices. Another example is the intervention of the then Leader of Opposition in settling the labour contract with HTG. The district administration helped them source sand from the auctioning of illegally extracted and seized sand. This was very helpful because there was a scarcity of materials during the said period. The party was able to influence the Indian Oil Corporation (IOC) to provide subsidised LPG connection and stoves to the families.

CHALLENGES & RESPONSE

1. The people have been resettled from Alapad GP to, Klapana Panchayat without any formal understanding between the administrative departments.
2. There appears to be sense of dissatisfaction among people for not having been involved in decisions taken regarding the resettlement. This has created dependency among the people who maintain the sense that the government should provide for all their needs and solve all problems.

STRATEGIES

The government had taken definite steps to augment the people's income through the Kudumbashree projects and women SHGs. Various enterprises of cloth and embroidery, coconut oil extraction and food processing had been set up with excellent market linkages.

Unresolved Issues: Despite the good work that was done years ago, the people are still faced with a number of problems. Soak pits report frequent flooding. The sewerage systems lead to flooding of not only the roads but the houses as well. Health, education and transportation facilities are too far away and inaccessible from the settlement site. The most critical issue that appears to have emerged is the visible lack of initiative from the residents. With regard to maintenance and upkeep their clear stand is that all their problems will be and must be addressed by the government.

IMPACTS

The people were very grateful for the provision of the houses after the tsunami. However, the people of the rehabilitated sites currently express a deep resentment for the fact that the government had uprooted them from their home lands and bought them so far inland. Technical snags add to the complexity of the issues faced by these people. It can be concluded that no initiative can be truly successful without the complete participation of the primary stakeholder right from planning onwards.

8.0

KEYWORDS: ecological sanitation, closed loop systems, community participation, cost effective technologies

EVOLVING ECOSAN COMMUNITY TOILET

SUMMARY

The ECOSAN Community Compost Toilet (ECCT), the first of its kind in the country has been constructed in Saliyar Street on the banks of the River Cauvery in Musiri, Tamil Nadu. The ECCT was Commissioned in April 2006 and is serving two communities of approximately 500 families. These were built in response to the dire needs expressed by women living along Cauvery River who wanted latrines, but pit latrines were not workable since it was a high-water table area close to the river Cauvery. The ECCT has two blocks, one for men and the other for women with seven cubicles in each block.

SCOPE (The Scientific Committee on Problems of the Environment) with the help of WASTE, Netherlands launched the Musiri ECOSAN Pilot Project to construct environment friendly community toilets. These ECCTs also helped in bringing down the pollution levels in River Cauvery caused due to the indiscriminate discharge of sludge and human waste.

In June 2009, compost from the first chamber was taken out in the same month, first bunch of bananas raised under the UNICEF-SEI research project using urine as liquid fertiliser was harvested.

CONTEXT

Located at Saliyar street, Musiri village community at Trichy has shown the use of Ecosan community facility. Out of a total population of 1200, 350 persons use the facility daily with no other means of safe sanitation. The Project was implemented by SCOPE, Trichy with the help of WASTE, Netherlands.

SIGNIFICANT HIGHLIGHTS

Technology: Within the Ecosan system, urine and faeces are separated. Built on a raised plinth above ground level, the toilet has two attached chambers, which are used in turn for depositing human waste. When the first chamber is filled up with faeces, it is closed for 6 months to a year. In the meantime the second chamber is filled up. Alongside there is a urine outlet. The faeces that are deposited in the chamber, through a process of dehydration helped by ash or sawdust etc. sprinkled becomes a good soil conditioner and is used as compost in the agricultural fields.

The wash water goes through a pipe into a vertical filter to Canaindica plant which eats up the waste dissolved in the water while there is ground water recharge. The urine from the toilets is collected separately in a tank and taken to nearby farms for cultivation of paddy, banana and sugarcane, after appropriate dilution.

