

**bmtpc**

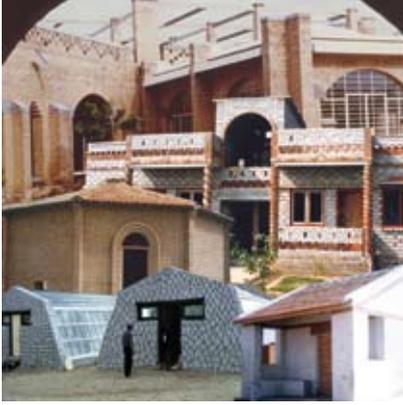


World  
Habitat  
Day 2007  
1<sup>st</sup> October, 2007



# A Safe City is a Just City





## CONTENTS

From the Desk of Executive Director	2
Green Building Technologies for Sustainable Habitat	6
Vulnerability Atlas of India - First revision (2006)	20
Seismic Vulnerability Reduction of School Buildings of MCD	21
International Workshop on Emerging Trends in the Cost Effective Housing Technologies	22
Round Table Meeting on Innovations in Building Technologies	23
Safety of Structures and Construction	24
Sanitation - to improve quality of life in slums	34
BMTPC's activities under JNNURM	40
BMTPC's presence at important events	41
Cooperative Housing Movement - Creating Safer Cities and Vibrant Communities	42
The Mumbai Dream - A House for Every Family by 2010	48
Post Tsunami Resettlement and Rehabilitation Policy in Sri Lanka	52
Creating Safer Cities and Communities	58
Construction of Demo Houses under VAMBAY	62
Development without Disaster: Spatial Planning Issues and Options	64
Technical Workshop on Building Byelaws	71
वर्क लुज	72
Capacity Building Programmes	74
Activities in the NE Region	76
Publications of BMTPC	78
Films Produced by BMTPC	79

## From the Desk of Executive Director

To live with security and dignity is everybody's wish. With rapid growth of population in cities, urban crime and violence are at their peak. Crime and fear of insecurity is perhaps the most influential factors in our daily lives dictating where we chose to live, how we behave, where we go, where we work. Urban safety for citizens not only calls for policing and relying on the penal system for crime prevention, it is also about the design and planning of built environment including public spaces for women and men and its impact on social urban development. To improve quality of life within human settlements, we must combat the deterioration of conditions that, have reached crisis proportion in most developing countries.

Lack of opportunities, lack of principles of equity in administrative and regulatory mechanism, ever increasing poverty, daunting housing conditions and growing despair amongst vulnerable sections are some of the causes which are at the root of widespread and fast growing unsafe conditions in cities today. In this context, the theme "A Safe City is a Just City" selected for the World Habitat Day is most timely and crucial.

Government of India has already taken a lead by launching Jawaharlal Nehru National Urban Mission for an integrated approach for city development. With mandatory and optional reforms, the Mission aims at planned development of identified cities with focus on efficiency in urban infrastructure/services delivery mechanism, community participation and accountability of urban local bodies towards citizens.

BMTPC through its comprehensive and integrated approach towards development, promotion and application of technology has undertaken several activities required for sustainable development of built-environment. Bringing out digitized version of Vulnerability Atlas of India, seismic retrofitting of life-line buildings such as Kupwada District Hospital, J&K and MCD Schools in Delhi, Capacity Building programmes, helping State Governments in strengthening their techno-legal regime for safety against natural hazards, preparing guidelines for Green Habitat are some of the important initiatives of the Council in the recent past. The Council is also actively involved as an appraisal & monitoring agency for BSUP and IHSDP projects under Jawaharlal Nehru National Urban Renewal Mission (JNNURM).

It is the endeavour of the Council to work towards carrying forward the national agenda for providing affordable shelter with necessary infrastructure facilities with due attention to environment and safety aspects. The Council looks forward to network with other agencies, both within the country and outside to achieve the above goals.

आर.के. सेली  
(R.K. Celly)



**BAN KI-MOON**  
*Secretary - General*  
**UNITED NATIONS**

**W**e are at the dawn of a new urban era. Half of humanity now live in towns and cities. It is estimated that by 2030, two-thirds of the world's people will be urban dwellers.

At this turning point in human history, surveys show that crime in urban areas is on the rise everywhere. And fear of crime is one of the most influential factors shaping our daily lives. In too many cities around the world, it dictates where we choose to live, shop, work and play. This is bad for human progress and for economic development — especially in a world where for the first time the number of urban slum dwellers is set to top the one billion mark. In many countries, crime has divided cities into areas of decline on the one hand, where guns, rape, robbery, and violence prevail, and wealthier districts on the other hand, where residents can afford better protection.

In slums and poor urban districts, people lack security of tenure, utilities and health services, and are most at risk to disasters wrought by climate change. World Habitat Day 2007 is an occasion to encourage city leaders to plan better for crime reduction, security of tenure, and climate change mitigation. As the theme of this Day aptly tells us, “a safe city is a just city”.

As we pass the halfway point for achieving the Millennium Development Goals, let us also use this occasion to examine how we can improve urban governance. Many forms of urban crime cut across local and national boundaries, calling for better cooperation between all spheres of government and civil society. We must invest more in our children and young people, especially those at risk of becoming marginalized and turning to crime as an escape from the harsh realities of poverty and deprivation. Let us also step up efforts to be more energy-conscious. Our cities are our biggest polluters, and require big, innovative thinking commensurate with their size.

On this World Habitat Day, let us resolve to make cities around the world safer, greener, more inclusive and more secure places for everyone.

Ban Ki-moon



**Anna Kajumulo Tibaijuka**  
Executive Director,  
UN-HABITAT

**U**rban crime and violence are at the top of the agenda for many people living in cities. Ask any woman: crime, in its various forms, is their number one concern, particularly those who live in the poorest neighbourhoods.

In the decade since UN-HABITAT started its Safer Cities Programme, we have noticed that cities around the world are becoming more aware of this bane of our daily lives. As a result, local government leaders are now beginning to take up the challenge of urban safety and security.

We live in an unacceptably violent world. And this is why we have chosen the theme, *A safe city is a just city*, to mark the occasion of World Habitat Day this year.

Indeed, as we reflect on these words, in every slum in Africa, Asia, Latin America, and the Caribbean, and in most cities around the world, someone is being assaulted, a woman is being raped, countless homes are being burgled and vehicles hijacked. Not even children are spared. Why?

To an extent, we do know why: an estimated 1 billion people are living in slums, the vast majority of whom make up the urban poor. They suffer high levels of unemployment, live in overcrowded conditions often without access to

water and sanitation and security of tenure. They form part of the growing victims of the urbanisation of poverty and deprivation and suffer from all forms of social exclusion. UN-HABITAT research tells us that the number of slum dwellers is growing rapidly, and that half are under the age of 25 and 40 percent of them are under 19. These are the primary victims of poverty and despair. Despite this potentially explosive situation, the problems of urban youth living in poverty are largely absent in urban and national policies and strategies.

These facts and figures explain in part why young people living in urban areas are so vulnerable to unwanted pregnancies, early marriages, prostitution, drug abuse, crime, and AIDS. Deprivation leads to desperation – the root cause of unsocial behaviour. That is why we must invest in young people and consult them in actions and decisions affecting their livelihoods.

Again, ask any woman: In cities around the world, social capital is lost because public spaces get taken over by gangs or are abandoned because of fear. As private guards and vigilante groups take over the protection of our lives and assets, the State is increasingly perceived to be in tactical retreat, unable to tackle the root causes of crime and disorder.

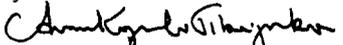
It is now accepted by most governments, at national and local level, that urban safety needs to be built from street level up, and incorporated into local and national planning. It cannot be left to the police alone. Urban governance processes, and urban policies that target exclusion, social inequalities, as well as appropriate planning measures, are key to success. Indeed community security requires a holistic and coordinated approach.

UN-HABITAT is committed to working with our partners in the pursuit of three strategic objectives:

- To develop capacity for local crime prevention strategies that are gender and age sensitive and which address root causes of crime in a holistic, inclusive way.
- To build safer urban spaces, particularly in the public realm, as hubs of social development and safety.
- To mainstream urban safety in all aspects of housing and urban development.

This agenda is compelling and urgent, and calls upon specific partners both within and outside the UN to embrace the urban challenge.

How urgent, might you wonder? Ask any woman.

  
(Anna Tibaijuka)



**KUMARI SELJA**

*Minister of State (Independent Charge) for  
Housing & Urban Poverty Alleviation  
Government of India*

**U**N-Habitat's theme for the World Habitat Day this year is "A Safe City is A Just City" in order to highlight many complex factors affecting safety of a city, such as lack of opportunity, widening inequity, territorial segregation, economic polarization, poor urban planning and social exclusion of weaker sections of community.

Housing policy and land management are seen as important instruments for improving living conditions in slums and making cities safer and more livable. Realizing this, Govt. of India has taken a number of initiatives to improve the living conditions in cities. The draft National Urban Housing and Habitat Policy envisages promotion of sustainable development of habitat in the country, with a view to ensure equitable supply of land, shelter and services at affordable prices.

Government has also adopted "inclusive growth" as the key development design in the 11<sup>th</sup> Five Year Plan. In the urban context, this calls for "inclusive cities" with focus on slum upgradation, poverty alleviation, bridging divides and including the excluded in an equitable environment. Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the single largest initiative undertaken by the Government in the areas of urban renewal with a central government assistance of Rs.50,000 crore envisages a large number of reforms for inclusive cities and urban renewal in an integrated manner. The seven-point charter of basic services to urban poor and slum dwellers, prescribed in the mission guidelines, includes provision of security of tenure, affordable housing, water supply, sanitation and convergence of delivery of soft services like health, education and social security. All these initiatives are aimed at creating safer environment in cities.

BMTPC is a proactive agency of the Ministry of Housing and Urban Poverty Alleviation and has been in the forefront in facilitating the Government's initiatives in improving the cities to make them safer.

I am happy to note that the BMTPC is bringing out a special publication "Building Materials News" on the occasion of World Habitat Day, 2007.

I hope the publication will help in focusing some of the important issues related to safer cities for wider dissemination. I extend my best wishes to BMTPC for its significant contribution in the improvement of Habitat scenario and wish the publication all success.

(Kumari Selja)

# Green Building Technologies for Sustainable Habitat

*R.K. Celly\*,  
J.K. Prasad\*\*  
and S.K.Gupta\*\*\**

**H**ousing, one of the basic needs of the mankind is at the top of the list of priority areas of the Government. With the growing population, urban housing shortage has increased from 15.2 million in 1961 to 24.7 million as per latest Census 2001 report. A target of 2 million houses every year has been set up by the Government of India to tide over this shortage. House alone, however, has no meaning unless it is a part of sustainable habitat. A sustainable habitat is an ecosystem that produces shelter and food for people and other organism, without resource depletion and in such a way that no external waste is produced. The principle of sustainability advocates returning to the nature more than what we take from it so that there is no depletion of resources. The National Housing & Habitat Policy, which calls for a "Housing Revolution" rightly stressed on the development of alternate and innovative construction materials and technologies and their wide application with special emphasis on protection of natural environment by stressing upon the use of locally available raw materials besides

advocating reduction in use of scarce natural resources and planning them with renewable resources.

Massive construction activities associated with the development of habitat have numerous environmental impacts and unless tackled properly may create ecological imbalance. In developing countries like India materials producers and builders often use traditional, less energy efficient techniques or old fashioned highly polluting equipments. There is often a lack of knowledge about how to make production clean and energy efficient. Improvements might also be hindered by lack of capital, availability of indigenous equipments. Weak management, mind set both in material production and their use at construction sites might be other reasons for this status. Inadequate government policies and enforcement mechanism to encourage designers and builders to adopt environment friendly technologies in construction and standards & building regulations also cause continued use of energy intensive materials and technologies.

Complex, highly dispersed and resource demanding nature of activities in the construction

sector contributes to the loss of important natural resources and impose severe stress on the environment. Agricultural land is often lost through urbanization and extraction of raw materials. Forest timber is harvested for construction and as fuel for manufacturing building materials faster than it can be replaced by planting new trees or by natural growth. Many raw materials used in construction are limited resources in India. For example the reserves of some metal and mineral resource like limestone, fossil fuel are likely to be finished after few years, if the current rate of exploitation continues. The consumption of fossil fuel also contributes to increased air pollution and emission of greenhouse gases. Construction activities also contribute to the release of ozone depleting substances that damage the ozone layer.

All these demand a concerted, integrated approach for building green habitat which alone can minimize the adverse impacts on the environment and reduce the consumption of natural resources over the building life.

**THE IMPACT OF CONSTRUCTION ON LAND, WATER RE-**

\* Executive Director \*\* Chief – Building Materials \*\*\* Dy.Chief – TDE&IC,  
Building Materials & Technology Promotion Council, Ministry of Housing & Urban Poverty Alleviation, Government of India



## SOURCES AND FORESTS

### Degradation of land

There is growing concern about increasing land dereliction, caused by extraction of sand, gravel and clay etc, which alternately reduces the land available for human settlements development.

Brick making activity alone consumes, at present, equivalent of 300 mm depth from 100,000 hectares (1000 sq. km) of fertile land,  $22 \times 10^6$  tonnes of coal and  $10 \times 10^6$  tonnes of biomass annually. With the available land area of  $1.62 \times 10^6$  sq km comprising of alluvial soils, black soil, red soil, laterite soil and desert soil, of which only alluvial, laterite and red soils are suitable for making bricks. Area under the soils suitable for brick making may not exceed 50% of the available land. Brick making activities to meet the present and future demand can result in consuming the 300 mm depth fertile top soil of available land in about 90 years (assuming 2.5% compounded growth rate). Similarly the pressure on raw materials like limestone to manufacture cement and energy requirement to produce these materials are required to be addressed.

Destruction of land can be avoided by applying more sustainable methods of quarrying, such as restoring agricultural land after clay winning.

### Degradation of coastal areas and water resources

Construction activities can be detrimental to coasts and water resources, which can become critical in some areas. The extraction of sand and gravel



**DR. HARJIT S. ANAND**

*Secretary*

*Ministry of Housing & Urban Poverty Alleviation  
Government of India*

**A** 'Safe City is a Just City', the theme for this year's World Habitat Day is a topical theme given the situation that our cities are faced with problems of crime, violence and consequent insecurity of citizens. This is the event when the UN, member countries and civil society organizations join hands to deliberate over key issues facing human settlements all over the world.

Large migration of people from rural areas and smaller towns to cities causes increase in unemployment, over-crowded living conditions and shortage of houses. This in turn leads to proliferation of slums and economic disparities amongst the rich and the poor. Slum dwellers suffer from all sorts of social exclusion.

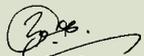
Urban safety is a broad issue requiring appropriate policy intervention at local, state as well national levels. Security of citizens requires a holistic and coordinated approach. Urban policies and governance must take care of social disparities and bring the urban poor into the mainstream of society.

The Ministry of Housing and Urban Poverty Alleviation, through various programmes, aims at developing an enabling environment for the urban poor for living a safe life free from crime and violence in our cities. The Jawaharlal Nehru National Urban Renewal Mission gives an opportunity to State Governments and UTs to go for reform driven, fast track planned development of identified cities with focus on high quality urban infrastructure and efficiency in delivery of services, community participation and accountability of urban local bodies. Mandatory reforms under this Mission include security of tenure at affordable prices, improved housing, water supply, sanitation and ensuring facilities of education, health and social security to the urban poor. All these are vital for making cities safe. Another significant element of our strategy for urban poor is the new National Policy for Street Vendors which is being finalized. This Policy will seek to promote a supportive environment for street vendors as well as ensure absence of congestion and maintenance of hygiene in public spaces.

The BMTPC is playing an active role in implementation of the Government policy relating to introduction and promotion of alternate building materials and technologies. I am confident that BMTPC will excel in its endeavour to play an important role in achieving specified goals.

I am happy that BMTPC is bringing out a special publication titled "Building Materials News" on the occasion of the World Habitat Day which will focus on some of the important issues related to human settlements.

I extend my best wishes to the Council for success in their efforts.

  
(Dr. Harjit S Anand)

from river beds and beaches can have serious environmental consequences, increasing soil erosion. In parts of India, removal of coral and shells from the coast to produce lime and cement is common, because of their high chemical purity. The use of coral as an aggregate or building stone is also common in parts of India. Logging practices also damage water resources. Heavy logging can cause increased rate of erosion, increased sediment loads then affect habitats for plant and river organism downstream. Debris from logging and saw milling can also increase the input into stream of organic materials, whose decomposition reduces the amount of oxygen in river water, jeopardizing the life of water animals. It is therefore necessary to strictly implement the coastal zonal regulations for all construction activities.

### Deforestation

Forest are an important natural resources base, which play a crucial role in the conservation of watersheds, prevention of soil erosion and balancing the ecosystem. Forests are sources of domestic energy supply, such as wood for cooking and heating, and of fuel for brick and lime production in rural areas.

Inefficient commercial logging operations and the use of wood as fuel have resulted in deforestation in many regions. There is also increasing concern about the destruction of the tropical forest and the adverse impact of this on the environment. Managing the forest in a sustainable manner, so as to minimize the rate of deforestation,

is therefore imperative and should be given highest priority.

The second consultation on the wood and wood products industry, organized by UNCHS (Habitat) and UNIDO in 1991, underscored the importance of greater utilization of wood on a sustainable basis, as a renewable source of indigenous building materials in housing construction. This includes commercially Less-accepted species (CLAS) and industrial tree plantation species (ITPS). If properly managed and exploited, these species can serve as abundant and renewable resource of building materials, which can be afforded by the vast majority of the population.

CLAS and ITPS are slowly

discovered, and new technology might extract more than is possible today, the rate at which the reserves of these resources are depleting means consumption must be controlled. Other preferable renewable resources must replace these traditional materials.

### Use of metallic minerals

The construction industry is a major consumer of metals such as iron, aluminum, zinc, copper etc. According to geological studies, the existing exploitable resources of metals are very different. The world's economically exploitable resources of some metals commonly used in construction are shown in Table-1 together with production pattern and life indices.

**Table – 1 : Annual production, reserves and life index of some metals**

<b>Metal</b>	<b>Production/year (Million MT)</b>	<b>Resource (Million MT)</b>	<b>Life index (Years)</b>
Bauxite/Aluminium	104	23,000	222
Copper	9.3	310	33
Iron	930	150,000	161
Lead	3.4	63	18
Nickel	0.9	47	51
Zinc	7.1	140	20

showing their potential as raw materials in industrially processed wood products for construction in the country.

Serious consideration, therefore, is needed to explore these metals in construction, to extend the life of existing reserves

### CONSUMPTION OF NON-RENEWABLE RESOURCES IN CONSTRUCTION

Non-renewable resources used in construction include fossil fuels, metals and minerals such as stone and clay. Supply of some of these may last only a few decades. Although more pockets of these resources are

### USE OF ENERGY IN CONSTRUCTION

The construction sector is a major user of energy. Energy is required for manufacturing materials, for transport and for construction of buildings. Apart from this initial energy use there is also need for energy to oper-



ate buildings.

Since energy is one of the most costly inputs to the construction industry and source of most of the polluting effects, improving energy efficiency is one of the most urgent tasks to be addressed. This calls for efficient use of energy intensive materials, greater use of low energy - intensive materials, improving the energy efficiency of production process, increasing the use of recycled and waste materials and applying low energy architectural design principles.

### **Embodied energy in buildings**

The materials for habitat are traditionally classified under the following categories

- Cement and masonry materials;
- Metallic materials;
- Wood, natural fibers, polymers and elastomers;
- Glass and ceramic materials;
- Insulating, sealing, bonding, electrical and electronic materials; and
- Finishing and decorative materials

The embodied energy in buildings is defined as the total energy used at all stages of the production of these materials. These stages start with the extraction of raw materials, production of building materials and components, transportation on-site construction and completion of the buildings.

Most of the embodied energy in buildings is related to the production of materials, while construction activities and transport



**S.K.SINGH**

*Joint Secretary (Housing)  
Ministry of Housing & Urban Poverty Alleviation  
Government of India*

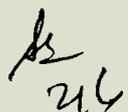
In the prevailing scenario of urban crime, violence, natural and man-made disasters, incidents of harassment of the elderly etc. this year's theme of the World Habitat Day viz. **'A Safe City is a Just City'** is the most appropriate.

This theme stresses the need to review the whole spectrum of issues leading to environment, quality of life imbining safety and dignity of citizens. Urban design and governance, infrastructure facilities like water, connectivity, public transport, street lighting, sanitation etc. are important factors influencing the urban safety. Local self-governments also play an important role in bringing improvement in the quality of life for their citizens.