Therefore, Ecosan is a closed loop between sanitation and agriculture. However, in order for this to work, it is important that no water is running down in the chambers where faeces are collected.

Whereas total cost of a septic tank is Rs 14000 , the Ecosan toilet can earn Rs 36,000 in 20 years along with the fact that it is cheaper, easier and ecofriendly to construct.

Institutional: The institutional framework is a critical component that decides the success of failure of a technology new to an area.

Following are the key features in the case of Musiri that have contribute to the success of the model:

- The toilet is managed by the Gram Panchayat. A 'User Card' is issued to every user who gets registered, on which number of usage per day is marked. The user gets paid 10 paise for every use of the toilet, paid at the end of the month.
- At Musiri, SCOPE established ECOSAN toilets in which human urine is collected in an integrated manner and the NRCB started its research experiments in half an acre land with banana plantation by using collected urine as liquid organic fertiliser through drip irrigation system.

The land for these ECCTs was provided by the State Govt.

- The urine from the toilets is collected separately in a tank and taken to nearby farms for cultivation of paddy and sugarcane also, after appropriate dilution.

Social

- This initiative is a key development that has led to upliftment to a section of the society that was engaged

in handling human waste, besides providing hygienic sanitation to people.

- The provision of financial incentive, however small, has helped to ensure that there is social acceptance of the initiative
- Pollution of the river that is highly revered has also reduced.

CHALLENGES AND RESPONSE

Challenges

- The river was getting polluted everyday with sludge being discharged into it.
- Due to lack of sanitation facility in the village, open defecation became an accepted practice.

Strategies

Key Strategies followed were:

- Construction of community ecological toilets for use by people who do not have sanitation facilities at home.
- Money is being paid as an incentive to people who are using ECCTs. This has been successful in discouraging people from open defecation.
- Urine is separated from solid waste and mixed with the water from washing. All the water is diverted to a soakage pit, to the kitchen garden or collected, diluted and used as urea for agriculture.
- Human waste is to be used in agriculture once it is composted.
- Earlier, due to lack of experience the vent pipes were bent and the slope in urine and washing water pipes, as it was found, was not enough. But these mistakes were rectified in toilets later contributing to continued usage of the toilets.

Processes: The initiative for Ecosan community toilets was taken by SCOPE and the state government in order to prevent further pollution of river Cauvery while providing hygienic sanitation facilities to people. Ecologically safe toilet facility is provided to the 350 users daily out of a population of 1200.

Impacts

- Increases water holding capacity of soil
- Improves soil structure
- Breaks up organic matter in a form that plants can use as nutrients
- Contains useful chemicals
- Prevents pests.

9.0

HABITAT DEVELOPMENT - ODANTHURAI

KEYWORDS: shelter upgradation, habitat development, Panchayat leadership

SUMMARY

Odunthurai Panchayat used to be like any other Panchayat with poor living conditions and lack of basic amenities. Besides, there was no close interaction between the district administration and village Panchayat with 90 per cent of the families working as daily wage agricultural labour. The village school used to operate from a small building with no play area.

This situation however changed over the last decade. Today, Odathurai has electricity provision to almost all the houses. The 350 kW wind turbine installed by the Panchayat not only provides electricity to the villages but also generates surplus which is sold to the State Govt. The village also has Village Poverty Reduction Committee (VPRC) that has been set up by the state government and the Gram Panchayat. It aims to ensure economic well being of all the families, eradicate poverty through bringing in improvements in income levels to such an extent that there are no Below Poverty Line families in the village.

The Panchayat also has many SHGs run by women. Odanthurai continues to demonstrate how a Panchayat can take conclusive action to bring the entire community out of poverty and improve overall quality of life.

CONTEXT

With a population of 2954 people, Odanthurai Village itself is a Panchayat situated in the foothills of Nilgiris, Karamadai Development Block, Coimbatore District, about 40 km north of Coimbatore city.