Government, through various policies on human settlement has provided opportunities to improve the scenario and minimize the problem. What is required is to work sincerely and effectively on these policies to achieve the desired goals. BMTPC, which has got a very good network with other organizations & institutions of excellence, has a vital role to play in this regard.

I am happy to note that BMTPC is bringing out a special publication "Building Materials News" on the occasion of World Habitat Day 2007. The publication will bring awareness among professionals on some of the vital issues concerning human settlement through technical articles by well known professionals and technocrats.

I wish BMTPC a grand success in its efforts.

  
(S.K. Singh)

account for a smaller proportion. On the basis of gross energy requirement for manufacturing a unit weight of building materials, these can be classified in three categories: low, medium and high energy content materials. Table 2 shows a classification of major building materials used in construction in terms of energy requirement for their production.

If medium and high energy materials such as ceramics and steel are used, typically 70% or more of the embodied energy comes from the manufacturing processes of these materials. The lower values in table 2 correspond to more energy-efficient production. Amount of energy used to produce a unit weight of a high energy - content materials can be more than 100 times that needed for low energy-content materials. However, as the densities of building materials vary greatly and they are used in completely different ways, it is more pertinent to compare different types of building elements - such as roofs, walls etc - with similar performance.

Comparative energy requirements for different roof and wall assemblies are given in Table 3, 4 & 5.

Different types of construction systems can result in considerable difference in the total embodied energy requirements in a complete house system. Table - 6 shows a comparison of three houses using different materials.

### Operational energy in buildings

A considerable amount of

**Table 2 : Comparative energy requirements of building materials**

Material	Primary energy requirement MJ/kg
<b>Very high energy</b>	
Aluminium	200-250
Plastics	50-100
Copper	100+
Stainless steel	100
<b>High energy</b>	
Steel	20-60
Lead, Zinc	25+
Glass	12-25
Cement	5-8
Plaster board	8-10
<b>Medium energy</b>	
Lime	3-5
Clay bricks & tiles	2-7
Concrete	
In-situ	0.8-1.5
Blocks	0.8-3.5
Pre-cast	1.5-8
Sand-lime brick	0.8-1.2
Timber (sawn)	0.1-5
<b>Low energy</b>	
Sand, aggregate	<0.5
Fly ash, RHA, volcanic ash	<0.5
Soil	<0.5
Adobe	<0.2

*Source: Building Materials in India : 50 Years - A Commemorative Volume published by Building Materials & Technology Promotion Council (BMTPC), New Delhi, India, 1998.*

**Table-3: Comparative energy requirements of some common roofing materials for pitched roofs**

Roofing material	Weight (kg/m <sup>2</sup> )	Energy requirement (MJ/kg)	Energy requirement (MJ/m <sup>2</sup> )
Corrugated aluminium sheet, 0.8 mm	3.1	190	580
Corrugated galvanized steel sheet, 0.4 mm	4.4	60	270
Ceramic roofing tiles, 12mm	35	4	140
Concrete roofing tiles, 12 mm	45	1.3	60
Micro concrete roofing tiles, 8 mm	30	1.3	40

*The calculations are based on average values from Table -2 (Tiles require more wood in the roof structure than sheets, but the energy requirement for the wood structure is of no significance compared to the roofing materials)*

energy is used in buildings during their lifetime. This energy is required for heating, cooling, ventilation, lighting, cooking and other domestic activities. The energy use patterns inside buildings vary a great deal according to occupants' behavior, type of structure and location of buildings. In residential buildings, urban and rural patterns tend to be very different. Household income and climate have major influences both on the type of energy sources and

end-use patterns.

In India, being a country of varying climate zones, energy sources and end use pattern differ considerably.

Although there is little information on how households use energy, the use of operational energy in buildings is increasing steadily. Many households, which previously endured a poor indoor climate, are installing equipment for active climatization as soon as they can afford it. This trend is especially obvious



### **The Kyoto Protocol and The Clean Development Mechanism (CDM)**

The Kyoto protocol provides an unprecedented opportunity for the Organization for Economic Co-Operation and Development (OECD) countries to reduce greenhouse gas emissions and at the same time help developing countries and economies in transition invest in climate friendly technologies and infrastructure. The protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI) provide an element of flexibility for the industrialized countries to meet their obligations under the Protocol to reduce greenhouse gas emissions by on average 5.2 per cent below their 1990 levels by 2012. In so doing, the Protocol provides an unprecedented incentive for those seeking lower cost emission reductions, to leverage the flow of private capital and privately held clean technology from North to South.

*(Sources: CE & CR, October 2006)*

in urban households, which tend to have a better economy and a modern life style.

Architects and engineers have a crucial role to play in designing buildings to minimize energy use for active climatization and lighting. A good approach is to take advantage of natural means such as solar radiation and winds and use the building as a collector, storage and transfer mechanism. These so-called passive techniques might be so efficient that in some regions no energy will be needed for heating or cooling.



**DR. P.K. MOHANTY**

*Joint Secretary (JNNURM)*

*Ministry of Housing & Urban Poverty Alleviation  
Government of India*

**R**apid population growth due to migration of people from smaller towns and rural areas has highlighted the need to ensure safer living conditions and provision of adequate shelter particularly for the poor and marginalized sections of the society in cities.

Issues of improving safety in urban centres is intimately related to housing and other basic infrastructure facilities. Concerted efforts for institutional reforms, management development, security of tenure etc. are essentially required to achieve an urban environment where each family may gain and retain adequate shelter to live in security and dignity.

This year's theme of World Habitat Day – "A Safe City is A Just City" rightly focuses, inter-alia, on building safer spaces, broadening of the slum upgradation concept, developing capacity for gender and age sensitive local crime prevention strategies.

Launching of Jawaharlal Nehru National Urban Renewal Mission by the Government of India has given opportunity to States and UTs to improve the scenario in the cities. Through mandatory reforms, it is helping in introducing better governance at local level and also providing resources for slum upgradation and infrastructure development at a faster rate. A number of projects have already been initiated in many States. BMTPC is playing an active role in this effort of the Government.

I am pleased to learn that BMTPC is bringing out special publication "Building Materials News" on the occasion of World Habitat Day highlighting some of the important issues related to developing safe and just cities.

I wish BMTPC all the success in their continued efforts.

(Dr. P.K. Mohanty)

**Table – 4: Comparative energy requirements of some flat roofs**

Roof Assembly	Weight (kg/m <sup>2</sup> )	Energy requirement (MJ/kg) (MJ/m <sup>2</sup> )	
<b>Reinforced concrete slab, 180 mm</b>			
180 mm concrete	420	1.3	550
Steel reinforcement (0.5% by vol.)	7	40	280
<b>Total</b>	<b>427</b>	<b>41.3</b>	<b>830</b>
<b>Concrete slab with fillers, 180 mm</b>			
Concrete, 40% by vol.	170	1.3	220
Steel reinforcement (0.5% by vol.)	7	40	280
Concrete hollow blocks, 60%	110	1.3	140
<b>Total</b>	<b>287</b>	<b>42.6</b>	<b>640</b>
<b>Elements of autoclaved aerated concrete (AAC), 150 mm</b>			
150mm AAC elements (0.2%)	90	4	360
Steel reinforcements (0.2%)	2	60	120
<b>Total</b>	<b>92</b>	<b>64</b>	<b>480</b>
<b>Timber roof, boarding on joists, 200 mm</b>			
25 mm timber boarding	150	3	450
175x 50 mm timber joists	5	3	15
<b>Total</b>	<b>155</b>	<b>6</b>	<b>465</b>
<b>Earth on branches and round timber joists, 350 mm</b>			
250 mm compacted earth	450	0.1	45
Branches, leaves, etc	0	0	0
Round timber joists	5	0.5	2
<b>Total</b>	<b>455</b>	<b>0.6</b>	<b>47</b>

*The calculations are based on average values from Table - 2. Note that neither waterproofing nor ceiling plastering is included.*

**Table-5: Comparative energy requirements of some common walls**

Wall Assembly	Weight (kg/m <sup>2</sup> )	Energy requirement (MJ/kg) (MJ/m <sup>2</sup> )	
<b>Solid clay brickwork 150 mm</b>			
120 mm solid clay brick	150	4.0	600
Lime/cement mortar	50	0.7	35
<b>Total</b>	<b>200</b>	<b>4.7</b>	<b>635</b>
<b>Hollow clay brickwork, 180 mm</b>			
120 mm hollow clay bricks	110	4.0	440
Lime/cement mortar	50	0.7	35
<b>Total</b>	<b>160</b>	<b>4.7</b>	<b>475</b>
<b>Hollow concrete block work 180 mm</b>			
150 mm hollow concrete blocks	120	1.3	160
Lime/cement mortar	50	0.7	35
<b>Total</b>	<b>170</b>	<b>2.0</b>	<b>195</b>
<b>Brickwork of cement stabilized earth bricks, 180 mm</b>			
150 mm compressed earth brick	220	0.5	110
Lime/cement mortar	50	0.7	35
<b>Total</b>	<b>270</b>	<b>1.2</b>	<b>145</b>
<b>Adobe block work plastered on both sides, 450 mm</b>			
400 mm adobe plus earth mortar 480	<b>480</b>	<b>0.1</b>	<b>50</b>

*The calculations are based on average values from Table – 2. Plastering is not included. A lime/cement plaster applied internally and externally would add another 40 MJ/m<sup>2</sup>.*

**Table – 6: comparative energy requirements for three single storey houses**

House type	Embodied Energy (MJ/m <sup>2</sup> )
House made primarily with manufactured materials (Hollow brick walls, concrete frame and roof)	1580
House made partly with manufactured materials (Clay brick walls, concrete frame steel sheet roof)	1310
House built primarily with local materials (adobe walls, timber frame, steel sheet roof)	590

*(Source – UNCHS 1991)*



The knowledge of passive techniques is well developed, but is unfortunately not yet effectively practiced.

Many existing buildings were never designed for active climatization through heating or air conditioning. The energy performance of such buildings can be improved significantly by increasing air tightness through sealing of windows and doors, and by adding thermal insulation materials to the building envelope. The additional cost of such measures is normally paid back in a few years.

Seen over a building's lifetime, the ratio between embodied and operational energy will vary considerably, depending on factors such as type of construction, climate and user behavior. For example, if a building is constructed with medium and high-energy materials and no heating or cooling is used, the portion of embodied energy will be very high. But if a building has high annual use of energy for heating and/or cooling, the portion of operational energy will be very high, especially if the building is badly adapted to the climate.

### **Use of industrial and agricultural wastes in production of building materials**

A large number of industrial and agricultural wastes have found wide acceptance, as alternatives to clay, limestone and various other argillaceous and siliceous materials in the production of bricks, tiles, cement, concrete slab and ceramics. With considerable advantages of not only conservation of natural resources but also sav-

ing precious energy as some of the wastes have their own intrinsic fuel value. The developing countries must be selective to adopt all such technologies in which industrial, mining and mineral wastes constitutes a raw material resources for building materials.

Table - 7 Indicates a list of well established industrial, mining and mineral wastes and by-products and their use in production of building materials as developed in India.

Table - 8 gives energy saving in the manufacture of alternative building materials through use of industrial wastes.

Table -9 indicates resource and energy saving through use of important natural fibers and allied agro wastes and names of some well accepted commercially produced building boards and sheets made from them. This table also indicates the saving of timber and the binder used in the materials which get substituted by organic-fibers based composite sheets and panels.

Use of agro-industrial wastes not only helps in tackling the environmental problems but at many instances actually improves the properties and durability of building materials.

Qualitative and quantitative assessment of the pollutants generated from industrial production of steel, cement, bricks, aggregates, composites using organic and inorganic chemicals indicate an alarming situation from environmental considerations. Coal being the main energy resource in India, for example, it is estimated that as much as 22 per cent of carbon

dioxide emissions are attributable to the construction sector which consumes a variety of energy intensive materials. Scientific studies for in depth analysis of available technologies for change-over to alternative fuel sources in materials manufacturing that will reduce GHG emissions requires to be initiated. This need is being increasingly realized through establishment of environmental regulatory mechanisms to ensure installation of pollution control systems which have already been developed and are commercially available in the country.

There appears to be a need to evolve an "Eco-Rating Tool" to guide the choice of materials that will maximize the efficiency of the critical resources. Reduction in embodied energy in materials and construction merits attention both by manufacturers of materials and design professionals. There is a need to direct efforts for promoting use of passive solar systems to achieve reduction in operational energy in buildings. The HVAC industry has been guilty of propagating a "one size fits all" concept in



**Table 7: Industrial, mining, mineral wastes and their application in building materials as alternate to traditional materials and natural resources**

Sl. No.	Industrial waste/by-product	Application in building materials as alternative to traditional materials	Traditional material saved fully or partly (20 - 30%)	Natural resources saved fully or partly (10 - 20%)
1.	Blast furnace slags (i) air cooled  (ii) foamed  (iii) granulated	<ul style="list-style-type: none"> <li>Dense aggregate in concrete or road</li> <li>Light wt. aggregate for concrete</li> <li>Portland-slag cement super sulphate cement</li> </ul>	<ul style="list-style-type: none"> <li>Rock, stone</li> <li>Traditional light wt. (high energy)</li> <li>Ordinary portland cement (OPC) sulphate resisting portland cement</li> </ul>	<ul style="list-style-type: none"> <li>Stone</li> <li>Clay, slate, shale</li> <li>Limestone, clay</li> </ul>
2.	Ferro-alloys and other metallurgical slags	<ul style="list-style-type: none"> <li>Pozzolana-metallurgical masonry cement</li> </ul>	Lime pozzolana	<ul style="list-style-type: none"> <li>Clays (for pozzolana)</li> <li>Limestone</li> </ul>
3.	Flyash (Pulverised fuel ash)	<ul style="list-style-type: none"> <li>i) Portland-pozzolana</li> <li>ii) Concrete filler</li> <li>iii) Sintered light wt. aggregate</li> <li>iv) Lime-flyash calcium silicate brick</li> <li>v) Cellular concrete (flyash-lime)</li> <li>vi) Clay-flyash brick</li> <li>vii) Stabilisation in roads, mines, lagoons etc.</li> </ul>	<ul style="list-style-type: none"> <li>OPC</li> <li>Fine aggregate</li> <li>Other L.W. aggregate</li> <li>Sand-lime brick</li> <li>Cement-sand based cellular concrete</li> <li>Burnt-clay brick</li> <li>Road materials &amp; other fillers</li> </ul>	<ul style="list-style-type: none"> <li>Limestone, clay</li> <li>Sand, crushed stone</li> <li>Clay, shale, slate</li> <li>Sand, lime</li> <li>Cement, sand</li> <li>Clay</li> <li>Traditional road material, clay</li> </ul>
4.	Byproduct gypsum (from fertiliser, hydro fluoric acid, boric acid)	<ul style="list-style-type: none"> <li>Gypsum for cement</li> <li>Gypsum plaster &amp; blocks</li> <li>Gypsum plaster fibrous board</li> <li>Special cements</li> </ul>	<ul style="list-style-type: none"> <li>Mineral gypsum plaster and blocks from mineral gypsum.</li> <li>Sulphate-resisting portland cement.</li> </ul>	<ul style="list-style-type: none"> <li>Mineral gypsum</li> <li>Mineral gypsum</li> <li>Clay &amp; limestone (for OPC)</li> </ul>
5.	Lime sludges from acetylene, sugar, paper & fertiliser industries	<ul style="list-style-type: none"> <li>Raw meal component in cement</li> <li>Lime pozzolana mixture, (L.P.)</li> <li>Building lime</li> <li>Masonry cement</li> </ul>	<ul style="list-style-type: none"> <li>Raw meal in cement Traditional L.P.</li> <li>Lime from limestone</li> <li>Limestone based masonry cement</li> </ul>	<ul style="list-style-type: none"> <li>Limestone &amp; clay</li> <li>Limestone</li> <li>Limestone</li> <li>Limestone</li> </ul>
6.	Red mud (from alumina in aluminium)	<ul style="list-style-type: none"> <li>Cement raw meal</li> <li>Bricks and tiles</li> <li>Sintered aggregate</li> </ul>	<ul style="list-style-type: none"> <li>Ferruginous muller</li> <li>High strength brick</li> <li>Stone and other aggregates</li> </ul>	<ul style="list-style-type: none"> <li>Oxides of iron</li> <li>Clay, feldspar</li> <li>Clay, shale, slate</li> </ul>
7.	Mine tailings (from zinc, copper, gold, iron mines)	<ul style="list-style-type: none"> <li>Filler in concrete</li> <li>Calcium silicate bricks</li> <li>Cellular concrete</li> <li>Tailing-clay brick</li> <li>Masonry cement (tailing + cement)</li> </ul>	<ul style="list-style-type: none"> <li>Fine aggregates</li> <li>Sand (in sand-lime brick)</li> <li>Ground sand</li> <li>Clay bricks</li> <li>Limestone-cement based</li> </ul>	<ul style="list-style-type: none"> <li>Sand</li> <li>Sand</li> <li>Clay</li> <li>Limestone</li> </ul>



**Table – 8: Energy saving through use of industrial wastes**

Sl. No.	Building material	Composition	Material compared	% Energy saving
1.	Portland pozzolana cement	75% OPC 25% Flyash	100% OPC	20
2.	Portland blast furnace slag cement	60% OPC 40% B.F. Slag	100% OPC	30
3.	Masonry cement	50% OPC 50% Tailings/waste chalk	100% (Masonry cement (50% OPC + 50% Limestone))	20
4.	Lime-pozzolana mixture	25% Acetylene gas lime 75% Flyash	25% Lime 75% Calcined brick	75
5.	Calcium silicate brick	90% FA Tailings 10% Lime (waste source)	Burnt clay brick	40
6.	Burnt-brick	75% clay 25% Flyash	Burnt clay brick	15

**Table – 9: Resource and energy saving through use of natural fibres and agro-wastes in building materials**

Sl. No.	Waste and source	Commercial product using natural fibre & agro-waste	Traditional resource fully or partly saved	Energy (%)
1.	Coir fibre (coir industry)	Coir fibre-cement roofing sheet & panels	Asbestos	10
2.	Rick husk (Rice mill)	Rick-husk- cement building board	Resin (PF or UF) bonded particle board timber	20
3.	Ground nut hulls (Oil mills)	Ground nut- hull- cement building board	Resin-bonded particle board timber	20
4.	Jute fibre (Jute mills)	Jute-fibre-polymer bonded panel; door and window	Timber, metal	10
5.	Cotton waste (Textile mills)	Cotton-lint-cement bonded board	Gypsum, timber	25
6.	Bagasse (Sugar mills)	Bagasse-polymer- bonded boards	Timber fibres (in insulation board)	30
7.	Corn cobs (Corn mill)	Corn cobs-cement bonded boards	Timber, polymer	40
8.	Sisal fibre (Sisal plant)	Sisal fibre-polymer/ cement bonded roofing sheet, door, window	Asbestos fibre Timber	20-25
9.	Rice straw & wheat straw (Farms)	Compressed and paper covered board	Timber Polymer	40
10.	Banana fibre (Banana plant)	Banana fibre + cotton pulp/ paper pulp and polymer insulation boards	Timber Traditional light weight mineral viz. vermiculite or mica	25

thermal comfort. It calls for evolving Energy-Consumption Indices for different types of buildings for varying climatic conditions. Having standardized these indices the policies and regulatory mechanisms will be needed to ensure that designs conform to these standards by

proper selection of materials and processes.

### CONSERVATION OF WATER

Any human settlement requires sufficient source of water for daily and other needs. With the rising population and over exploitation of ground water

resources, it is important to conserve water. Rain water harvesting is required to be incorporated in the building byelaws as mandatory requirement.

Under the Jawaharlal Nehru National Urban Renewal Mission also, it has been emphasized that State Governments

should revise their bye-laws to make rain water harvesting mandatory in all buildings to come up in future and for adoption of water conservation measures including reuse of recycled water. Some states have already made mandatory provisions of rain water harvesting in their byelaws.

### WASTE MANAGEMENT

Integrated waste management is essential to ensure appropriate disposal and recycling of agricultural, municipal and industrial waste and preventing the indiscriminate abuse of precious land for dumping garbage. Besides reduction in waste and reuse for appropriate applications, segregation of waste at source and recycling of waste for building materials, fuel and manure or energy recovery should be promoted. Sustainable waste management practices are required for not only for municipal garbage but also for industrial refuse or bio-medical waste. The hazardous and toxic waste from health care establishments, comprising of infectious, bio-medical waste constitute a grave risk and should not be allowed to get mixed with other municipal waste.