The Panchayat has demonstrated integrated habitat development through local action, creation of community infrastructure and promotion of sustainable development. It's the first Panchayat in the country to install a 350 kW windmill besides installing solar street lights, biogas systems and the bio-mass electrification that is also used in water purification. The Panchayat, led by Mr. Shanmugam has successfully demonstrated installation and management of decentralised systems. The Panchayat has also been clear on wiping out poverty and empowering women. All nine villages -Oomapalayam, Uppupallam, TAS Nagar, Vinobhaji Nagar, Gandhi Nagar, Kallarpudur, Adivasi Colony, Agasthiar Nagar and Samathuvapuram, under the Panchayat have access to purified drinking water. With firm belief in corruption free, fair and just system of governance, all nine villages under the Panchayat are now free of private money lenders.

Housing has been done with funds from Government of India's innovative and rural housing scheme, Indira Awas Yojna as well as Schedule tribe Housing Scheme. 525 houses have been constructed in 10 years making it a model 'hutless' village including the 100 houses built on Mr. Shanmugam's own 2 acre land. As on date, only one hamlet has houses with tin sheet/tile roofs in dilapidated condition due to lack of finances.

SIGNIFICANT HIGHLIGHTS

Institutional: The Panchayat has led the development process with support from the State Govt. Not only has infrastructure been improved, people have been linked with the opportunities created, in turn bringing benefits to the community. The community too contributes towards funds required for any project or helps in paying back the loan taken from Banks.

Self Help Groups run by women are not only sustaining themselves but are also contributing to the community. The most successful of these is the 'packaged drinking water' SHG run by 12 local women. This Packaged drinking water plant was set up by the help of State Govt. and with a cost of 20 lakhs of which Rs 5 lakhs are from State government funds and the remaining 15 lakhs were provided by the Bank as a loan. The entire loan amount has been repaid.

A Micro Finance Project arranged for anyone to get Rs. 1,000 to Rs. 10,000 loan within 1 to 3 days with an interest of 40 paise per month.

Technological: The following infrastructure has been created: Seven overhead tanks with borewell motors, a biomass gasifier run by local women SHGs and provision of bacteria free drinking water making use of Rajiv Gandhi National Drinking Water Policy. Solar lights are installed all over the village and electric power generated by wind turbines.

Need for basic durable housing is fulfilled by making

use of central and state funding

The current cost of the house and breakup is as follows:

Total cost: Rs. 1,15,000.

State Govt. / Indira Awaas Yojna: Rs. 75,000.

Beneficiary contribution: Rs 40,000 (out of which Rs 20,000 is by the bank and Rs 20,000 contribution by the beneficiaries).

Social: From very early on, Mr. R. Shanmugam, the Panchayat leader embarked on a mission to provide basic amenities to all families in the village. The success of the entire effort is based on inclusion, cost sharing, social equity, gender equity and sustainability. Mr Shanmugam realised that durable housing and protected safe water are the immediate needs of the people and started to act accordingly. He improved the financial position of the Panchayat through improved tax collection with the cooperation of people and through government grants for projects.

Members of the village community were made familiar with concepts, shown photographs and slide shows of what can be done. Video screenings were organised showing videos of developed villages.

CHALLENGES AND RESPONSES

Challenges: Various challenges faced were:

- Lack of trust in people and dependency on government funding.
- Ensuring quality in infrastructure work being executed.
- Provision of land for house construction for the landless families.

Strategies: Various strategies followed were:

- Bringing in transparency, accountability into panchayat's functioning and ensuring a corruption free panchayat.
- Active participation of the community in all development works.
- Setting up of various SHGs and micro industries for sustainable development. A 35 kW wind turbine was installed to ensure electric supply in every household. Similarly, water purifying plant was also installed by community contribution.
- Provision of land for every landless family. (government land was mostly provided. In some instance, Mr. Shanmugam gave a part of his land for building of houses).