### SAFETY OF HUMAN HABITAT AGAINST NATURAL HAZARDS

India, being highly prone to natural hazards like earthquakes, cyclones, floods and landslide, it is imperative that any human settlement and infrastructure building is constructed safe from such hazards. For this a model Byelaws have

been prepared and state governments are taking actions to modify their byelaws to incorporate provisions for safe design and construction practices to make sustainable habitat.

### LIFE CYCLE APPROACH

The analysis of the impact of the construction industry on the environment is very complex. To assess how different materials and operations influence the environment over a longer period of time, it is worth considering a life cycle approach to materials and buildings.

#### Life cycle assessment of products

To compare the environmental impact of different materials, life cycle studies of building materials are important. The goal should be to help designers and users chose environmentally friendly materials. The approach, often called life cycle assessment or life cycle analysis (LCA), considers the entire lifetime of the products and their impact on the environment during that time. This includes the following phases: extraction and transport of raw materials, production, use, demolition and waste treatment.

The environmental impact of the products is evaluated within each phase. The environmental parameters that are considered normally include:

- Resource depletion: energy, materials, water etc.
- Human health: consequences of toxic emissions, impact on work environment, etc.
- Global and regional pollution: global warming, depletion of

the ozone layer, acidification etc.

- Impact on animals and vegetation: biological diversity, etc

To evaluate a product, its different environmental impacts are scored, and the sum from all phases is added. One difficulty with LCAs is how to weigh different environmental impacts against each other. Existing LCA methods all have different points systems and a comparison between materials often turns out differently depending on the method.

Another problem with life cycle assessments is that no method considers the complete life cycle, which, of course, is linked to the complex nature of the task. It is also not always possible to obtain the necessary data, as they are often confidential.

Products achieving good ratings in life cycle assessments are based on renewable raw materials, are produced with methods using low amounts of energy and having low pollution, are sound and non-hazardous for the users, etc. if there is a possibility to reuse or recycle the product when a building is demolished, or if the product can be used as fuel, this is considered positive and reduces the total environmental impact considerably.

Many industrial countries have developed so-called eco-labeling schemes to promote production of environmentally friendly products. Products that meet the requirements get the eco-label, which works as a "guarantee" to consumers that the particular product is envi-



ronmentally sound. Gives the increasing awareness among consumers of the importance of protecting the environment, eco-labels have become important tools to market products.

Apart from being used to compare building materials, life cycle assessments have long been used by materials producers to improve their products. LCAs are performed to compare alternative production processes, to look into the possibilities of reducing inputs such as raw materials and energy, and to identify and reduce the wastes and polluting effects. In many cases LCA is an excellent tool for material producers to make their products more environmentally friendly.

### **Life cycle studies of entire buildings**

A limitation with product life cycle assessments is that they normally concentrate on the product itself, and do not include its influence on the energy use in the building during operation. Many thermal insulation materials, which are resource-consuming and would not be considered good options in most product life cycle assessments, may reduce energy use in buildings considerably.

Useful approaches when studying energy use in entire buildings are life-cycle cost or life-cycle energy analyses. Since energy use is largely linked to environmental impact, the life cycle energy use of buildings, taking into account both the embodied energy in the building and its operational energy requirement, can be considered a measure of a



building's environmental friendliness.

### **NEED FOR INTEGRATED APPROACH FOR GREEN BUILDINGS**

In view of various details given in preceding paragraphs, it is important to focus on Green building technologies for sustainable development. A green building is one, which encompasses the use of clean energy, renewable energy, efficient use of water, use of recycled or recyclable materials and provide healthy indoor air quality. It has to be designed, built, renovated, operated, or reused in an ecological and resource efficient manner. Green buildings are designed to meet certain objectives such as protecting occupants health: improving employee productivity: using energy, water and other resources more efficiently; and reducing the overall impact to the environment. This is possible if an integrated approach to building design, at initial stage itself, is followed which involves judicious use of application of:

- Efficient Green Materials and construction practices.
- Bio-climatic/ solar passive architectural principles.
- Efficient systems and equipments
- Renewable sources of energy.
- Efficient waste and water management practices.

The range of 'green' design features is very diverse, with options that include energy efficient materials, passive solar Considerations, and structural and mechanical components. These all work together to create a building that is attractive and functional, saves utility costs over the life of the structure, and has minimal impact on the environment. The uses of active solar features such as photovoltaic and thermal panels, as well as reclaimed and recycled materials are increasingly popular in green building construction.

A green building may cost more up front, but saves through lower operating costs over the life of the building. The green

building approach applies a project life cycle cost analysis for determining the appropriate up - front expenditure. This analytical method calculates cost over the useful life of the assets. These and other cost savings can only be fully realized when they are incorporated at the projects conceptual design phase with the assistance of an integrated team.

### INDIAN INITIATIVES FOR GREEN BUILDING TECHNOLOGIES

Recently, in India, green building approach has drawn attention of many agencies both public and private like TERI (The Energy Research Institute), Pune Municipal Corporation, CII-Sohrabji Godrej Green Business Centre, etc. Many of these agencies have started their own certification process to rate a building on the degree of its greenness.

TERI's Green Building Rating System (TERI-GRIHA) evaluates the environmental performance of a building holistically over its entire life cycle, thereby

providing a definitive standard for what constitutes a 'green building'. The rating system, based on accepted energy and environmental principles, will seek to strike a balance between the established practices and emerging concepts, both national and international. The guidelines/criteria appraisal may be revised every three years to take into account the latest scientific developments during this period.

Pune Municipal Corporation (PMC) is another example as the first urban local body in the country to take up implementation of Eco Housing Programme under technical assistance provided by the United States Agency for International Development (USAID). The assessment criteria which focus on resource conservation measures like site planning, total water management, energy conservation, eco-friendly and energy efficient building materials, renewable energy and solid waste management will help serve as a benchmark for Eco-Housing projects. Designed to serve as

a performance assessment tool, the criteria help quantify the environmental achievement of a building and provide a meaningful differentiation of buildings in the market place.

CII-Sohrabji Godrej Green Business Centre (GBC) in Hyderabad — jointly promoted by the Confederation of Indian Industry, Pirojsha Godrej Foundation, Government of Andhra Pradesh and USAID - is the only building in the world to be awarded the 'platinum rating' under the LEED rating system of the US Green Building Council, making it 'the greenest building in the world.' This most environment-friendly building has been built as a unique public private partnership as a demonstration building for the industry in India and other countries of the world for use of water and energy efficient technologies and recycled materials.

Building Materials and Technology Promotion Council (BMTPC) an inter-ministerial organisation under the Ministry of Housing and Urban Poverty Alleviation, Govt. of India has taken an initiative for formulation of comprehensive set of guidelines and strategies for promotion of sustainable habitats to be called 'Guidelines for Green Habitat' (GGH).

The overall aim of 'Guidelines for Green Habitats' would be to act as a tool for each stakeholder through better or new practices that must be adopted in order to realize these goals and achieve the higher degree of collaboration necessary to reach the targeted sustainable performance objectives. These guidelines would aim to both





instruct and facilitate input from public agency executives and staff; implementing agencies and elected officials; architects and engineers; contractors; building managers; and the public at large and GGH would relate to and build upon the existing standards and codes and the buildings rating systems.

## CONCLUSION

As proposed in the Habitat Agenda adopted by Habitat II at Istanbul a practical and integrated approach, based on achievable targets and realistic courses of action formulated on the basis of understanding of prevailing situation is required.

Based on the Global Plan of Action of the Habitat Agenda guidelines, actions are required to be formulated at national and state level on the following:

- Promotion of locally available, appropriate, affordable, safe, efficient and environmentally sound construction methods and technologies.
- Promotion of more energy efficient technology and alternative/renewable energy for human settlements, and reducing the negative impacts of the energy production and use on human health and on the environment.
- **Institutional support:** Institutional support should be provided in form of standards and quality control, with particular attention to energy efficiency, consumer safety and protection.

States can also provide tax incentives to promote green buildings. A green building credit can be awarded to tax payers who construct a



building that meets certain requirements. The amount of tax credit awarded for a green building may be proportional to the size of the building and the extent that the building is green.

- **Research and Development:** Need to intensify and support research efforts to find substitutes for or optimize the use of non-renewable resources and to reduce their polluting effects, with special attention to recycling, reuse of waste materials and increased reforestation.
- **Exchange of information:** Promotion of information exchange and the flow of appropriate environmentally sound, affordable and assessable building technologies and facilitate the transfer of technology.
- **Regulatory Measures:** Encouragement and promotion of the application of low-energy, environmentally sound and safer manufacturing technologies backed by appropriate norms and effective regulatory measures.

## REFERENCES

1. *Building Materials in India: 50 years - A commemorative volume*, Published

by Building Materials & Technology Promotion Council (BMTPC), New Delhi, 1998

2. *Clean Building Technologies for sustainable Development*, BMTPC, New Delhi.
3. *Promoting Eco-friendly and sustainable urban settlements- the Indian experience*, BMTPC, New Delhi.
4. T.N.Gupta, *Materials for the Human Habitat*, Published in *MRS Bulletin*, April 2000
5. T.N.Gupta, *Innovative Energy Efficient and Environment Friendly Building Materials Developed in India*, presented at 2<sup>nd</sup> International Conference on Intelligent Green and Energy Efficient Buildings & Technologies (IGEBT), March, 2006, China.
6. Baris Der-Petrossian and Erik Johansson, *Construction and Environment - Improving energy efficiency*, Published in *Building issue 2000*, volume 10, Number 2.
7. B.V.Venkatarama Reddy, *Sustainable Building Technologies*, Published in *current science*, volume 87, no.7, 10 October, 2004
8. *Websites: Answers.com, Sustainable Habitat, serconline.org*
9. Sam C.M. Hui, *Web-based learning for Building Energy Efficiency- A Capacity Building Tool*, International workshop on Energy Efficient Buildings in China for the 21<sup>st</sup> century, 14-15 December 2000, Beijing, China.
10. *Housing statistics an overview 2006*, published by National Buildings Organization, Ministry of Housing & Urban Poverty Alleviation Government of India, New Delhi.

## Vulnerability Atlas of India – First revision (2006)

**A**s a follow up of Yokohama strategy for safer world during Mid term review of International Decade for Natural Disaster Reduction (IDNDR) 1990-2000, the then Ministry of Urban Development constituted an Expert Group (1994) to prepare the first ever Vulnerability Atlas of India. This Atlas prepared in 1997 by BMTPC contains hazard maps with respect to earthquakes, cyclones and floods and district wise risk tables of housing stock. Since its publication, the Atlas has proved to be a very effective initial tool for pre-disaster mitigation and preparation planning of the Government.

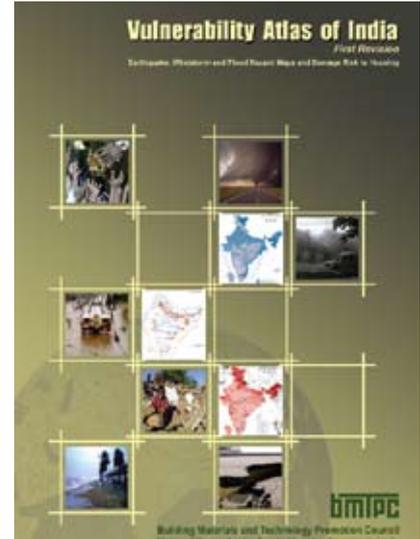
Considering the formation of new states and districts, changes in earthquake hazard zonation Maps, changes in flood scenario, availability of seismotectonic details, updated storm surge data from IMD, changes in housing scenario, Ministry of Housing & Urban Poverty Alleviation set up multidisciplinary Peer Group under the chairman-

ship of Prof. A.S. Arya, National Seismic Advisor with experts from other concerned organizations to revise and update the Atlas.

The revised Atlas, prepared by BMTPC is the outcome of detailed study of all the available data in a series of meetings and dialogue by the Peer Group. This Atlas contains digitized hazard maps with respect to earthquakes, cyclones, floods and district wise risk tables of housing stocks as per Census 2001. This also includes Landslide hazard maps and a chapter on Tsunami.

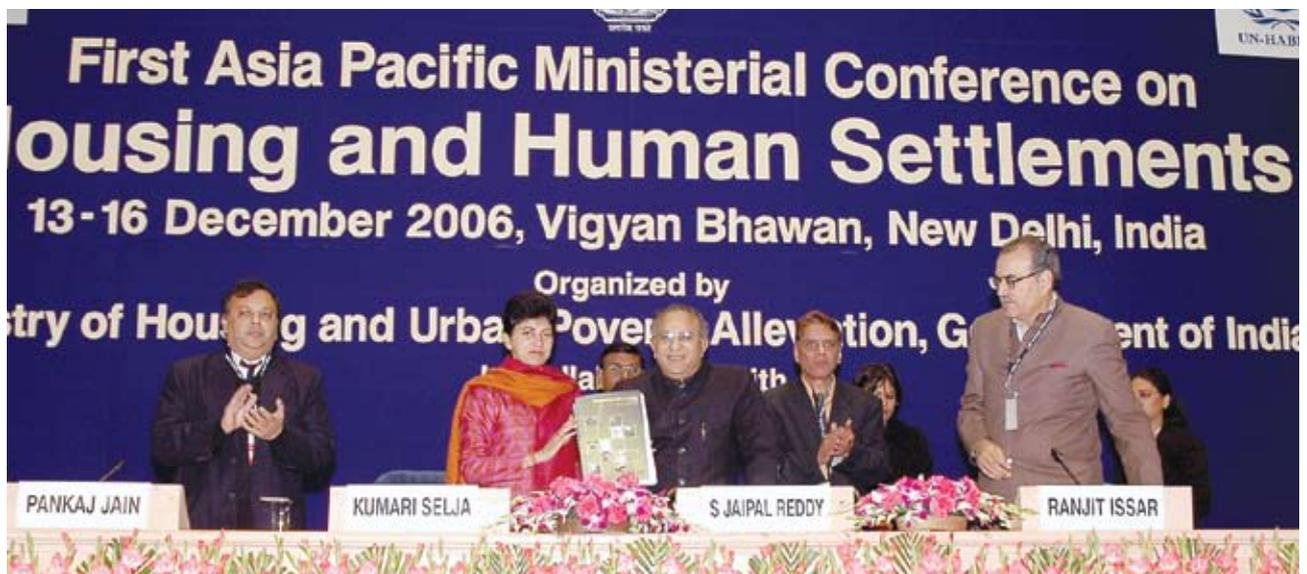
The revised Atlas, with latest information on the possible intensities in the event of natural hazards and resulting risk level to housing and buildings will be very useful in our future disaster management planning and preparedness.

The Peer Group constituted by the Ministry of HUPA submitted its report to the Ministry on 9<sup>th</sup> October, 2006. The revised Vulnerability Atlas of India has



also been printed and the publication was released by Shri S.Jaipal Reddy, Hon'ble Minister of Urban Development in the gracious presence of Kumari Selja, Hon'ble Minister of State (Independent Charge) for Housing & Urban Poverty Alleviation during the Asia Pacific Ministerial Conference on Housing and Human Settlements on 13<sup>th</sup> December, 2006.

**The Vulnerability Atlas of India has been recognised as one of the GOOD PRACTICE by the Technical Advisory Committee of UN-HABITAT under the Dubai Award for Best Practices, 2006.**





## Seismic Vulnerability Reduction of School Buildings of MCD through Retrofitting

The past several years have witnessed destructive earthquakes in various parts of the Indian Subcontinent. These disasters leave behind them a trail of death and destruction. Not only do these earthquakes destroy houses, but they also affect the infrastructure buildings that are meant to play a vital role in the immediate aftermath of the disasters. Delhi, the nation's capital, lies in the Seismic Zone IV, and can witness similar earthquakes.

In the past decade and a half BMTPC has been at forefront in taking up post earthquake vulnerability studies and in promoting the earthquake resistant building technologies, with a special focus on the seismic retrofitting of the existing masonry buildings.

After retrofitting of MCD school in Vasant Vihar, New Delhi, the Council identified 4 multi-story masonry school buildings for the purpose of taking up demonstrative retrofitting work with the help of the MCD. This included two storey school buildings at Ramesh Nagar, Rana Pratap Bag, Sarai Rohilla, and a three story structure at Ram Nagar. All four buildings have been in use for several decades and are being used even today.

Based on the recommendations of Prof. A.S. Arya, National Seismic Advisor, Govt. of India, the retrofitting schemes for all four buildings were evolved.

This was followed by the retrofitting with the help of National Centre for Peoples'-Action in Disaster Preparedness (NCPDP), Ahmedabad.

In the course of retrofitting, an awareness program for around 200 MCD engineers was conducted on the subject with a view to train them in seismic strengthening techniques.

The experience on these four buildings would help people at large and the policy makers in working towards reducing the vulnerability of lakhs of existing buildings through retrofitting of public and private buildings, thus protecting most number of people in case of future earthquakes.



## International Workshop on “Emerging Trends in the Cost Effective Housing Technologies”, 23-25 May, 2007, Bangalore

**B**MTPC in cooperation with International Centre for Advancement of Manufacturing Technologies, (ICAMT-UNIDO) Bangalore organized a three day International Workshop on “Emerging Trends in the Cost Effective Housing Technologies”, from 23-25<sup>th</sup> May 2007, at Bangalore, Karnataka.

The event was attended by 61 delegates from Sri Lanka, Bhutan, Maldives, Nepal, China, U.K. besides India comprising of policy-makers, professionals, experts, scientists, entrepreneurs, etc. in the field of Housing and Building Technologies.

The Address of the Hon’ble Minister of HUPA was read out by Shri S.K. Singh, Joint Secretary (Housing), MoHUPA. The Workshop was inaugurated by Shri D.T. Jayakumar, Hon’ble Minister of Housing, Govt. of Karnataka. Dr. H.S. Anand, Secretary (HUPA) delivered the Keynote Address which set the agenda for the deliberations for three days International workshop. Shri S.K. Singh, Jt. Secretary gave the Welcome Address and presented a broad overview of the Workshop. Dr. P.K. Mohanty, Joint Secretary (JNNURM), MoHUPA, Shri Subir Hari Singh, Principal Secretary (Housing), Govt. of Karnataka and Shri Ashok, Commissioner, KSCB also attended the Inaugural Session of the Workshop.

On this occasion, an exhibition on innovative technologies was also organised and delegates showed keen interest in the Indian technologies.





## Round Table Meeting on Innovations in Building Technologies, 21<sup>st</sup> August 2007, New Delhi

**B**MTPC, is working for transfer of new innovative building materials and technologies from lab to field. Over the last 17 years of its existence, the Council has built up close relation with CSIR labs and related institutions. With the challenge of fulfilling the need of shelter for all, specially for economically weaker section of the society and those below poverty line and protecting environment from global warming and green house effect, it was felt that to take stock of the innovations going on at R&D stage with different institutions, the Council should organise a “Round Table Meeting on Innovations in Building Technologies”, The meeting was organised on 21<sup>st</sup> August 2007 at New Delhi.

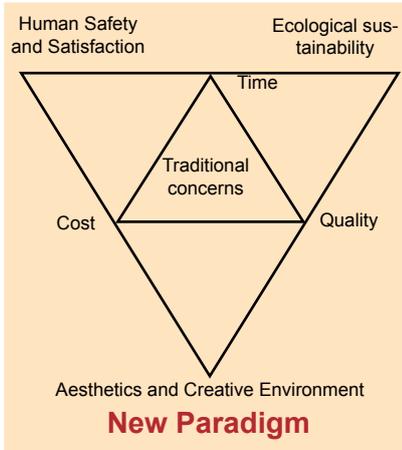
The meeting was inaugurated by Kumari Selja, Hon’ble Minister of State (Independent Charge) for HUPA. The Keynote Address was delivered by Dr. H.S.Anand, Secretary (HUPA) and Shri S.K. Singh, Jt. Secretary (H) also addressed the august gathering. The meeting was attended by representatives of 24 institutions comprising different R&D institutions, private sector organizations etc. Day long meeting covered various aspects of innovations in building materials sector. Based on the meeting, recommendations were framed for planning of BMTPC’s future Action Plan.



# Safety of Structures and Construction

A.K.Jain\*

**T**ime, quality and cost have always been the traditional factors in the management of construction projects. Today a new value system is emerging which is enveloping these traditional concerns. These are – human safety and satisfaction, ecological sustainability and aesthetics by creation of a visually pleasing, compatible built environment.



Safety in buildings and construction can be seen in different ways, viz. safety during construction process, safety of structure and safety during occupation and use of the buildings. There are several elements which concern the aspects of safety.

## Safety during Construction Process

- Securing construction sites from accidents, threats, hazards, thefts and entry of unauthorised visitors etc.
- Safety of people, property, traffic and environment in the vicinity of site.
- Safety regulations, specifications, code and enforcements.
- Safe work practices and performance evaluation.
- Process hazard assessment.
- Safety of transportation, material movement and construction machinery, electric equipments and tools, including their maintenance.
- Communications, lighting and public address/warning system.
- Operational procedure, manuals and instructions.
- Insurance and medical cover.
- Accident Investigation System.
- Safety gear for workers/supervisors.
- First-aid, medical help, accident and trauma treatment.
- Materials management (including security, storage and transport).
- Safety audit.

## Training and awareness.

### Safety of Structures

- Structural design, specifications, standards and codes.
- Safety system, performance evaluation and managements
- Fire safety, lifts, escalators, power system, cables, building services, etc.
- Access for disabled.
- Emergency preparedness, response, rescue and operational control.
- Operational procedure, manuals and instructions.
- Communications, lighting and warning systems,
- Insurance and medical cover.
- Maintenance, safety audit and inspections.
- Safety Management Information System (MIS).
- Safety drill, training and awareness.
- Continuance of relevant safety practices initiated during the construction process.

### Occupational Safety

- Hazard assessment.
- Operational procedures, manuals and instructions
- Fire safety, lifts, power system, cables, escalators, etc.
- Safe storage of hazardous goods, chemicals, gases,

\* Commissioner (Planning), Delhi Development Authority  
E-mail: akjain@del3.vsnl.net.in



- etc.
- Emergency planning, rescue and response.
- Access for disabled.
- Risk Management and Insurance.
- Occupational health safety.
- On the job and off the job safety.
- Building maintenance, services management and inspections.
- Checks, supervision, commitment and accountability.
- Safety Information and Warning System.
- Safety audit.
- Training and awareness.
- Continuance of relevant safety practices taken up during planning, design and construction including periodic check of the structure, equipment, services, communications, safety MIS, certification, etc.

### Potentially Hazardous Buildings

A hazardous building is that presents a potential for life loss or serious injury when an accident occurs. Types of buildings considered to potentially hazardous include:

- Concrete frame buildings without special reinforcing;
- Pre-cast concrete buildings, including pre-1973 built-up structures;
- Soft-storey buildings (those with the lower story lacking adequate strength or toughness);
- Buildings with pre-stressed concrete elements and/or post-tensioned concrete slabs;
- Steel frame or concrete frame buildings with unrein-

- forced masonry walls;
- Reinforced concrete wall buildings with no special detailing or reinforcement;
- Unreinforced masonry wall buildings with wood or pre-cast concrete floors;
- Theatres and auditoria having long span roof structures;
- Large unengineered wood frame buildings;
- Buildings with inadequately anchored exterior cladding and glazing;
- Buildings with poorly anchored parapets and appendages;

Often the common failures of a structure are the following:

- Roof sheets or tiles fly off.
- Joints and connections are broken.
- Anchorage of roof gets broken and whole roof collapses.
- Frames collapse due to joint failures.
- Corners splaying
- Bulging of walls
- Diagonal cracks in the walls
- Diagonal cracks from corners of openings
- Cracks wherever materials change
- Delamination of plasters
- Walls and columns giving because of roof load

It is generally not the natural hazard per se that kill people; rather unsafe buildings and construction that lead to loss of life and property. For ensuring safe construction, the following are the imperatives:

- Site selection, planning and architectural design
- Engineering and technologies that are cost effective,

- environment friendly, ecologically appropriate, energy saving and locally relevant
- Codes, specifications, regulations and enforcement

### SITE SELECTION CRITERIA

#### Access

- Proximity and condition of local road infrastructure
- Proximity to facilities, fire stations, hospitals, dispensaries, service infrastructure
- Proximity to bus stands, transport kiosks
- Constraints and vulnerability

#### Site conditions

- Topography and site gradients should be sufficient for drainage while being habitable for the expected density of occupation. The appropriate maximum site gradient depends on soil conditions, vegetation and possible drainage and erosion control measures, which need to be taken into consideration in order to prevent flooding and mudslides. The ideal gradient is between 2% and 4%.
- Ecology, agriculture, sub soil water, plantation, etc.
- Natural hazards including earthquakes, volcanic activity, landslides or flooding.
- Permeability of the ground.
- Micro-climatic conditions.

#### Services

- Availability of sufficient drinking water within a suitable distance throughout the year
- Height of the water table, whether it risks pollution by

sanitation and flooding, and seasonal variations.

- Wastewater disposal and treatment
- Sanitation, sewerage, energy and power supply

### Space

- Whether there is sufficient space for the desired density of the population
- Whether there is space for extension
- Land use and development parameters and norms

### Topography

- Look for gentle slopes (1 per cent minimum for gravity water distribution and upto 5-6 per cent) with natural drainage.

**Land ownership** and possibility of acquisition of additional land for future expansion.

### Soil Type

- The soil type affects sanitation, water pipelines, road and building construction, drainage and the environment.

### Planning Mandate:

It is necessary to incorporate mandatory planning provisions in the city plans. Land use and Town Planning are the important aspects of disaster mitigation, prevention and management. Safety and disaster management, for the first time, have been incorporated in Master Plan for Delhi-2021 (MPD-2021), as given below:

According to the Indian Seismic Zone map, Delhi is placed in Seismic Zone IV, which means high damage risk zone. In the past, several earthquakes of

Richter magnitude 5.5 to 6.7 have occurred in the National Capital Territory of Delhi. Two major lineaments, namely Delhi-Haridwar ridge and Delhi-Muradabad faults pass through the territory, both having potential of generating earthquakes of the magnitude upto 6.5 to 6.7 in future. Such natural and man made disasters neither can be prevented nor predicted. However, with the technological advancement to some extent mechanism can be developed to mitigate the after effects of the disaster. Areas of vulnerability can be identified and necessary measures can be proposed by the concerned agencies. The concerned local bodies should keep updating the building byelaws to safeguard against disasters and ensure effective and impartial enforcement. Following policies and strategies for disaster management are proposed :

### 1. Pre-Disaster Preparedness

- a) Micro-zonation surveys should be referred for land use planning and be considered while preparing the Zonal Plans and Layout Plans.
- Seismic micro-zonation for selected areas having high growth rates should be taken up on priority.
- On the basis of vulnerability studies and hazard identification, which includes soil conditions, probable intensity of earthquake, physiographic conditions of the area, fault traces, etc., local level land use zoning and planning should be undertaken.

(b) Building bye-laws should incorporate the aspects of Multi Hazard Safety, and Retrofitting.

- Priority should be given to public buildings (such as hospitals, educational, institutional, power stations, infrastructure, heritage monuments, lifeline structures and those which are likely to attract large congregation) for their ability to withstand earthquake of the defined intensity.
- Suitable action should be taken for retrofitting and strengthening of structures identified as vulnerable as per earthquake manuals and National Building Code. A techno-legal regime has to be adopted for provisions on Multi Hazard Safety aspects.
  - Delhi Fire Services being the nodal agency for disaster management should identify vulnerable areas such as areas with high density and poor accessibility in the city and propose suitable measures. Proposed Disaster Management Centres should be established in every zone to deal with the disasters, including bio-chemical and nuclear disasters.
  - Sensitize people, particularly school children, about after effects of disaster.
  - Make people aware through media campaigns and advertisements about emergency procedures and location of emergency shelters etc.

### 2. Post Disaster Management

- It has been observed that any



disaster is generally followed by break down of communication lines and disruption of essential services. Therefore, the key communication centres should be protected from natural disasters i.e. flood, fire and earthquake etc. and services restoration should be taken up on top most priority. Necessary set-up should be created in each of the concerned department for such eventualities.

- (ii) Standard type designs and layout should be prepared by the local bodies and made available to the people so that crucial time is not lost in approval of layout plans and building plans after disaster. Disaster Management Centres have been proposed to serve people in the case of disaster and provide emergency shelters.

### Engineering and Construction

The major areas of damage are the walls and roof. According to the Building Materials and Technology Promotion Council (BMTPC), the following matrix provides a guideline of probability of damage for various type of roofs and walls.

It is necessary to understand that the loss-susceptibility is an aspect of building and construction types and it largely varies with the ground/geological/sub-soil conditions (Tables 2, 3, & 4). A building infrastructure schedule for a District should be prepared to meet the damage risk to buildings. For this the format developed by the BMTPC provides a comprehensive guideline.

Apart from the information on vulnerable buildings, the

following aspects need due consideration for hazardous buildings survey:-

- i) Visual description of failures of structures
  - ii) Type and quality of soil strata including level of water-table
  - iii) Type and quality of materials used in construction
  - iv) Local level of workmanship/construction techniques available
  - v) Terrain and topographic details
  - vi) Size and shape of the structure
  - vii) Age of the structure
  - viii) Distance to the roads and nearest highway
  - ix) Engineering details of the structure, construction drawings
  - x) Observed/inferred mechanisms of failure
- Most of the housing in our

**Table - 1 : Vulnerability of Buildings to Hazards**

Category(Type of Wall and Roof)	EQ Intensity MSK				Wind Velocity m/s				Flood		
	> IX	VIII	VII	< VI	55 & 50	47	44 & 39	33	Prone	Prote-cted*	Out-side**
A1 Mud wall (All roofs)	VH	H	M	L	VH	H	M	L	VH	M	L
A2 a Unburned Brick Wall (Sloping roofs)	VH	H	M	L	VH	H	M	L	VH	M	L
A2 b Unburned Brick Wall (Flat roofs)	VH	H	M	L	VH	H	M	L	VH	M	L
A3A Stone Wall (sloping roofs)	VH	H	M	L	VH	H	M	L	VH	M	L
A3.b Stone Wall (Flat roofs)	VH	H	M	L	H	M	L	L	VH	M	L
B.a Burned Brick Wall (Slopping roofs)	H	M	L	VI	H	M	M	L	H	L	VI
B.b Burned Brick Wall (Flat roofs)	H	M	L	VI	M	L	L	VI	H	L	VI
C1 a Concrete Wall (Slopping roofs)	M	L	VI	NII	H	M	M	L	L	VI	VI
C1 b Concrete Wall (Flat roofs)	M	L	VI	NII	L	VI	VI	VI	L	VI	VI
C2 Wood Wall (All roofs)	M	L	VI	NII	VH	H	M	L	H	M	VI
C3 Fkra wall (All roofs)	M	L	VI	NII	VH	H	M	L	H	M	VI
X1 GI and other metal sheets (All roofs)	M	VI	NII	NII	VH	H	M	L	H	M	VI
X2 Bamboo, Thatch, Grass, Leaves, etc. (All roofs)	M	VL	NIL	NIL	VH	VH	H	L	VH	M	L

\* With probability of more severe damage under failure o protection works\*\* The local damage may be more severe under heavy rains

#### Building Category

Category-A : Buildings in field stone, rural structures, unburnt brick houses, clay houses

Category-B : Ordinary brick buildings, building of the large block and prefabricated type, half-timbered structures, building in natural hewn stone

Category-C : Reinforced building, well built wooden structures

Category-X : Other types not covered in A,B,C. These are generally light.

**Table-2: Earthquake loss-susceptibility data for different construction types (MM = modified Mercalli scale) (from Degg. 1992)**

S.No.	Construction type	Average damage(%) at intensity (MM):				
		VI	VII	VIII	IX	X
1	Adobe	8	22	50	100	100
2	Unreinforced masonry, non-seismic design	3.5	14	40	80	100
3	Reinforced concrete frames, non-seismic design	2.5	11	33	70	100
4	Steel frames, non-seismic design	1.8	6	18	40	60
5	Reinforced masonry, medium quality, non-seismic design	1.5	5.5	16	38	66
6	Reinforced concrete frames, seismic design	0.9	4	13	33	58
7	Sheer wall structures, seismic design	0.6	2.3	7	17	30
8	Wooden structures, seismic design	0.5	2.8	8	15	23
9	Steel frames, seismic design	0.4	2	7	20	40
10	Reinforced masonry, high-quality seismic design	0.3	1.5	5	13	25

**Table-3: Seismic intensity increments.**

Ground conditions	Reid (1908)	Medvedev (1965)
Granite	0	0
Limestone, sandstone	0 – 1.2	1 – 1.5
Gravel	1.2 – 2.1	1 – 1.6
Sand	1.2 – 2.1	1.2 -1.8
Clay	1.5 – 2.0	1.2 – 2.1
Fill	2.1 – 3.4	2.3 – 3.0
Wet gravel sand Clay	2.3	1.7 – 2.8
Wet fill	3.5	3.3 – 3.9

**Table-4: Average changes in intensity associated with different types of surface geology (from Degg. 1992)**

Subsoil	Average change in intensity
Rock (e.g. granite, gneiss, basalt)	-1
Firm sediments	0
Loose sediments (e.g. sand, alluvial deposits)	+1
Wet sediments, artificially filled ground	+1.5

**Table -5**

Category of Damage	Extent of Damage	Remedial Measure
A. Slight Non-structural Damage	Fine cracks in plaster, fall of small pieces of plaster	Only architectural repairs needed
B. Moderate Structural Damage	Small crack in walls fairly large pieces of plaster states slip off, cracks in parapet, walls	Architectural repairs requesting to achieve durability.
C. Heavy Structural Damage	Large and deep cracks in walls, chimneys fall, load carrying capacity of the building is partially reduced.	Building needs to be vacated and reoccupied only after structural restoration and seismic strengthening.
D. Severe Structural Damage	Gaps in walls, parts of buildings may collapse separate parts of building lose cohesion and show relative movement, inner walls collapse. Approx. 50 per cent of the main structural elements fail	Building has to be vacated. Either the building has to be demolished or extensive structural restoration and seismic strengthening work has to be undertaken.
E. Collapse	Total Collapse of building	Clearing site and reconstruction



country is built by people themselves with the help of semi-skilled artisans; i.e., non-engineered construction, which need special attention being hazard and accident prone.

The categorization of various buildings helps to identify the extent of damage and strategy for redevelopment is given in Table-5.

### Key Elements of Safe Construction:

- A – Anchorage
- B – Bracing
- C – Connections
- D – Detailing
- E – External Environment

Retrofitting of existing buildings and structures should be undertaken in the following priority:

#### a) Public Buildings:

- i) Educational : Schools, Colleges, Libraries, etc.
- ii) Health : Hospitals, wards, clinics, etc.
- iii) Essential Service : Telephone exchange, Fire Stations, Water Supply pumps Houses, Power Houses, etc.
- iv) Congregation : Cinemas, Theatres, Auditoria, religious buildings, etc.
- v) Administrative : Offices and staff residences
- vi) Monuments
- vii) Critical hazardous Industries (to prevent collateral chemical hazards)

#### b) Other Critical Structures:

These include those essential to water supply, transportation and communication.

#### c) Suggested Actions:

- i) Government initiative in re-

gard to the buildings in the government sector.

- ii) Incentives for Public and Private Sectors, such as, adjustment of insurance premia.
- iii) Models and prototypes illustrating retrofitting techniques for different building types.
- iv) Incentives and Disincentives for the general public to motivate retrofitting of their homes, along with loan or loan-cum-subsidy schemes.
- v) Technology Transfer for unorganized and informal sectors.

### Lifeline and Temporary Shelters:

In the event of a disaster it is essential that rescue shelters are available for taking temporary refuge and for treating the injured. It has to be ensured that the community asset buildings and social infrastructure such as schools and hospitals are designed with provisions to serve the dual purpose of serving as rescue shelters. It is also advisable to adopt more stringent norms in the design and construction of these public buildings so that they would be able to withstand even disaster of intensity a level higher than the estimated vulnerability. The key lifelines such as, major roads, rail-lines, helipads, airports, jetties and communication systems in the vulnerable areas need to be designed, strengthened and retrofitted in advance to ensure uninterrupted access in the event of a disaster. For construction, reconstruction and repair of buildings, the following are the critical considerations:

### Foundation:

- Desist from Foundations in loose sand, soft silt and expansive clays, it is necessary to provide a rigid raft foundation or piles resting on a firm stratum wherever unavoidable.
- Soil improvement measures for lighter buildings could be taken up through sand piling and soil stabilization.
- Individual footings or pile caps need to be connected together by RCC ties of prescribed reinforcement, below plinth level in at least two directions at right angles to each other.

### Super Structure

- Buildings in earthquake prone zones classified into categories from A (best case) to E (worst conditions) based on location and seismic coefficients.
- Simple structural systems and diagonal bracings in the vertical panels of steel or concrete frames to withstand the seismic forces.
- Construction as light weight as possible.
- Avoid mud and rubble masonry in highly seismic areas
- Well-braced timber framed structures and light-weight materials to prevent loss of life and property due to falling debris.
- Precaution against chain effects, such as, landslides, floods, fires and disruption to communications.
- Separation sections in buildings asymmetric in plan, elevation or mass.
- To ensure a structural equilibrium of flexibility and rigidly

by transferring stresses to adjacent structures and use structures for their 3D performance.

### Walls

- For brick or Laterite stone masonry in mud mortar, provide damp-proof course at plinth level to stop upward seepage of pore water.
- Eaves projection of minimum 50 cm. to protect walls from driving rain.
- Water-proof plaster using bitumen cut-back and kerosene oil on outer face of walls.
- Free standing boundary wall to be checked against overturning
- For brick work in mud mortar, the minimum wall thickness should be 9 inches in single storeyed construction; could be varied from single brick in the top storey to 1.5 brick thickness in bottom storeys in construction upto 3 floors.
- Walls to be reinforced with reinforced concrete bands.
- Wooden beams of two parallel pieces with cross elements as alternative to RC Bands.
- Load bearing walls not recommended above four storeys and beyond a height exceeding 15 m.
- Wall corners to be strengthened; proper bonding by stepped or toothed joints. Care has been taken to reinforce the corners of walls and buttresses using alternating bands of thin bricks and stones because of irregular shape and non-availability of large sizes, of vulnerable points like corners, thin bricks

may be used instead for efficient bonding. Thin bricks may be used instead for efficient bonding. Thin bricks act like a tying element with respect to the volume of masonry. It act like fibers reinforcing the volume wherever used. Stone can be used mainly in infill walls.

- Instead on bricks, in a few places, pressed large pieces of stone can be used at corner of building.
- Good masonry with proper interlocking and bonding wherever necessary.
- Use of thin fired bricks for a better structural performance of the wall. Use of earthquake resistant features as prominent details in the building system. Diagonal stone masonry performs best during earthquakes.

### Non-engineered Buildings

- Hand-formed walls tapering upwards keeping the minimum thickness 300 mm at top and increasing it with a batter of 1:12 of bottom.
- Footing and Masonry wall above foundation up to plinth level to be built of stone or fired brick in cement lime mortar.
- Height of plinth above High Flood level (min. 30 cm. above Ground)
- Waterproofing layer of waterproof mud using bitumen cut-back or heavy/thick polythene sheet at plinth level.
- For strengthening of existing masonry, in the case of damaged wall and floor diaphragms, steel mesh could be provided on the outside of the surface and nailed or

bolted to the walls. It then be covered with plaster or micro-concrete.

### Monitoring Cracks

#### (a) Sticking Paper Across the Cracks

Strong paper of size 2" x 6" should be stuck across the crack with strong glue. The paper should be kept tight along the length and the width, if the wall is still settling the paper will tear. This method is good for interiors only.

#### (b) Marking Minor Cracks By Pencil Line

With help of ruler and pencil, draw a straight line across the crack. If the pencil line on either side of the crack gets misaligned, the wall is settling.

### Grout or Epoxy Injection in Existing Weak Walls

For cracks wider than 6 mm or for regions in which the concrete masonry has crushed, a treatment other than injection is indicated. The following procedure may be adopted:

- (a) The loose material is removed and replaced with expansive cement mortar, quick setting cement or gypsum cement mortar.
- (b) Where necessary, additional shear or flexural reinforcement is provided in the region of repairs. This reinforcement could be covered by mortar to give further strength as well as protection to the reinforcement.
- (c) In area of very severe damage, replacement of the member or portion of mem-



ber can be done.

### Wooden Members and Joints

Since wood is an easily workable material, it will be easy to restore the strength of wooden members, beams, columns, struts and ties by splitting additional material. The weathered or rotten wood should first be removed. Nails, wooden screws or steel bolts will be most convenient as connectors. It is advisable to use steel stars to cover all such splices and joints, to keep them tight and stiff.

- All poles and posts to be properly anchored into the ground or reinforced cement footing.
- Alternatively, the posts with cross members connected at the lower end be embedded in ground to a minimum depth of 75 cm..
- For earthen buildings, lintel band and roof band to be provided wherever height of wall exceeds 2.5 m. Unfinished rough-cut or sawn lumber with diagonal bracing could be used for the bands.
- Iron-straps with sufficient nails/screws for elongation of bands to ensure strength at the joints.
- Collar beam to cover the buttresses where pilasters or buttresses are used at corners or T-junctions.
- Diagonal struts at corners for further stiffening of the collar beam

### Staircase

- Interconnection of the stairs with adjacent floors should be appropriately treated by providing sliding joints to

prevent bracing effect on the floors.