10.0

DEMONSTRATING ALTERNATE TECHNOLOGY IN PUBLIC INFRASTRUCTURE

KEYWORDS: poverty reduction, green building technologies

SUMMARY

Society for Education, Village Action and Improvement (SEVAI) is based in Allur, almost 20 kms from Trichy, Tamil Nadu.

SEVAI has helped build SEVAI Shanthi Matriculation Higher Secondary School located in a beautiful setting amidst lush green environment on the bank of Cauvery river on National Highway 67 from Trichy to Karur, 21 kms from Trichy. The latest of the four buildings is made using innovative ecofriendly techniques. In addition, school campus incorporates child-friendly and ecofriendly toilets made with ferrocement technology.

CONTEXT

The SEVAI technology centre situated in the vicinity promotes sustainable livelihood and women SHGs by providing training in ecofriendly construction techniques. The Centre helps women become financially independent- every two months 20 women complete their training.

SEVAI has also participated in the construction of state government's Samathuvapuram housing projects, apart from housing and overseas projects supported by international agencies such as DESWOS, Germany, and Swiss FPV and FdnF.

SIGNIFICANT FEATURES

Technological: SEVAI Rural Technology centre has been involved in upgradation of traditional construction technologies as well as developing new ones that are versatile enough to meet the needs of rural communities.

These technologies emphasise the optimum uses of the locally available skills, means and resources. It is a means to enhance the process of strengthening rural development by creating livelihood of the rural population.

Roof slab of the school building is made using R.C.C. filler slab with Mangalore tile infill.

Traditional Sand filling technology is used in foundation trenches with stone filling at edges.

The toilet structures are constructed out of precast ferrocement panels providing playful aesthetics to the finished product.

Water filtration is done by means of low cost sand filtration system.

Some of the other approaches being used by SEVAI to reduce construction costs are as follows:

Reduce plinth area by using thinner wall concept such as 15 cms thick solid concrete block wall and innovative use of Compressed Earth blocks in place of burnt brick.

Other cost effective technologies promoted by SEVAI are- concrete or steel section frames or use of brick arches instead of RCC lintels as spanning options for openings.

Ferrocement channels are favoured in SEVAI's work contributing to an overall cost savings of 30-40 per cent.

Institutional: The main development process is led by SEVAI in order to help develop various SHGs that can sustain themselves.

A building Technology Centre to promote Ecofriendly construction to train the women has been set up. Over the years, SEVAI has trained over 600 masons. SEVAI is able to mobilise manpower for masonry, carpentry, barbending, household level electric wiring and plumbing.

The shelter delivery system works through two Building Material Services Banks (BMSB) which can produce building material quantities enough for the construction of five houses per day.

Social: The training-

- 20 women are trained every 2 months and these women then run their own SHGs.
- SEVAI Shanthi Matriculation Higher Secondary School is providing education to approx. 3000 children from surrounding regions.
- Generating awareness about ecofriendly construction techniques.

CHALLENGES AND RESPONSE

Challenges

- Various challenges faced were:
- Lack of trust in people and dependency on Govt. to

provide funds.

- How to ensure quality in work being executed.
- Illiteracy among the target population

Strategies: Various strategies followed were:

- Setting up of SHGs and micro industries for training women.
- Generating awareness about ecofriendly construction techniques.

Impacts

- SEVAI Shanthi Matriculation Higher Secondary School is providing education to children from all the surrounding villages
- Spreading awareness about ecofriendly construction helping build acceptance for alternate technologies
- Training and setting up of various women SHGs.