- Alternatively rigid walls enclosing the sides of the stair or stairs separated by a gap from the floor slab with provision of tread plate.

### Openings:

- Opening at any level to be small with continuous lintel band.
- Length of openings not to exceed  $3/5^{\text{th}}$  to half wall-length between adjacent cross walls
- Offset from inside corner of the external wall to the outer edge of the opening 22 to 45 cm
- Minimum pier width between consecutive openings 34 cm to 56 cm.
- Minimum vertical distance between openings one above the other 60 cm.
- Openings not compliant with requirements to be strengthened by provision of RCC Band or reinforced brickwork.
- Arches to span openings not ideal in seismic areas unless steel ties are provided.
- Both lintel and sill stones of windows have a bearing at least 6" on each side. This prevents diagonal cracks originating at the corners.
- Width of all openings should not exceed one-third of total length of a wall.
- Minimum pier widths should be 600 mm and the openings in any storey shall continuous lintel band
- In earthen buildings, the width of a door or window not greater than 1.2 m, with not more than one opening in a

wall.

- The minimum offset between an inside corner and the opening should be not less than 90 cm.
- In earthen buildings, in order to prevent suction of the roof from inside, it is advisable to have openings less than 5 per cent of wall area.

### Retrofitting of Old Buildings

Usually existing old buildings are more prone to damage due to the fires, structure failure, overloading, cyclones and floods. The first and premost need is to save them from falling down. For this bracing, scaffoldings and buttressing are required to provide support. Following guidelines, developed by Indian Trust for Arts and Cultural Heritage (INTACH) are handy:

- In cracked external corners place wooden planks across the crack and then support the planks with wooden members.
- Do not prop the damaged wall at the parapet level, it may cause more damage.
- Propping in a single storied structure support at ceiling level. Use supports at different levels if necessary.
- In two storeyed structures use jute bags filled with rubble or sand till the lintel level of the ground floor and then use the planks and the wooden supports. Use folded jute bags at the end of the support. At the corner of the wall use supports at various levels.
- Long lengths of damaged walls can be supported using rubble masonry of regular stones at regular intervals along the length of the wall.

- Mud mortar could be used.
- Jute or plastic bags filled with rubble or sand collected on site can also be stacked at intervals to support the walls.
- Do not support the arches at the center or along the curve.
- Support them at the spring point of the arch. Use wooden supports. In case of metal support use folded gunny bags at the end of the support.
- In a column-beam situation, support the beam in the middle with either a masonry pillar or stacking sand filled jute or plastic bags.
- If a flat ceiling is being supported with wooden or metallic supports, do not forget to use folded jute bags at the end of the support.
- For tall tower like structures erect a wooden scaffolding all around and carefully remove all the loosely hanging elements. In case you are dismantling arches, do not remove the keystone.
- On roofs tie the loose damaged parapet with GI wire (Galvanized Iron). Collect the rubble either at the corners or on the periphery. Do not stack in the middle of the slab or on the cracks. Too many people should not get on the top of a damaged roof at the same time.

### **CODES OF STRUCTURAL DESIGN AND SAFETY**

The structural design of foundation, masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete and structural steel be carried out in accordance with Part-VI structural

design, section-1 loads; section –2 foundation; section-3 wood; section-4 masonry; section-5 concrete; section-6 steel; of National Building Code of India, taking into consideration the Indian Standards for safety from structural failure, fires, earthquake, cyclone/windstorm and floods.

The following codes, specifications and guidelines that can be referred to for planning, for taking up retrofit measures and for designing new constructions in hazard prone areas:

1. The Atlas and Guidelines prepared by the Expert Group on Natural Disaster Prevention, Preparedness and Mitigation constituted by Ministry of Urban Affairs and Employment and published by Building Materials and Technology Promotion Council (BMTPC), New Delhi;
  - 1.1 Vulnerability Atlas of India, 1997, BMTPC, New Delhi.
  - 1.2 Techno-legal Aspects of Earthquake, Windstorm and Flood Hazards and Land use Zoning, "1998, BMTPC, New Delhi.
  - 1.3 "Land Use Zoning in Hazard Prone Areas related to Earthquakes, Wind Storms and Flood Hazard – Guidelines", 1998, BMTPC, New Delhi.
  - 1.4 "Improving Flooding Resistance of Housing – Guidelines", 1998, BMTPC, New Delhi.
  - 1.5 "Improving Wind/Cyclone Resistance of Housing – Guidelines", 1998, BMTPC, New Delhi.
  - 1.6 "Improving Earthquake

Resistance of Housing – Guidelines", 1998, BMTPC, New Delhi.

2. **For General Structural Safety**, the following codes published by Bureau of Indian Standards (BIS) New Delhi are to be referred;

- 2.1 IS: 1905-1987 "Code of Practice of Structural Safety of Buildings : Foundations", 1995.
- 2.2 IS:1904-1978 "Code of Practice of Structural Safety of Building : Foundation", 1995
- 2.3 IS: 465-1978 "Code of Practice for Plain and Reinforced Concrete", 2000.
- 2.4 IS:800-1984 "Code of Practice for General Construction in Steel", Feb., 1985
- 2.5 IS:883-1966 "Code of practice for Design of Structural Timber in Building", March, 1967.

3. **For Earthquake Protection**

- 3.1 IS:1983-1984 "Criteria for Earthquake Resistant Design of Structures (Fourth Revision)", June 1986
- 3.2 IS: 13920-1993 "Ductile Detailing of Reinforced concrete Structures subjected to seismic Forces – Code of Practice", Nov. 1993.
- 3.3 IS:4326-1993 "Earthquake Resistant Design and Construction of Buildings – Code of Practice (Second Revision)", October 1993.
- 3.4 IS:13828-1993 "Improving Earthquake Resistance of Earthen Building" – Guidelines, October, 1993.
- 3.5 IS:13827 – 1993 "Improving earthquake Resistance of Earthen Building" – Guide-



lines, October, 1993.

- 3.6 IS: 13935-1993 “Repair and Seismic Strengthening of Buildings” – Guidelines, Nov. 1993.

#### 4. For Cyclone/Wind Storm Protection

- 4.1 IS:875(3)-1987 “Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Part 3, Wind Loads”, Bureau of Indian Standards, Feb. 1989.

### CONCLUSION

Frequent disasters on one hand, and global competition on the other, are driving pursuits towards better safety management of buildings. This is aided by high accident costs, social awareness and judicial activism. There is a need to adopt an integrated approach towards safety which addresses the issues, problems and concerns on a sustainable basis. Safety on construction is not just an add-on management issue, but SAFETY FIRST should be the starting point, which comprises of a cycle of parameters and planning to prevention, mitigation, preparedness, emergency reconstruction and review.

### References:

- Arya, A.S, “Long Term Measures for Earthquake Protection Uttarkashi Area of Uttar Pradesh, India” Memoir 30, Geological Society of India, Bangalore, 1995.
- Bureau of Indian Standards – National Building code and Various Standards, New Delhi.
- Building Materials and Technology Promotion Council, (1997), Vulnerability Atlas of India, New Delhi, and other Publications.
- Chaturvedi, Pradeep (Editor), 2005, Seminar Proceedings – Managing Safety: Challenges Ahead, Institution of Engineers, (India) New Delhi. Concept Publishing Company, New Delhi.

### UN HABITAT : 21<sup>st</sup> Governing Council Meeting



UN-Habitat is an important organ of the UN system responsible for dealing with all issues relating to human settlements. It is mandated by the UN General Assembly to promote socially and environmentally sustainable towns and cities with the goal of providing adequate shelter for all.

The 21st session of the Governing Council of the UN Habitat was held at Nairobi, Kenya from 16th to 20th April, 2007. The theme was on ‘Sustainable Urbanization local action for urban poverty reduction with emphasis on finance and planning. Kumari Selja, Hon’ble Minister of State (Independent Charge) for Housing and Urban Poverty Alleviation was unanimously elected as President of the Governing Council for a two year term. Till date, this is the highest recognition India has received at UN Habitat with the two year term (2007-2009) as President of the Governing Council.

Hon’ble Minister, during the above meeting was also elected as the Chairperson of the Commonwealth Consultative Group on Human Settlements (ComHabitat). Furthermore, Kumari Selja holds the position of Chairperson of the Bureau of the Asia Pacific Ministers Conference of Housing and Urban Development (APMCHUD) and also represents Asia in the Commonwealth Local Government Forum’s Conference.

Source: <http://mhupa.gov.in>

- Delhi Development Authority, (2007), Master Plan for Delhi-2021, New Delhi.
- Jai Krishna, A.S. Arya, Krishan Kumar, “Importance of Isoforce Lines of an Earthquake with special Reference to Koyna Earthquake of December 11, 1967”, Proc. 4<sup>th</sup> Symp. EQ Engg., Roorkee, November 14-16, 1970.
- Girarder, Herbert, “Sustainable Cities – A Contradiction in Terms”, Architectural Design.
- Govt. of NCT Delhi, (2006), Delhi Human Development Report-2006, Oxford, New Delhi.
- Government of India (2007): The Twelfth Five Year Plan, the Planning Commission, New Delhi.
- Government of India (2007): Urban National Housing and Habitat Policy, Ministry of Urban Affairs and Employment, New Delhi.
- ISO-9000 and ISO-14001 Compendiums.
- Jain, A.K., (2007), Handbook on Disaster Management, Pragun Publication, Delhi.
- Jain, A.K., (2001): Ecology and Natural Resource Management, Management Pub. Co., Dehradun.
- Jain, A.K., (2005): “Emergency Planning and Shelter for Safety”, Inst. Of Engineers Seminar, New Delhi.
- Levitt Bernstein Associates, (1978): “Supervisor’s Guide to Rehabilitation and Conversion”, The Architectural Press, London.
- Murty, C.V.R. & Indian Inst. Of Technology, How to Reduce Earthquake effects on Buildings, Kanpur, IITK-BMTPC Earthquake Tips, Kanpur.
- NCR Planning Board, Govt. of India, (2005), NCR Plan – 2005, New Delhi.
- Pelling, Mark (2003), “Natural Disasters and Development in a Globalising World”, Routledge. London.
- UN-Habitat (2002), Habitat Debate-Towards Women Friendly Cities, Nairobi.

# Sanitation - To improve quality of Life in slums



**Dr. Bindeshwar Pathak\***

**T**he urban population in developing countries is increasing at a very fast rate. India is not an exception to it. Urban population in India was about 330 million in 2001, which was the total population of the country at the time of its independence. The main reason for increase in urban population is migration of people from rural to urban areas. Due to limited capacity of rural economy and attraction of better employment opportunities in urban areas, the migration of population from rural to urban centers has become very fast. By 2025, India's urban population is projected to reach 50% mark. Indian cities will then be among the densely populated cities in the world.

The concept of slums and its definition vary from country to country depending upon their socio-economic conditions. In India, the slums as defined in section 3 of the Slums Areas (Improvement and Clearance) Act 1856 are those areas where buildings.

- (i) are in any respect unfit for human habitation,
- (ii) are by reason of dilapidation, over-crowding, faulty arrangements of streets, lack of ventilation, light or sanita-

tion facilities or any combination of these factors which are detrimental to safety, health and morals.

As per survey\*, slum population in urban areas in India was 15.4% of total urban population in 1991. Delhi, Maharashtra, Andhra Pradesh, Karnataka and West Bengal were 5 states where more than one-fifth of urban population was living in slums. Delhi, capital of our country, tops them with as high as 28.4% and the second was Maharashtra with 26.8%.

It will be interesting to note that nearly two-third slum houses in the country had unauthorized electricity connections and 60% of the slums are located in areas which are subjected to water logging during rains. This survey also indicates that 39% of the slums are located on private land and the remaining 61% on public land, of which 37% are on land owned by municipalities.

In order to make "a city a just city", we should first analyse the conditions which give rise to creation of slums and also deliberate how to improve the quality of life in existing slums.

The emergence of slums in urban areas is the direct outcome of greater economic activities and industrialization, which attract people from smaller settlements and rural areas. The migrants finding shortage of developed land for housing, the prices of land beyond their reach, settle down on vacant lands near railway tracks, river and nala banks, other low lying areas which are mostly owned by municipalities or Government. Availability of land being limited, they become overcrowded.

The slums described as jhuggi-jhoupadies are usually characterized by dilapidated and infirm housing structures, absence of latrine facilities, paucity of safe drinking water, zigzag narrow streets, poor ventilation, inadequate lighting, water logging and flooding during rains, dumps of garbage, stagnation of waste water and non-availability of basic physical and social services resulting in foul environment and unhealthy living conditions. The sub-human conditions give rise to ill health, social evils such as anti-social behaviour, drug and

\* Source: Government of India, Slums in India, NSS Report No. 417, September, 1997



alcohol abuse, socio-cultural and legal problems. Most of the slum dwellers work in the informal sector as petty hawkers, daily wage earners, labourers, domestic workers, labourers in industrial units or construction sector, cycle-riksha pullers, rag pickers etc. Their income is low partly because of their low educational and skill levels and partly of the unorganized nature of their work.

Over the years, there has been progressive deterioration in the quality of life in urban areas, because the basic infrastructure facilities like water supply, sanitation, drainage, refuse collection, electricity, transport and housing etc. are not able to keep pace with the growth of population due to many reasons. The gap between the demand and supply of these services is continuously widening. Due to ill health and low productivity slums which form a large section of urban population, are unable to participate in developmental activities. Hence to make cities safe and for their all round development, they should be transformed into vibrant community.

It has been universally recognised that for better economic growth rate and higher productivity, emphasis has to be laid on protecting and promoting the health of the people for which provision of basic facilities like water supply and sanitation are necessary. The absence or inadequacy of water supply and sanitation affects all, but more the poor who suffer the most because they lack not only the means to have such facilities, but also live under conditions

which expose them to several health hazards.

Insanitation has wide spread effects- water courses get polluted, incidence of diseases rises affecting billions of people all over the world, labour force is affected, productivity of industry and agriculture falls putting stress on budgetary resources needed for development and to strengthen the economy. Insanitation results in millions of child deaths every year in developing countries. Countless man-days are lost from schools and tremendous deficiency in growing children occurs.

It is the primary responsibility of the local authorities to look after sanitation in their areas. Almost all the local bodies are entrenched with the problem of lack of finances and other resources in governance and management of the basic services of sanitation and health. The demographic, economic, spatial and environment changes, poverty and socio-cultural diversity compounded by institutional and managerial weaknesses have resulted in lack of sanitation facilities to half of the urban population. These issues can best be addressed primarily by capacity building at local bodies level in the areas of financial management, asset management, preventive operation and maintenance.

Poor institutional framework with fragmented responsibilities often contribute to inadequate measures of sanitation. In matter of resource allocation, sanitation receives only a mini-scale proportion of resources. To complicate the problem further, often such technological

options are suggested which are both unacceptable and unaffordable. Consumers are often taken for granted when technology choices are specified. The socio-cultural, financial and physical conditions are not given due attention. Poor promotion techniques fail to attract the target group.

The development planning and control mechanism in most of the urban areas is either absent or so adhoc that unplanned urban extensions are being added to each city without any infrastructure. Unplanned growth is accompanied by wide spread poverty, marginalisation and neglect of children who are forced to work to fetch some income to the family. Besides this, there is inadequacy of social services such as proper schools for education, health-care units etc.

If immediate steps are not taken, situation would deteriorate further by coming up of *more* slums. Therefore for making "a safe city a just city", appropriate measures should be taken to stop emergence of new slums. For this, the strategy should be:

- i) to assess number of people belonging to economically weaker section and below poverty line, likely to migrate in a town,
- ii) to prepare development plan for each town identifying appropriate locations for settlement of migrant population,
- iii) To make available plots and houses with complete infrastructure development to migrants at affordable price,
- iv) Since financial position

of local authorities is very poor, necessary funds should be made available to them by government and financing institutions for development of plots, construction of houses and provision of infrastructure facilities,

- v) The owners of vacant lands specially the local bodies, development authorities, railways and other government agencies should remain vigilant that land belonging to them is not encroached upon,
- vi) Easy accessibility to schools for imparting quality education to the children,
- vii) Easy accessibility to medical facilities,
- viii) The economically weaker section think that more children means availability of more income earning members. This perception has to be changed. They should be made aware of the advantages of a small family with one or two children,
- ix) Programme for vocational training should be taken up to improve the income of migrant families.
- x) Most of the migrants are illiterate and not aware of importance of safe water supply and sanitation. Health education and awareness programme should commence and women group be organized in each habitat to enable them to actively participate in development activities.

### **Environment Improvement in Slums**

The problems of slum dwellers have been engaging the at-

tention of Government of India and State Government since the beginning of the sixties. Different ameliorating programmes, most notably the Slum Clearance and Rehabilitation of Slum Dwellers in new areas with minimum basic amenities was taken up in 1956. The scheme did not find favour with the slum dwellers as they did not like to move from their areas of occupation. In 1972, the above scheme was abandoned and another scheme. "Environmental Improvement of Urban Slums" was introduced. Under this scheme, infrastructure facilities at community level are being provided. No doubt this scheme has proved more useful than the previous one, but it has not made the desired impact.

### **Sanitation in Slums**

Safe water supply and sanitation are vital for protecting environment, improving health, alleviating poverty and improving quality of life. The development programmes, however, innovative they may be, are not likely to yield desired results unless environmental sanitation and ecology are improved and protected.

Sanitation is a broad term and includes water supply, disposal of human waste and waste water, solid waste management, control of vector diseases, domestic and personal hygiene, food sanitation, housing etc. The scope of sanitation may vary and emphasis may shift with the need and communities but in developing countries management of human waste is very vital for improving the quality of life. Human excreta is the cause of many enteric diseases such

as cholera, dysentery, typhoid, paratyphoid, infectious hepatitis, hookworm, diarrhoea etc. Over 50 infections can be transferred from a diseased person to a healthy one by various direct or indirect routes from human excreta. Studies carried out in India and abroad have indicated that in comparison to other components of sanitation, safe human waste disposal can bring about most remarkable improvement in health and environment. Hence due to limited resources, safe disposal of human waste should be given priority.

### **Appropriate technology:**

The foremost need is to identify most appropriate technological option to serve as an alternative to bucket or dry privies and to stop open-air defecation. The technology selected should provide socio-culturally and environmentally acceptable level of service at the least economic cost.

With the present economic condition, we cannot provide sanitation facilities to all in the foreseeable future, if we continue to advocate sewerage or septic tank latrines. To provide sanitation facilities to all within a reasonable time frame, cost-effective technological options have to be followed.

Sustainability and replicability are two important issues, which should be considered while choosing an appropriate technology. Besides it should be socio-culturally acceptable, affordable and easily available. Sulabh Shauchalaya (twin pit pourflush toilet) fulfils these criteria fully. It is an indigenous technology and the toilet can



easily be constructed by local labour and materials. It provides all the health benefits by safe disposal of human excreta on-site, which sewerage provides. It requires only 2 litres of water for flushing, thus conserves water. Another advantage of adopting this technology is that these toilets can easily be connected to sewers when introduced in the area. Thus the expenditure made on construction of Sulabh Shauchalaya would not become infructuous.

Sulabh Shauchalaya can be designed with different specifications and use of different materials in varied costs without compromising the design principles. Thus the need of families with different income groups can be met easily.

### **Community toilets:**

Slum and pavement dwellers are the worst sufferers in absence of latrine facility. Due to space constraint and unaffordability, majority of them cannot have individual latrines. Hence feasible option is to provide community toilets. To ensure that the target population use them, these should be well designed and kept neat and clean.

The community toilets are mainly operated by the municipal authorities, but these remain so insanitary that people prefer to go for open air defecation rather using them. Hence in order that the community toilets could be used, these should be handed over to NGOs having experience in the field of sanitation and be operated on 'pay & use' system.

The financial position of

local authorities is not such that they can meet the cost of community toilets from their own resources. Hence financial assistance should be provided to them for constructing toilets either by Government or donor agencies.

In many slums, land is not available for construction of community toilets. In such cases mobile latrines designed by Sulabh can be provided.

The system of Sulabh Shauchalaya Complexes has proved a boon to the local bodies in their endeavour to keep the slums clean and the environment safe. Some of these complexes have been turned to social centres by providing medicare, family welfare-services, telephone, safe drinking water and cloakroom facilities.