CONCLUSION AND WAY FORWARD

CONCLUSION AND WAY FORWARD

More than 70 per cent of India's poor reside in rural areas having poor access to information about new materials and technologies, bottlenecks of technical supports, no supply of eco-materials, inadequate skills and poor access to finance amongst many other development barriers such as inequities, poor governance capacities etc. The Central as well as various state governments in India have undertaken numerous efforts to provide housing and public infrastructure facilities such as water supply, roads, electricity, telecommunication, transport and livelihood support to people. However, till date the task of housing the millions of poor in rural India is grappling with the twin challenges of facilitating affordable shelter and demonstrating ecological and social responsibility. This is despite the fact that the construction sector is also one of the key sectors with the potential of radically reducing green house emissions and resource intensities, enhancing job creation and fuelling economic growth through mainstreaming of ecofriendly housing and habitat infrastructure construction. This has been demonstrated at very small scales in some scattered projects. If adopted on a large scale, ecological construction practices can provide a way to mitigate much of the ecological damage caused by human settlement processes paving a way for a greener more sustainable future of rural India. Solutions lie in directing local actions towards sustainable practice on very large scale. Systemic interventions are required

Table1: Need Based Analysis of Key Stakeholders

Key Stakeholders	Role	Tools and Capacities (Need)
Community	To take ownership and participate in the process of development	▪ Skills in resource efficient and locally appropriate building techniques ▪ Management and administration skills (for undertaking development processes) ▪ Handling finances for setting up and running enterprises ▪ Gender sensitisation ▪ Access to technical and other backstopping support
Panchayat and Local Leadership	Providing leadership and acting as a conduit between the community and the government agencies to ensure the flow of funds and technical expertise	▪ Leadership ▪ Management and administration skills ▪ Awareness on new building technologies ▪ Skills in liaison with government officials ▪ Access to funds ▪ Access to technical and other backstopping support ▪ Gender sensitisation
Civil Society Organisations	To understand the local needs and provide backstopping, technical and skill development support to the community as well provide the link between the community and the donor and governmental agencies	▪ Access to funds ▪ Access to training facilities ▪ Gender sensitisation ▪ Setting up of backward and forward linkages for local enterprises ▪ Management and administration skills ▪ Access to better technologies for habitat development
Technology Centres	To increase awareness regarding technologies and to provide technical support whenever needed.	▪ Technical support ▪ Demonstration of technologies
District and State Government Officials and Agencies	To recognise the gaps in development and implement schemes in a transparent manner	▪ Administration ▪ Technical support ▪ Monitoring and evaluation

that work with a long term perspective to facilitate and support "processes for sustainable habitat development" in rural India.

These "processes" include strengthening institutions at local, district and state level to create awareness, facilitate delivery of goods and services and support planning and implementation of eco-habitats at scale; fostering partnerships that will make available eco-technology options, skills and finance to the rural families; and, building capacities to enable communities to access eco-habitat and delivery agents to service eco-habitat construction.

Based on experiences of the Lok Awaas Yatra, documented in film and case studies we can safely say that the rural India offers a tremendous potential for promoting and applying ecological construction that can provide benefits not just in terms of improvement in quality of life, increased economic productivity due to safe and healthy living environment but also of larger resource conservation, clean water systems and regeneration. While these cases are beacons of hope for sustainable habitat development, there is an urgent need to scale up and facilitate processes across the country.

The *Yatra* highlighted certain drivers that have enabled the success of studied interventions. These are leadership of local institutions; availability of and access to funds; materials and services; technical and management support services through local institutions; and, skill development while ensuring that the process is inclusive and participative. (Table 1)

The large scale proliferation of eco-habitat development will happen if there are evident win-win conditions for all stakeholders. Thus cost–effectiveness, enhancing affordability through design, technology and financing; economic benefits from job-creation, enterprise development, quality of life benefits such as improved health, reduced drudgery, increased social status, go together with resource conservation and resource management in habitat.

Table 2: Framework of the Systemic Interventions Needed

Interventions	Awareness about cost effective and environment friendly models and methods for habitat development	Availability of eco-products and services	Access to products, services, finance and technical supports
Strengthening Local Institutions	▪ Demonstrating environmental and social responsibility in construction of rural public buildings and infrastructure	▪ Strengthening local building centers ▪ Orienting local blocks and district rural engineering services	▪ Supporting PRIs in planning of local habitats ▪ Panchayat committees for supporting O&M of eco-habitat
Capacity Development	▪ Large scale promotion of eco-habitat solutions and options through demonstrations amongst rural families ▪ Knowledge portals and community radio mechanisms to promote and support eco-habitat development ▪ Capacity building of village panchayats with information and know-how	▪ Training of artisans, entrepreneurs	▪ Strengthening self help groups for accessing housing and habitat finance
Fostering Partnerships	▪ Civil society-public sector initiatives to mobilise action directed towards eco-habitat development	▪ Public-Pvt-community partnerships to create local entrepreneurial models for delivery of products and services	▪ Partnerships of local Panchayats with technical resource institutions ▪ Linking entrepreneurs, home owners and local governance institutions with financing agencies

Technology availability alone will clearly not suffice, nor will only finance. While, knowledge and awareness (including appreciation of benefits) will convert need for housing into a demand for eco-habitat; availability of materials and skills with access to finance will ensure that demand is fulfilled. Invigorated and strengthened local leadership is a base that will ensure sustainability of interventions.

Scaling up of safe and sustainable habitat development across rural India in all states will therefore require,

- institutional mechanisms that reflect/facilitate and support the policy intent for enabling large scale creation of safe and sustainable habitat for all in rural India,
- capacities across stakeholders for providing knowledge, management, finance, materials, technologies and services to rural communities at scale, and,
- collaborative frameworks for action with strategic partnerships amongst local government, financial institutions, civil society organisations and the private sector.

The frame above (table 2) is a representation of some of the systemic interventions needed and can be considered work in progress. A policy intent to address the interventions as defined in the frame at the national level, coupled with clear state level action plans and strategies implemented at district and village levels will realise the goal for safe and sustainable habitat for all.

The recent developments in the rural habitat sector in India indicate a strong possibility of large scale positive action facilitated by national policies. The need, however, as mentioned before is for scaling up and replicating these models to become the norm in terms of habitat development in the nation. In order that 'Adequate Habitat for All' is achieved in an environmentally and socially sustainable manner, it is essential that the planners, implementers and managers delivering habitat services be enabled through exposure to knowledge of good practices, which has been the aim of the Lok Awaas Yatra. This will require the perspective to broaden beyond the scheme based approach to a national policy for rural housing and habitat.

To conclude, while building capacities at the local level are essential and critical, these efforts will remain scattered unless the policies reflect and ensure successful implementation of such models across the nation which are motivated not just by a local environmental disaster but simply through the fact of achieving holistic and environmentally sustainable development.

Development Alternatives, an independent sector action research organisation has pioneered sustainable development in India since 1982. The DA Group has to its credit three decades of experience in the field of energy and resource efficient building technology development and designing and implementing.
www.devalt.org

Knowledge Works, believes that knowledge works!! Founded by a group of architects and development planners, Knowledge Works (KW) is committed to human settlements that are safer, and more sustainable and sensitive to the needs of the inhabitants. Knowledge Works provides viable solutions to homeowners, businesses, intermediary agencies and support agencies to contribute to development that is sensitive to the environment and promotes sustainable development.
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basin-*South Asia* - Regional Knowledge Platform is committed to developing knowledge systems and promoting collaborative action within South Asia to enable access by the poor to sustainable habitat and livelihoods. Currently, 22 members across South Asia share their knowledge of rural habitat development through the Platform. They work with their partners and associates across the region to disseminate good practices and influence policy development for pro-people, pro-environment houses and settlements. www.basinsa.net

RURAL HOUSING KNOWLEDGE NETWORK

Rural Habitat Knowledge Network

Rural Housing Knowledge Network is an initiative conceived and supported by the Ministry of Rural Development, Government of India. The objective of this network is to develop a knowledge portal which serves as a dynamic updatable repository of information and experiences pertaining to rural housing with the ultimate goal being one of promoting affordable, safe and sustainable rural housing in India.
To know more visit www.ruralhousingnetwork.in

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