The community toilets with bath, laundry and urinal facilities have restored human dignity by providing facilities for defecation and bathing in privacy to those who were so far deprived. Provision of toilet facilities has made a positive impact on improvement of environment and health of community in slums.

### **Community toilets linked with biogas plants:**

The human waste discharged in to septic tanks from the Sulabh Shauchalaya Complexes were not being put to any use earlier. The organization has developed design of biogas plant to be attached with the community toilets in place of septic tank, to recycle the human excreta. This provides alternative source of energy as well as manure from the human excreta.

The organization started its efforts in 1982 when the first such biogas plant was set up. The biogas produced from human excreta at community toilet is being utilized for cooking, lighting, to supply warm water for bathing and providing fire for warming bodies during winters at the Sulabh Shauchalaya Complexes. The biogas can also be used for generating electricity through dual-fuel engine coupled to a generator. At optimum level the biogas replaces upto 80% consumption of diesel.

Based on its research and development efforts, the organization has developed more effective design of biogas plant that has been approved by the Ministry of Non-Conventional Energy Sources (MNES), Government of India.

### **Biogas plant effluent treatment:**

Sulabh is maintaining over 6000 public toilet complexes on pay & use basis all over the country. Nearly 100 of these are linked to biogas plants. Effluent from these plants is highly polluted with high BOD, COD and faecal count and under the Central and State Pollution Control Acts, it can neither be discharged into water bodies nor used for agricultural purposes.

Sulabh has developed a technology for effluent treatment that makes wastewater free from odour, colour and pathogens. The technology is based on filtration through activated charcoal followed by Ultra-violet rays. Waste water is passed through filter bed

where its colour and particles are removed. Thereafter it is passed through UV rays, which help eliminate pathogens. It reduces BOD (biochemical oxygen demand) from >200 mg/l to <10 mg/l. The treated water is quite safe for aquaculture, agriculture or discharge into any water body.

### **Promotion and health education:**

The low cost sanitation programme offers a new facility to the unserved people, but offering a facility is not an end in itself. It has to be accepted and used by the target group. Majority of the slum dwellers are illiterate. They are not aware of health and environmental benefits of improved sanitation and personal hygiene. Therefore the communities belonging to economically weaker section do not consider sanitation a “felt need”. Their priorities are food, clothes and shelter. They are also unaware of the availability of affordable technological options and government’s efforts and programmes.

In order to get full benefits of safe water supply and other sanitation interventions, good personal hygienic practices are equally important and essential. It has been assessed that about 50% reduction in diseases is possible by adopting hygienic practices. Such practices primarily are washing of hands with soap before handling food and after defecation, safe handling of drinking water, proper covering of eatables and food, etc.

Socio-cultural habits, customs and traditions are deep rooted in the society. It is very

hard to bring about change in their perception. Health education is the main tool to bring about change in socio-cultural habits and attitude and develop self-reliance and confidence in the community resulting in sustainable benefits. Therefore sanitation programme must be given back-up support by launching a sustained campaign of health education. The programme need to be monitored (noting down the approach to audience, attractiveness and effectiveness).

### **Role of mass media:**

Role of mass media in dissemination of information and creation of awareness about sanitation can hardly be over emphasized. Information technology has bridged the distance between places around the world and has made this planet what we call ‘a global village<sup>1</sup>. Print and electronic media has the tremendous potential to reach every nook and corner of the country in a remarkably short span of time. It can play a vital role in educating the masses about the basics of hygiene and sanitation.

### **Teacher - students participation:**

It would be very useful to involve the teachers and taught in the health education campaign. This way, the families can be made aware of clean and hygienic environment and benefits of sanitation. This approach will create awareness faster than through other methods.

Once the people are educated and made aware of the importance of sanitation, they

would themselves come forward to demand and willingly participate in the sanitation programme.

### **Women’s participation:**

The role of women is very critical in promotion of sanitation. I give you an example of women’s participation. The women of Banswara in Rajasthan took over the responsibility of operating and maintaining the handpumps. They acquired the necessary skill, tools and spare parts to ensure immediate repairs. Things changed dramatically. Pump breakdowns were *minimized* and the community was happy to have uninterrupted water supply.

Much of the demand for latrines comes from women as they are the worst sufferers due to non-availability of these facilities. Women have by far the most important influence in determining household hygiene practices and in forming habits of their children. So the facilities should be planned with full awareness of their perceptions and needs. Women can persuade male members to have a toilet in the house and pay for it. Women hold the key to the continued operation and effective use of these facilities for the benefit of family’s health and better environment. The children can be educated by them to use the toilets. Involving women in water supply and sanitation programme, however, requires certain changes in approaches and techniques. Education materials should be geared and designed to suit their socio-cultural habits, beliefs and educational level.



### **Research and Development:**

Sulabh International is carrying out research and development and dissemination of information in the field of sanitation and biogas technology. A dedicated team of qualified and well experienced scientists and public health engineers are working on the optimum utilization and techno-economic evaluation of human excreta and other mixed waste biogas plants for community purposes in order to ensure more useful waste disposal as well as harnessing of bioenergy.

### **Cost-effective waste water treatment system:**

Sulabh carried out research-cum-demonstration project on duckweed based low cost waste water treatment in the urban and rural areas with as economic return from pisciculture. The study has helped in identifying low cost technology, which would not only treat the waste water but also give economic return on investment. It has proved a boon to small habitats to take up waste water treatment projects to improve the environment and health of the people.

### **Sulabh thermophilic aerobic composter (STAC):**

Solid waste management has been a problem causing health hazards and environmental pollution. Composting is an important method of biodegradable solid waste management having direct/indirect economic returns in the form of manure and soil conditioner. One of the limitations with this technology is that it requires not less than 35 days - making it difficult for

towns to adopt it where large amounts of garbage is produced every day. Further, manual handling of garbage to make usable compost makes the process unhygienic and cumbersome. Sulabh has developed a new technology, which requires only 9-10 days to make compost from any biodegradable waste without manual handling during composting. Besides, quick conversion of wastes into compost, it also helps in controlling diseases transmitted from wastes as pathogens are eliminated from the compost at high temperatures.

### **Recognition of Sulabh efforts:**

It may be of interest to note that the United Nations Centre for Human Settlement (UNCHS) has recognized Sulabh's cost effective and appropriate sanitation system as a global "Urban Best Practice" at the Habitat II conference held at Istanbul in June 1996. UNCHS (Habitat) has also conferred the 2000 Dubai International Award on Sulabh for the "Cost-effective and appropriate sanitation system" for improving the environment. The organisation has Special Consultative Status with the Economic and Social Council of the United Nations. The organization has received a number of awards for its commendable service in the field of sanitation to improve the environment and quality of life.

## **CONSTRUCTION BOOM TO CREATE JOBS**

The construction industry alone will create more than 17 lakh employment opportunities during the 11<sup>th</sup> plan period. As per the planning Commission estimates seven million job opportunities during the 11<sup>th</sup> plan period and at least a good 20 to 25 percent of that will emanate from the construction sector alone, says a report. An investment to the tune of \$320 billion over five to seven years would be required to meet the demand of this sector. The Commission also emphasizes the criticality of forging PPP in the infrastructure sector, saying they hold the key for achieving our goals. The country at least needs \$100 billion in the Power sector and a similar amount of investment in Power transmission sector. In addition, the investment to the tune of \$30 billion in ports, \$10 billion for airports and \$50 billion would be needed to implement different projects under JNNURM and the rest for roads and Bharat Nirman projects. Construction industry is, therefore, well poised for a high-trajectory growth that it itself has yet not anticipated. The report urged the industry to be more innovative so that the undergoing construction activities could be termed as landmarks.

Source: NBM & CW, January 2007



# BMTPC's activities under JNNURM

The Council has been designated as one of the Appraisal Agencies for appraisal of Detailed Project Reports received under BSUP of JNNURM, for identified Mission Cities by the Ministry. So far, BMTPC has appraised 52 DPRs received from the States of Madhya Pradesh, Andhra Pradesh, Chandigarh, Gujarat, Karnataka, Nagaland, Himachal Pradesh, Rajasthan, Delhi and Tripura.

BMTPC is also helping the Municipal Bodies and State Nodal Agencies in preparation and modifications of DPRs through various workshops, meets, and capacity building programmes as given below:

- 7<sup>th</sup> July, 2006 at Hyderabad

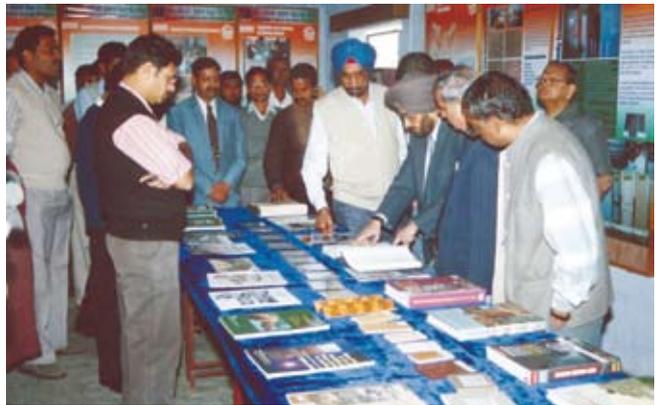
- July 13 – 14, 2006, at New Delhi
- July 20-22, 2006 at Pune
- July 31, 2006 at Kolkatta
- September 18, 2006 at Shillong
- October 27, 2006 at New Delhi
- October 28, 2006 at Bhubaneswar
- November 13, 2006 at Pune
- 5-6<sup>th</sup> January, 2007 at Bangalore
- 11-12<sup>th</sup> January, 2007 at Patna
- 15-16<sup>th</sup> January, 2007 at Kolkata
- 17-18<sup>th</sup> January, 2007 at Port Blair
- 23<sup>rd</sup> January, 2007 at Chandigarh.
- 24-25 February, 2007 at Bhubaneswar
- National Consultation on “JNNURM : Developing Inclusive Cities” held from 16-17 March, 2007.
- 7-8 May, 2007 at Amritsar
- 18-19 June, 2007 at Shimla
- 13-14 July, 2007 at Patna
- 3-4 August, 2007 at Guwahati
- 17-18 August, 2007 at Haridwar
- 10-11 Sept., 2007 at Lucknow.

The Council has also been designated as a Monitoring Agency for monitoring of the projects under BSUP & IHSDP.





# BMTPC's presence at important events



## Cooperative Housing Movement - Creating Safer Cities and Vibrant Communities



*Dr.M.L.Khurana\**

**T**he evolution and growth of cities is as old as the civilization itself. The earliest permanent settlements were in the alluvial plains of the Nile in Egypt, the Tigris and Euphrates in Mesopotamia, the Indus in India, and the Chang Jiang (Yangtze) and Huang He (Hwang Ho) in China. Officials and priests, who administered empires and invoked the gods, inhabited the earliest cities. Around them in the city lived the lower classes craft persons, artisans, and labourers. Cities grew at the intersections of trade routes, at harbours and at the mouths of rivers with easy access to the sea. Athens, Rome, Alexandria, and Carthage were located near the sea. Mecca, Damascus, and Samarkand were in land cities located on caravan routes.

The trading functions have been important for cities throughout history. All the major cities of the United States, including the cities of the Great Lakes and the Gulf of Mexico, began as centres of trade. The same is true of London, Vienna, Stockholm, Istanbul, Mumbai, Hong Kong and Singapore. In ancient India, towns/cities were created at such places where all facilities

were available to their citizens. All big cities were located near the banks of rivers, ports, etc. Varanasi is one such example of the ancient India located on the bank of river Ganges.

### URBANISATION ACROSS THE WORLD

In 1800 only 2% of World population lived in towns of more than 5000 inhabitants and not more than 45 cities had population over 1,00,000. In 1900, cities were home to just 9% of the planet's population. However, 19<sup>th</sup> and 20<sup>th</sup> Century witnessed enormous growth of urban population and cities were not only able to sustain the pressure of increased population but also could not provide conducive environment and services to new entrants. According to latest U.N. Report "State of World Population-2007 - Unleashing the Potential of Urban Growth" as of 2008, more than half the world's current 6.7 billion people will live in cities. Though mega-cities (more than 10 million people) will continue to grow, most people will be living in cities of 5,00,000 or fewer. By 2030, the urban population will rise to 5 billion or 60 per cent

of World population. Globally, all future population growth will take place in cities, especially in Asia, Africa and Latin America. In Asia and Africa, this makes a decisive shift from rural to urban growth. The report adds that the rise in urbanization is inevitable and should be considered a positive development. No country in the industrial age has achieved significant economic growth without urbanization.

The United Nations population projections as presented in Table 1 shows that the growth of cities having more than 1 million population shall be more prominent in Asia, Africa and Latin America by 2015.

These cities would experience rapid population growth and consequent inadequate investment in environmental infrastructure or services. Again, the reducing availability of land coupled with sky rocketing land prices compel people to take shelter in the urban peripheral areas. It also results in establishing squatter settlements that exhibit virtual mushroom growth thereby increasing urban population with declining civic amenities.

The factors for increasing cities population are more jobs in industry and service sectors

\* Secretary General, International Cooperative Housing Foundation for Asia and the Pacific & Managing Director, National Cooperative Housing Federation of India, New Delhi



**Table 1: Population in cities with more than 1 million population per Region (1950-2015)**

Region	Total Population in all cities with more than 1 million residents (Population in Millions)			
	1950	1970	1990	2015
AFRICA	3	16	59	225
LATIN AMERICA	17	57	118	225
ASIA	58	168	359	903
EUROPE	73	116	141	156
NORTH AMERICA	40	78	105	148

*Source: United Nations (U.N.) Population Division, World Population Prospects : Revision (UN, New York, 2004)*

than in agriculture and presence of agricultural opportunities in urban areas. The other contributing factors include better civic services, employment avenues, newer family formation etc. etc.

The Report urges upon city authorities and urban planners to make it a priority to provide shelters for the urban poor. They should offer the poor secured tenure on land outfitted with power, water and sanitation services. Those living in poor communities should have access to education and health care and should be encouraged to build their own homes.

Today cities are reaching the limits of their carrying capacity to sustain human life. As the size of cities grow, pressure increases on basic services, infrastructure, housing. At present, cities are growing at such a fast pace that life is becoming miserable due to rising expectations and aspirations beyond the available means. This is a phenomenon found in most developing societies. Unemployment, rising prices, frustration contributing to corruption, delinquency, theft, crime and use of drugs etc. are the prominent causes that make people feel insecure particularly

in big cities.

### **SOCIAL AND ENVIRONMENTAL PROBLEMS IN CITIES**

The cities around the world are facing a variety of social and environmental problems e.g. pollution, unemployment, poor health and absence of education. It generates societal crime because poverty and deprivation is the chief cause of eternal and perpetual crime.

During mid 70s and 80s, reported crimes world-wide increased by 5% per annum which was much faster than the growth in population. In the United States, there are two million victims of violent crimes every year. Four children get murdered every day in Brazil; while in Germany approximately 4 million women suffer from domestic violence. In Indian context, the Delhi High Court has rightly held that crime situation in the Capital was getting worse and has advocated strict action against the perpetrators.

The other major reason for violence, intolerance and social unrest is due to inequality and unjust distribution of fruits of development. The richest 2 per cent of adults still own more than half of the world's household

wealth, perpetuating a yawning gap between rich and poor. The report from the Helsinki-based World Institute for Development Economics Research shows that in 2000 the richest 1% of adults (mostly living in Europe or the United States) owned 40 per cent of global assets. The richest 10 per cent of adults accounted for 85 per cent of assets. By contrast, the bottom 50 per cent of the world's adult population owned barely 1 per cent of the world's wealth.

Another Study have observed that in countries of European Union the social disparities within cities and also between city and region have widened. Urban safety and increasing feelings of unsafety have become a major issue. Besides, affordable housing is a Central urban issue in majority of the member countries of the European Union.

The consequences of looming urban violence are manifold. It not only destroys men and material but also breed suspicion and insecurity amongst human beings, resulting in intolerance, isolation and even violent reactions between the constituents. The phenomenon of urban violence is also bringing about major changes in the patterns of daily living. It has been observed, of late, that in some cities, cases of violence and insecurity curtail people's movements and even use of public transport. Gripped by fear, people particularly women dare not frequently come into streets, parks and other public places. The self imposed social isolation extended to large sections of the urban popula-

tion thus adversely affects their mobility and consequent loss of productivity.

To tackle these problems, the governments have to drain out scarce resources for developmental work relating to upkeep of schools, parks, libraries etc. and combat other maladies e.g. drug abuse, etc. for promoting societal homogeneity and stability. It is imperative to do so in order to curb the possibility of potential urban violence that may be caused due to prevalence of disparities between the poor masses and rather a minority section of economically affluent people who control the social and economic infrastructure in urban regions. Notwithstanding the fact that the urban violence is not a spontaneous phenomenon, it is rather the product of a society characterized by inequality and social exclusion.

### **ROLE OF HOUSING COOPERATIVES**

No community can afford to neglect the welfare of such a large number of its citizens suffering from evils of poverty, inadequate housing, health, education and basic services etc. They need to be made partners in every development programme through the medium of cooperatives to yield better results. The essence of cooperation is that individuals come together to achieve as a collective group what they cannot achieve as individuals.

The main objective of a housing co-operative is to provide its members with suitable housing accommodation at a reasonable cost and on easy terms of

payment. The modern concept of housing does not limit the scope of housing alone, but a comfortable shelter with such surroundings and services to keep a man healthy and cheerful throughout his life. A housing cooperative, always strives to create conducive environment for fulfilment of the physical, social, economic and spiritual needs of its members. A co-operative also provides basic amenities like water, electricity, sanitary services, etc. to its members. Its efforts are further directed towards building up a community life within the co-operative, based on good neighbourhood and fellow feelings and it transforms itself into a new community wherein "each is for all and all are for each".

### **Instruments of Improved Social Life**

The essence of the co-operative movement is that members should themselves look after the management of their affairs including economic betterment and social welfare. The management of a housing co-operative is, therefore, not restricted or limited to management of housing estates, but encompasses all social and cultural activities as are to improve the social life within the cooperative system. The members themselves determine, by their collective wisdom, how the affairs of their co-operative ought to be managed.

Cooperative activities also include managing shops, laundries, etc., and provision of social, educational and cultural services (like running kindergarten schools, maintenance

of play grounds, recreation rooms, cinemas, study groups, youth clubs, etc). Thus, housing co-operatives do not restrict its activities to merely creating better houses for their members, they rather aim at building up a new social life based on shared responsibility and shared benefits and free from crimes. In the process they create jobs for the needy. In India, housing cooperatives incidentally create 1 million jobs every year.

### **A New Life for Migrants**

The history of housing co-operatives reveals that these have been instrumental in rebuilding the social life of people uprooted from their old surroundings. The pioneers of co-operative housing were people who had migrated to big cities in search of employment etc. Although they succeeded in finding work opportunities, they felt alienated and distanced from their old surroundings. To overcome the life of isolation in their new urban or metropolitan environs, they ventured into housing co-operatives which gave them not just housing but also an entire social environment based on sharing of their joys and sorrows.

### **A New Rural Community**

Housing conditions especially, in villages in developing countries at many places are deplorable with inadequate houses and inadequate amenities. Housing co-operatives formed in rural areas have endeavoured to provide their members good houses with improved sanitary facilities. That is why rural housing co-



operatives serve as catalyst for further improvement in the entire village. When the villagers have themselves addressed to the task of housing and related improvement on co-operative basis i.e. instant construction of village schools, roads, etc., through collective action, they have significantly improved their societal life thereby reducing migration to cities.

### **SOCIAL ACHIEVEMENTS OF HOUSING COOPERATIVES**

The social achievements of housing co-operatives can be summarised as under:

#### **a) Social Activities and Services:**

Besides laying out housing estates, the housing co-operatives have built schools, libraries, parks, etc. for the community.

#### **b) Social Functions**

Housing co-operatives organise special programmes for their members on occasions like New Year Day, Labour Day, Co-operative Week etc. They also organise tours and excursions on holidays. These functions bring people together and provide opportunity to understand one another.

#### **c) Health Services**

Many housing co-operatives arrange health services for the benefit of their members (dispensaries, first aid, family planning and welfare centres).

#### **d) Youth Development**

A number of housing co-op-

eratives organise youth clubs and sports centres. Some co-operatives have opened gymnasiums and even play grounds. Others organise debates, publish newsletters, conduct essay writing competitions, etc. to encourage youngsters to participate in literary pursuits.

#### **e) Ecological Improvement**

Housing co-operatives pay special attention to improvement of the ecology of the concerned area. They plant trees and maintain gardens.

#### **f) Women's Organisations**

Housing co-operatives have been specially helpful in promoting women's organisations to benefit female members.

#### **g) Transport Operations**

Housing co-operatives also arrange special transport services for their members.

#### **h) Promotion of other Co-operatives**

Housing co-operatives have also been prompt to promote Consumer Stores, Thrift and Credit Co-operatives for the benefit of their members

#### **i) Influence on Human Behaviour**

One of the outstanding merits of housing co-operatives is the healthy influence they exercise on human relations. On account of better social and emotional interaction, the members of housing co-operatives generally display improved social behaviour and mental health. The

incidence of addiction to drinking and juvenile delinquency are lower in housing co-operatives as compared to areas where people live in isolation, and are devoid of social activities.

#### **j) Emotional Integration**

Housing co-operatives have been instrumental in bringing about desired emotional and social integration. People of diverse religions, castes, sects, etc. voluntarily choose to come closer and live as one large family true to Aristotle's dictum that "man is a social animal".

### **Best Practices in Housing Cooperatives**

The International Cooperative Alliance (ICA) and the UN-Habitat have been collaborating to promote housing cooperatives through a series of Memoranda of Understanding, publications, seminars and development projects. In pursuance of this, the UN-Habitat and ICA undertook case studies in countries like Ecuador, Estonia, India, Mexico, Namibia, South Africa, Uganda, U.K. and Zimbabwe to identify approaches to cooperative solutions for housing problems of the poor.

The case studies illustrate effectiveness of cooperatives in housing sector not only as provider of shelter to members, but as nucleus of socio-economic development in the field of employment generation, provision of financial resources and improvement in the quality of life of their members. These multi-dimensional contributions of housing cooperatives has

been demonstrated in many countries viz:

- Cooperative Housing Foundation of Canada dealt successfully with the problem of domestic violence by sensitizing their members and soliciting cooperation of Municipal Authorities and Women Organisations.
- German Housing Cooperative Ludwig-Frank organised low income families of 15 countries to restore 400 apartments for them.
- In Turkey, Kent Koop (Union of Batikent Housing Construction Cooperatives) in collaboration with Municipal Authority of Ankara and Workers' Unions constructed 43,000 housing units for 190,000 low-income people.
- In India, housing cooperatives have substantially contributed affordable shelter to low and middle income families.

The potential role of housing co-operatives in solving the problems which are currently faced by our cities are outlined below:

- a) Housing for Homeless :** The problem of housing for the homeless has assumed serious proportions. Housing co-operatives can play a useful role in providing to the homeless not only shelter but also an environment in which they can live with dignity.
- b) Rural Migration :** Due to rapid urbanisation and industrialisation in the developing

world, there is large scale migration of rural population to urban centres. The conditions of housing in which these people live are often miserable and crowded. Some are condemned to live in isolation having separated from their families. The best means for socially rehabilitating such people is through housing co-operatives.

- c) Slums Clearance:** Existence of slums is the bane of rapid urbanisation. In these slums, there is not only lack of living space, but also total absence of essential sanitary facilities. The problem of slums cannot be solved by individual efforts. Even the assistance of the government or the local authorities can be of minimal help. Co-operative efforts alone can succeed in building up the social life of slum dwellers.

- d) Industrial Pollution :** Problems of pollution are attendant on industrialisation. Today, largely on account of lack of proper planning in the location of industrial units or absence of adequate arrangement for clearance of pollution, people residing near factories and industrial plants are unwilling victims of industrial pollution. The modern world is, therefore, faced with the problem of large scale shifting of the population to safer zones. Co-operatives can play a useful role in performing this task. Although the state and local authorities may assist the people in building homes

in safer areas, their social rehabilitation can be best achieved through housing co-operatives.

- e) Rehabilitation of Destitutes:** Floods and earthquakes are a spectre we see almost every year. Such natural calamities create the problem of rehabilitation of their victims. This gigantic task, can be most satisfactorily secured only through housing co-operatives.

- f) Social Evils:** The social life of people all over the world is infected with many evils on account of racial, linguistic and religious differences. Housing co-operatives wherein people voluntarily choose to live often maintain strict neutrality towards caste, religion and language etc. perform moderating role in lessening the conflict as well as to fight the menace of drug addiction particularly amongst youth.

- g) Ecological Improvement :** Another problem faced by the modern world is the indiscriminate destruction of flora and fauna. The human society has been consequently condemned to suffer on account of constant droughts, floods, and other calamities. Housing co-operatives by planting trees and maintaining gardens etc. can create an awareness in the minds of the people towards preservation of ecological balance.

In conclusion, it can be said that the most significant



social contribution of housing co-operatives is to create a new environment congenial for the social upliftment of their residents.

These contribute significantly in making the society free from societal crimes, help in mobilising community to spread social awareness and eradicate the villainous social and environmental problems which debase and dehumanise the societal living. The housing co-operatives have a vast potential of becoming an effective instrument of providing improved social life and creating safer cities and vibrant communities.

The various Governments must therefore address their priorities towards overall social development to remove dispari-

ties. They must find ways to help communities to deal with underlying factors such as houselessness, poverty, inequality, family stress, unemployment, absence of educational and vocational opportunities. A time bound action programme to tackle the critical problems should be prepared and executed through public private-co-operative partnership.

A well articulated land management policy should also be formulated for land acquisition, land development and land disposal/utilisation for housing low income families.

Though the latest UN Population Report-2007 says that most urban growth results from natural increase rather than migration, there is also an emergent

need to discourage migration and reverse the existing trend through speedy development of rural areas and creation of small cities. Instead of forcing people to migrate and settle, infrastructure facilities like employment opportunities, better sanitation & hygienic conditions should be created in rural areas. The improved facilities of health and family welfare, access to safe drinking water, transport and communication facilities, education etc. and above all affordable housing if made available to the needy people in rural areas would pave the way for discouraging them to migrate to the cities.

## World Habitat Day 2006 Celebrations



# The Mumbai Dream: A House for Every Family by 2010



*Prof.K.N.Vaid\**

**T**here are two visions of Mumbai, namely, heights of prosperity and depths of urban decay. Sunny side is that 46 percent of tax revenue of the Central Government and 60 percent income of the State of Maharashtra are derived from this Metropolis. <sup>1</sup>Some of the richest Indians and the most palatial buildings are in this city. The downside is that 64 percent of Mumbai's residents live in slums, built as one room shanties — along roadsides and railway tracks, atop water pipes and inside pigeonholes or on public land. In this City, 1.92 lac persons, about 2 percent of total have no place to live and sleep. <sup>2</sup>Over 73 percent married couples have less than one room to themselves. <sup>3</sup>In mill areas, typically 24 men live in one room of 10x8 sq. ft. area rented by pooling resources. <sup>4</sup>And 4413 police constables and 81 police inspectors live in slums. An aerial view of the city depicts it as a vast parking lot. First two hours of traveling out by train is accompanied by slums and hutments alongside the tracks; many children and adults relieving themselves in the open without any embarrassment.

The city is not poor. Most

people have jobs and work - many hold two jobs. There are plenty of two income families. The problems is they do not have proper houses to live in. Hundreds of new families migrate into Mumbai every day without regard to a place to live. The housing problem in Mumbai has been caused mainly by a combination of three factors — more jobs, less land and self-serving city government which should be evident from discussions that follows.

## **JOB GROWTH**

In 1850s and thereafter, when industrialization of Mumbai began, employers were required to provide housing to their employees. This requirement remained in force till about the First World War (1915-19) and forgotten thereafter. <sup>5</sup>The textile mills built chawls for their employees which were one room per family with shared facilities, open space for parks, playgrounds, worship and celebrations. Port, docks, railways, banks, government, universities, colleges, hospitals, municipal bodies and all other employers; even the stock exchange, built houses/dwellings for their employees. The city was livable, affordable, efficient and clean, Public roads

in Bandra, Dadar and Malabar Hill areas were washed every-day.

As the jobs and work opportunities began to grow at a much faster rate, house construction could not keep pace with it. Also, the second generation employees who were more concerned with revenue and profits, began withdrawing housing facility to employees. As industry, trade and commerce grew more and more people came to work and live here. It is amazing that so few people realized that it was increased jobs that resulted in added population. "Every job created in the city, adds 13 persons who need 3 more houses", estimated the famous economist Prof. D.T. Lakdawala of Mumbai University almost fifty years ago. <sup>6</sup>The City government and its babus watched the city grow, collected more taxes and haftas, increased revenues but did nothing to push construction of dwelling units commensurate with job increases. In Mumbai of today, one can see history repeating itself, lacs of employees of I.T. companies, BPO Centres, ITES, financial analysts etc. have come into the town for work. Unfortunately, the corporate culture of new economy does not place much

\* *Director General  
Akruti Foundation for Knowledge and Research (AFKR), Mumbai*



value on employees benefit measures except at workplaces. Compensation package is all cash pay -out on CtoC (cost to company) basis. Yuppies work long hours, sleep at PG pads, eat at foodcourts, sit in multiplexes, pass a few months and move on elsewhere.

### LAND DISTORTIONS

Distorted land assembly and distribution policies have been another major calamity for the city of Mumbai. The total land area of Mumbai is 437 sq. km. Sixty percent of city's population occupies only 12 percent of the total land, and the remaining 40 percent residents occupy 88 percent of the balance land.<sup>7</sup>This land distribution pattern has created a great divide in the upper class house owners and the Jhuggi Jhopdi (hutment) dwellers. Many properties in the city have been redeveloped and builders have done a commendable job of giving a modern face to the metropolis. The underside of the city is neglected by them. The land currently occupied by slum dwellers (approx. 2525 hectares) is the apple of eye of developers. At FSI 2.5 and land price of Rs. 2000 per sft., the value of land under shanties is approx Rs. 3000 crores. Some want slum dwellers to be shifted out and land used for redevelopment by builders, other would like the Government to go in for slum redevelopment on sites, and still another group advocates that slum dwellers be asked to organize themselves into housing societies and redevelop dwellings in which they live.

Land distortions have been

further complicated by mills and industries that closed down and offered land for re-development. Most of these land parcels are in city centres and it was expected that redevelopment would provide more open space to the congested city. But these lands have been put up for sale and are fetching unusually high prices. Building houses on these plots may not be remunerative. Commercial activities that may start on these plots, would provide more jobs and thus add to housing shortages.

Many suggest Shanghai as a role model for Mumbai. It cannot be. Mumbai is a different cultural and social milieu. Many of our builders and government leaders who visit Shanghai are shown the sunny side of city but not its underbelly-the city centre of the old part.

Shanghai is in China, Mumbai is in India. Can our government pull down slums, pack residents in trucks, dump them at places 50 to 200 kms away and ask them to make their own quarters. China has a culture of obedience. Most people do what they are told to do. Indians seem to relish a culture of disobedience and going to courts. Maharashtra Government tried the Shanghai approach and had to eat humble pie. In this country, under the prevailing democratic system, policy makers and administrators have to involve the common man-the Aam Admi. It is a difficult task. Workable programmes take time to be evolved. Some day, Mumbai will be bigger, better and different as compared to Shanghai.

### ESTIMATE OF HOUSING

### NEED

The number of residential houses in Mumbai, both occupied and vacant, was 27.3 lac units in 2001: 12 lac (44%) pucca houses and 15.3 lacs (56%) Kachcha houses that needed to be rebuilt.<sup>8</sup>During the period 2001-04, the Municipal Corporation of Greater Mumbai (MCGM) issued 2,29,941 Occupation Certificates under the Slum Rehabilitation Scheme and 206806 Certificates for other residential units.<sup>9</sup>This increased the stock of pucca houses to 14.3 lac units and decreased the stock of kachcha houses to 13.2 lac units. The population of Metropolitan Mumbai was 1 .20 crores persons in 2001. It has been growing @1.5 percent per annum and is estimated to be 1.39 crores persons in 2005 and 1 .59 crores persons in 2010.<sup>10</sup>Using a norm of 5 members per family, the city needed a total of 27.78 lac dwelling units in 2005 against 14.3 lac units available and 26 lac dwelling units by 2010. Thus, in order for every family to have a dwelling unit by 2010, the city should build approx. 5.20 lac dwelling units every year and add to its housing stock.

### TYPE OF HOUSES TO BE BUILT

Four types of houses may have to be built. First, is the Replacement Housing which refers to the existing Kachcha houses, Jhugis and Jhopdi and footpath dwellers and the houseless. This involves requisitioning all kachcha houses, Jhugi Jhopdi etc. demolish them, replace by new pucca housing and resettle the occupants back in their

houses free of charge. Under the existing law, the oustees are entitled to the Minimal Housing which is 225 sq. ft. area. Simply stated it is a one room house where cooking, bathing, washing etc. all are done inside the room. This does not make life livable but almost 64 percent of Mumbai residents live in one room or less houses already. However, many of them may want to expand their living spaces gradually. Our recommendation would be that of the total requirement of Replacement Houses, only 50 percent may be made as Minimal Housing units (225 sft. room) and allotted to the eligible persons. The balance half may be built as two rooms sets each of 450 sft. area and allotted to the eligible persons who may pay for area which is in excess of the minimal housing of 225 sft. Whether the reallocation could be done at the same premises or elsewhere is an issue which must be settled at a different platform. With improving financial conditions and easy availability of bank finance, many allottees may wish to go in for 2 room apartments. It should be encouraged.

The second type is the Immigrant Housing, the additional requirement created by immigrants. Typically the new comers to Mumbai are not only the poor mill hands. A majority of them are educated and skilled persons. Quite a few of them may wish to live in bigish houses, atleast two room sets and some may want three room sets. Practically, most of these buyers would be eligible for bank finance. Again, nearly 50 percent of them may be ac-

commodated in minimal housing (they pay for it) and the rest may like to go in for better housing, may be 2BKH, take mortgages and use bank finance.

The third type of housing may be called Yuppi Houses". Joint family living has been the traditional life style in the country. This is more true for the business community residing in the inner city. Considerations of business interests, ownership issues, and the tradition kept families together. Princess Street, Jhaveri Bazar and Girgaum areas have very high population densities. However, young educated and married couples are migrating to suburbs in order to set up their independent households. They want to live as nuclear families in their own style, away from parental control. Likewise, Mumbai is attracting young and educated couples in the age

may be called Corporate Housing. Heads of Indian and MNCs in India, Chiefs of International Agencies and FDIs etc. headquartered in Mumbai require large size and up-market apartments. Real Estate Consultants and property management firms estimate the requirement of 5000 top class apartments during next five years.

It may now be concluded that in order to provide a house to every family who will be living in Mumbai in 2010, the city needs to build/construct approx. 5.2 lac housing units per year or 26 lac units in 5 years 2005-2010. The type wise break-up is as indicated below:

### CONSTRUCTION AND FUNDING STRATEGY

The magnitude of the project and the need to achieve targets within the given time frame, demands an innovative strategy

Sr.No.	Type of Housing	No. in Lacs
1A	Replacement housing (Minimal 225 sft.)	6.6
1B	Replacement housing (minimal plus one more room)	6.6
2	Immigrant Housing (of various sizes)	11.7
3	Yuppi Housing (of various sizes)	1
4	Corporate Housing (top of the line)	0.05
		<b>25.95</b>
		<b>Say 26.00</b>

group of 18-31 years to work for the new economy firms; IT, ICE and the like. They cannot afford to rent or own apartments in South City and live in suburbs as tenants, paying guests etc. By a very conservative estimate, this type may require about 20,000 apartments a year, a total of one lac units during 2005-2010.

Finally, the fourth type of housing for top Executives. It

based on public-private partnership. The basic premises of this partnership is that the construction work may be assigned to the private sector who may construct 6.6 lac minimal housing for free replacement, another 6.6 lac minimal - plus- one room houses for sale at 50 percent of price and the remaining 13 lac houses for open market sale. This way, the government would



be able to meet its obligation of providing 13.2 lac free housing at no cost to itself. The Government may assume the role of facilitator, making land parcels, carrying out zoning and planning, discharging regulatory functions, doing monitoring and control, resolving disputes, removing bottlenecks, providing civic infrastructure etc. Basically, government would not be the doer but ensures that the doers do the job well and in time. It might be useful to create a SPV Corporation to co-ordinate and override if necessary, the work of all government agencies. The details can be worked-out.

A. The total area to be constructed and its approx. cost can now be worked out from Table 3 and it yields the following results:

1. Total area of dwelling units = 1134600000 sft.
2. Add 30% circulation/BUA = 340380000 sft.
3. Gross area to be built = 1474980000 sft.  
Say 1475000000 sft.  
Say: 147.5 crores
4. Cost @ Rs.600 per sft. = Rs. 885000000000  
Say Rs. 88500 crores / 5 years or Rs. 17700 crores/year

B. Cost of Replacement houses that Govt. is committed to underwrite (13.2 lac dwelling x 225 sft. Per dwelling x Rs. 500 per sft. c. cost)  
Say Rs. 14850 crores or Rs. 2970 crores / year

Thus, the estimated gross investment required to realize the Mumbai Dream of a House for every family by 2010 is Rs. 103350 crores over five years,

or Rs. 20670 crores annually. The economics and funding of the project is manageable. The private sector may be required to invest on construction who may raise funds from F.I.s and buyers. The land sold / leased to private builders may have to be given on long term mortgages and also tied up with replacement houses under SRS.

### REFERENCES

1. *Mumbai Makeover*, Newsweek, April 25, 2005
2. *Working Group on Housing in 10<sup>th</sup> Plan*, Planning Commis-

- sion
3. *Unpublished survey done by the author for New Bombay Planning Group*
4. *Ibid*
5. *Archives of Bombay Presidency, Royal Commission on Labour, 1931*
6. *Shirish Patel, Slumming Mumbai*, Times of India, May 19, 2005
7. *Vinita Shah, Housing Problem in Bombay*, NICMAR, 1992
8. *Census of India, Vol. I, 2001*
9. *D.L. Desai, Housing Scenario in the Country-Mumbai*, Indian Construction, June 2005
10. *Census of India, 2001, Household Survey.*

**TABLE 1 : BASIC HOUSING DATA ON MUMBAI**

Sr. No.	Items	Census 1991	Census 2001
1.	Population	12596243	11978450
2.	Households	2650802	
3.	Dwelling units	2616286	
4.	Census Houses	3610775	3404591
	Occupied Houses	3188110	3021465
	Vacant Houses	422665	383126
5.	Residential houses	2582300	2702284
6.	Shop-cum-residences	28495	56880
7.	Workshops, Factory-cum residence	29120	32518
8.	Residence in combination with other uses i.e. schools and colleges	7928	6814
9.	Hotels, Sarais, Lodges, Dharamshalas, Guest Houses etc.	7955	12914
10.	Shops (excluding eateries & Offices)	149190	313961
11.	Factories/ Workshops	129175	91733
12.	Restaurants & Eateries	14085	21858
13.	Places of Entertainment	4290	9932
14.	Places of Worships, Hospitals, Dispensaries	9245	14677
15.	Other non-residential purposes	142192	96726
16.	Of Censused houses, houses with concrete roof	1481635	1500732

Source : Census of India, 2001

i. Population of India, Final Tables, 1992.

ii. Table on Houses, Households, Amenities and Assets, Series 1, 2003.

**Table 2 : Residential Houses by No. of Rooms in Mumbai (Census 2001)**

Sr. No.	No. of rooms	Number of houses	Percentage
1.	Total Residential houses	2894550	100
2.	No rooms (Houseless)	192266	6.6
3.	1 Room	1736599	60
4.	2 Room	611322	21.1
5.	3 Room	249232	8.6
6.	4 Room	69787	2.4
7.	5 or more Rooms	35344	1.3

**Table 3 : Metropolitan Mumbai - Housing Requirement by Number of Rooms (2005-2010)**

Sr. Segment/ Type	Total	1RK Minimal (225sft)	2BRK (450sft)	2BHK (750sft)	3BHK (1350sft)	4BHK & above (2100sft)
1. Replacement housing	1320	660	660	-	-	-
2. Immigrant housing	1176	588	235	235	118	-
3. Yuppie housing	100	-	-	50	50	-
4. Corporate housing	5	-	-	-	-	5
5. Total for 5 years 2005-10	2601	1248	895	285	168	5
6. Required per year	522	252	179	57	33	1

# Post Tsunami Resettlement and Rehabilitation Policy in Sri Lanka - Case Study of Galle and Matara



*Prof. Madhu Bharti\**

**N**atural disasters provide opportunity for Government, NGO's and other aid organizations to work together and face the immediate and future challenges. The process of resettlement and rehabilitation (R&R) of the affected community is crucial for the future well being of the community. Involvement of various Stakeholders in the R&R process makes this process highly dynamic and challenging for planners.

After the Tsunami which struck Sri Lanka on 26th Oct. '04 Task Force to Rebuild the Nation (TAFREN) was set up on Presidential directive to

- Ensure coordination among the relevant stakeholders by providing forums to make decisions in a timely manner, on both a national and local level.
- Ensure accelerated and coherent reconstruction by providing stakeholders with the necessary frameworks and guidelines.
- Plays a key facilitating, enabling and empowering role in ensuring that the conditions are in place for effective implementation.
- To monitor that progress is being made.

The Housing Studio at CEPT (August '05 to Dec. '05) aimed at learning from the Sri Lankan case-study and evolve guidelines to be adopted for Rehabilitating and Resettlement of population affected due to natural disaster.

## STUDIO INVESTIGATION FOCUS

The focus of this Studio was to study

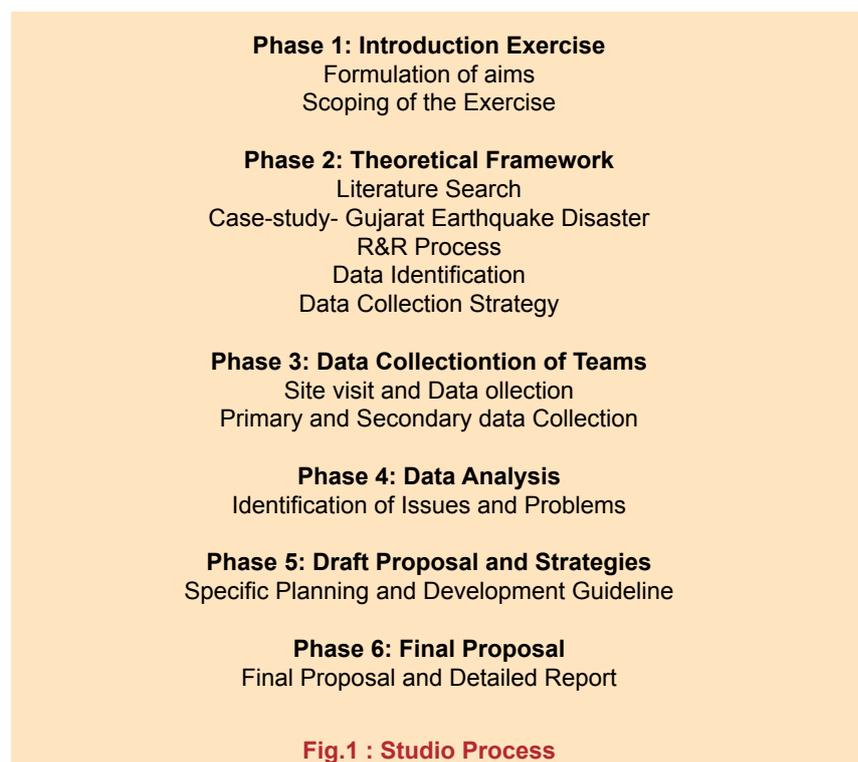
- a) Various R&R Programmes and policies.
- b) Analyze the role played by various Stakeholder, their

strategies and involvement in the implementation process.

- c) Suggest a R&R policy having
  - 1) Emphasis on Housing and Infrastructure requirements
  - 2) Involvement of various Stakeholders

## Process

The studio was divided into the six distinctive phases where considerable time was spent on formulating aims and defining scope of the exercise. The studio focused on policy guidelines.



\* Head, Department of Housing, Faculty of Planning and Public Policy, CEPT University, Ahmedabad



Extensive work carried out into the Disaster Reconstruction and Rehabilitation processes, policies and implementation guidelines as implemented post KACHCHH (Bhuj '2001) Earthquake. This case-study also provided inputs regarding the type of the data needed for evolving strategies. The scale of devastation caused by the Bhuj earthquake in terms of both loss of human life and property was comparable to the scale of Tsunami destruction in Sri Lanka. As the post Bhuj Earthquake reconstruction efforts involving Government agencies, NGO and local communities were well documented, it provided an opportunity for the students to critically evaluate successes and failures, causes and effects, as well as to question the possibility of alternative scenarios and interventions.

As a planning studio, the students were encouraged to approach the problem at Macro and Micro scale, in terms of its demography, economy, occupational structure; constitutional structure, the roles of Central and Provincial Governments; the responsibilities of Urban Development Authorities and local bodies; fund flow mechanisms, the role of other stakeholders such as NGO's, social and religious groups and the response of the affected population. This understanding was derived from published and unpublished documents, interviews with officials and implementing agencies, focus group discussions.

The household surveys were carried out in temporary shelter clusters and also in few settlements were permanent hous-

ing had been reconstructed. As purpose of the study was to understand the R&R process (from the affected populations point of view) socio-economic behavior (past and present) and levels of satisfaction due to the Rehabilitation and Reconstruction policies, areas of possible intervention, corrective measures that could be taken up, fieldwork served as an important vehicle for grounding proposals contextually.

### STUDY AREA

Damage occurred throughout the coastal area on the eastern side as well as in the southern province. Galle and Matara being areas having high population density the number of housing units damaged was maximum here. Significant proportions of people are employed in primary production, such as agriculture fisheries and animal husbandry. Tourism (26%) followed by Manufacturing (18%) and primary

sector (13%) have major share in the economy.

The existing industries are limited to a few large and medium scales. Enterprises like cement of hydrated lime, brick and tile manufacturing, rice milling are managed by both state and private sector. Small scale cottage industry and traditional crafts like pottery, wood carving, lace, metal working and jewelers are important segment of the economy. The Galle district has an area of 1652 sqkm. and a total population of 9,90,539. The sex ratio of the town is 938 and literacy rate is 92.9 percent. The total number of households in the district is 225,123 and average household size is 4.4. Total reported housing units were 253,697 out of which 94% are single houses and less than 2% are reported to be huts and other poor quality housing.

As per housing tables (Government Publications) the hous-

Galle District, 2001	
Total Population	9,90,539
Male Population	4,79,485
Female Population	5,11,054
Sex ratio	938
Literacy rate	92.9
Rural Population	8,62,880
Urban Population	1,10,654
Estate Population	17,005
Total Housing Units	2,53,697
Total no. of HH	2,25,123
Average HH size	4.4
District area	1652 Sq. Km.

Table 1: Demographic Details

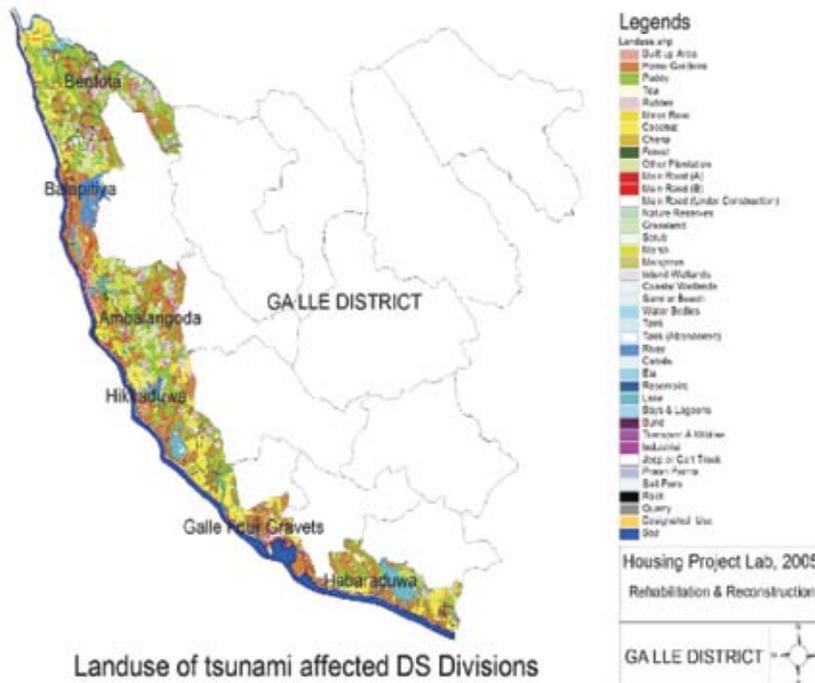


Fig. 2 Land use of Tsunami affected DS Divisions

ing stock in the district is more than the households with 9% of units remaining vacant, 72% of the units are of permanent nature, 26% of the dwelling units (mostly in the rural areas) had semi permanent materials. From the occupied housing units, 94% were single family units.

### Housing Damage

The coastal DS division of Hikkaduwa, Balapitya, Habaraduwa & Galle Four Gravets are the maximum affected DS divisions.

The number of fully damaged housing units is estimated to be

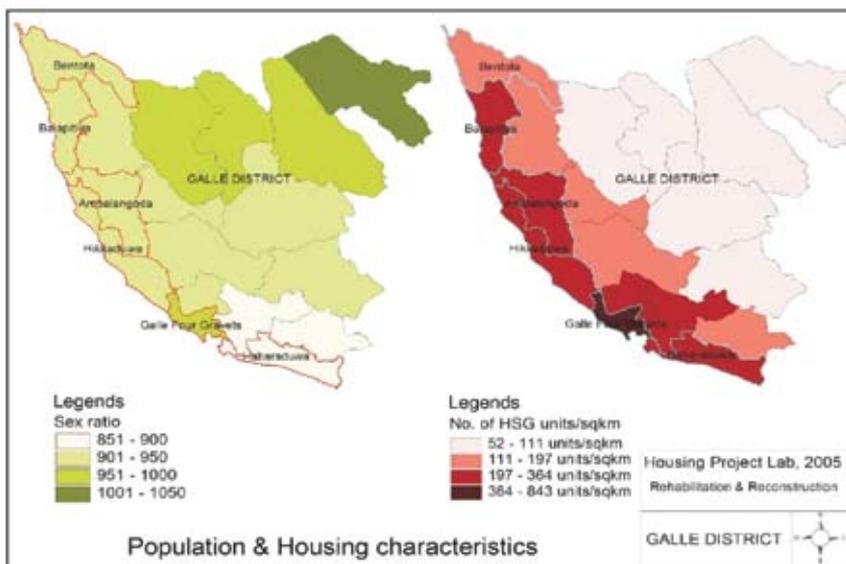


Fig 3: Population and Housing Characteristics

41,393 and partially damaged housing units at 36,168. Thus the total damaged houses are 77,561. Apart from this a large number of schools (200), and hospitals (72), also got damaged. Of these 69% of the units were located within 100 mt of the coastal line. This is due to the fact that the density along the coast is very high. The affected residences within 100 mts. belt were owned by people working in various sectors, but outside 100 mts. there were very few fishermen. The maximum loss has been to the coir industry, followed by the fishing sector. This sector employs mainly population from the poorer group, thus leading to higher levels of poverty.

## FINDINGS OF THE STUDY

### Housing Policy

As per the Government policy on Housing, no new houses were to be constructed within the buffer zone: i.e. 100m on the western coastline, and 200m on the eastern coastline. This was with the idea of shifting the population away from the vulnerable areas. As large number of NGO's had expressed the desire to assist the community and keeping in view of the limitations of the government machinery it was decided that the Government shall act as a facilitator and not a provider for housing. The new houses to be constructed would strictly be as per the new NHDA guidelines which specify the minimum size of the housing to be provided. The affected population would be resettled by passing through a variety of shelters starting



from the immediate shelters on the first day to the permanent houses within 2 years.

Due to the enforcement of the buffer zone the fisherman and other people traditionally dependent on economic activities near the sea and living near the coast suddenly had to scout for other lands away from the coast where they would be allowed to construct the house. As expected these lands were expensive. The reconstructed houses had to be as per the new NHDA guidelines thus making the units more expensive. The compensation provided by the government was Rs. 250,000 (Sri Lankan Rs.) for fully damaged house and Rs. 100,000 (Sri Lankan Rs.) for partly damaged unit. The money provided by the government was far less as the cost of construction (due to the high cost of labor and material) post Tsunami was high. This mismatch between the compensation provided and the requirements together with the restrictions imposed on areas where construction was not allowed lead to high dependence on the housing provided by the NGO's.

The financial assistance provided by the government was irrespective of the financial strength and needs of the family nor did it have any consideration to the family size. The houses provided by the NGO's were designed and built by NGO's through contractors. At many locations the design was not relevant to the lifestyle of the community for whom the units were meant. In future this would lead such houses being kept vacant or the houses would be

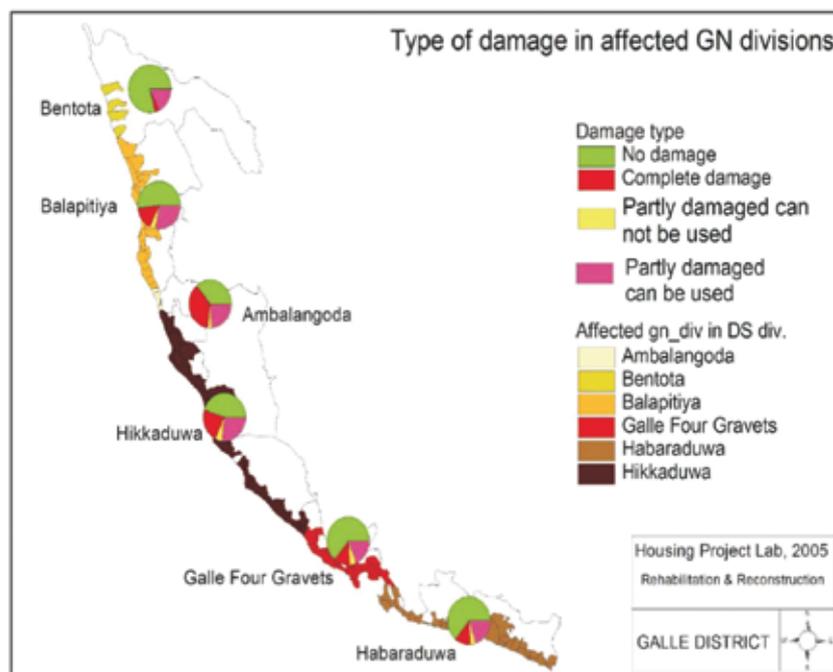


Fig. 4: Type of damage affected GN divisions

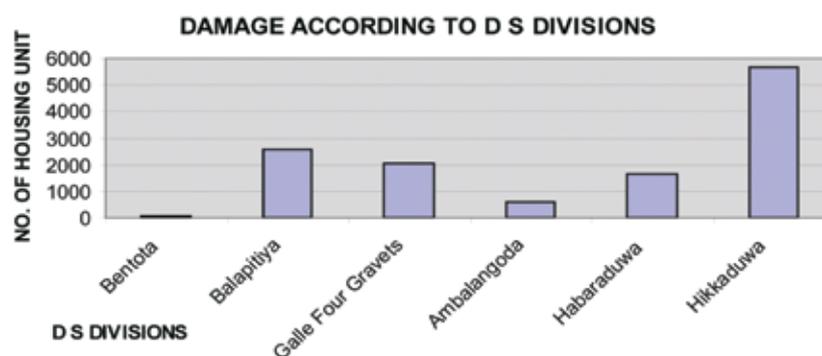


Fig 5. Damage according to DS division

sold in the market. In both the cases the objective of providing a dwelling unit is not fulfilled in spirit. Though the government specified the minimum size of the unit, many NGO's provided housing units of different sizes according to the financial capacity of the NGO's, this is lead to the resentment among the affected population, as neighbour having similar loss to property where getting different product.

### Resettlement Process

As per the R&R policy temporary shelters were to be provid-

ed within 1 month after disaster, further transitional shelter was to be provided between 2 to 4 months after the disaster. It was expected that permanent shelters would be ready within a period of 10 to 12 months. During the primary survey (Sept '05) it was found that the majority of population was still leaving in transitional shelters, having low levels of public amenities and services. Such transitional shelters though housing a large population have a lack of concern for schools, market places and other community facilities



Fig 6: Transitional Structure



Fig 7: Temporary Structure



Fig 8: Permanent Shelter

as these sites are located away from villages / Urban areas.

Despite the government policy the temporary structures (tents) existed even 8 months after the Tsunami. Currently 11% of the households surveyed are living in temporary shelters, 56% in transitional shelters and 33% in permanent shelters.

As per the policy a household is expected to shift atleast 3 times before they settle in their permanent house. Such shifts often disturb the social network that the family develops at each location. However education for children and opportunities for employment also get disturbed. The multistage process of Rehabilitation involving temporary shelter, transitional shelter and then permanent shelter leads to delay and wastage of resources

apart from other socio-psycho difficulty

### Livelihood Pattern

The change in the occupational pattern of the population has undergone a major change. The percentage of unemployed has increased from 3% to 14% post Tsunami. Population employed in fishery activity has gone down however the population employed in service sector has increased, this shift has taken place from fishing to the tourism sector. Due to relocation post Tsunami larger proportion of population (38%) are traveling more than 2.5 km to work (as compared to 20% earlier)

### Land and Development process and Suitability

As per the R&R policy decided by the Sri Lankan government, the land for reconstruction had to be provided by government and construction on the land would be the responsibility of the NGO's. Government was also responsible for provision of all trunk infrastructures. Due to the bureaucratic process considerable time was spend in identifying government lands which could be used resettlement.

Due to high population density, number of water bodies and marshy lands very few suitable land parcels were available with the government for reconstruction purpose. Restrictions were placed on construction without the buffer zone pushed the land price up. However low availability of land for the reconstruction sites delayed the Rehabilitation and Resettlement programme considerably. Apart from the

availability, these lands were not suitable for housing activities. Land suitability analysis was carried out using five important factors having specific rank value; rank sum method was applied for calculating the rank weightage. A comprehensive value of the weightages of all the factors together would indicate the suitability of the site. The factors used were the following:

1. Height from MSL
2. Distance from Coast line
3. Distance from Urban center/ settlement
4. Distance from Main road
5. Surrounding land use/soil type

This method was applied to 14 rehabilitation sites of four DS Divisions that is Weligama, Matara, Devinuwara, Dikwella. Only 3 sites had a total value of more than 1 and other 3 sites were having value near to 1, all other 8 sites were having values from 0.4 to 0.9. Most of the lands were found unsuitable as they were located in marshy lands and had lack of trunk infrastructure, poor terrain and poor accessibility. As these lands were located far from original settlement with poor terrain there is low possibility of having better linkages in immediate future. (Recently government has revised the buffer zone by narrowing it.)

At some sites, where two or three NGO's are involved in the constitution process, some infrastructure like a primary school, few shops have been constructed.

### Role of NGO's in Sri Lanka

Post Tsunami, a large number of NGO's (Local, National



and International) came forward to help the nation. Currently more than 250 NGO's are registered for provision of shelter, livelihood and other aid. In an effort to streamline the aid, NGO's bid for various projects floated was by the district secretariat through G.A. The NGO's are the providers for shelter; such as temporary housing, transition housing and permanent housing. The beneficiaries are chosen from the list of government identified beneficiaries. The NGO's monitor the sites and new construction as well as the flow of money to the beneficiaries. NGO's are responsible for site-level infrastructure and not at trunk level. The local body is responsible for provision of trunk infrastructure.

As agreed by the government and funding agencies, the land for the building construction purpose is to be provided by the Government. Involvement of different organization is as per the above system has laid to duplication of roles specially, in the selection of beneficiaries.

Also the roles and responsibilities between the provincial and central government with

reference to reconstruction programme have been duplicated. The NGO's are able to start construction only after land is made available to them by the government. This has again lead to delays as government owned limited lands in the 4 divisions of Weligama, Matara, Devinuwara, Dikwella and has not been able to provide land at suitable places.

Local NGO's (Sewa Lanka, Local Religious Organization) were ahead in the construction process as these organizations had the strength of local logistic support. Some of the NGO's are involved in small reconstruction programme of about 20-30 units, where a fair share of funds is spent on non developmental /construction but on administrative expenditure of the NGO itself.

### Rehabilitation and Resettlement Process: Satisfaction Level

The rescue operation in place immediately after Tsunami was rated as satisfactory by 68% of the respondents. Higher dissatisfaction was reflected with the distribution of monetary help

for basic necessities, which was irrespective of the family size.

Only 7% of the respondents reported to be highly satisfied with the Rehabilitation and Resettlement process, 47% of the respondents reported to be moderately satisfied. Higher satisfaction levels have been reported from settlements where the local NGO's are working. Despite the programme implementation process being strongly dependent on NGO the disaster awareness has not percolated to the affected population.

### POLICY GUIDELINES

The key issues to be kept in focus during the R&R processes are

- a) Financial assistance and immediate monitory help provided should be with regard to the post disaster family size, assistance to be provided for special medical care needed for injured and traumatized members of the family.
- b) Time taken for rehabilitation: It is suggested that the community be shifted directly to permanent shelters from temporary shelters so that time and resources are saved. This would also have socio-psycho benefits for the community.
- c) Rehabilitation sites to be selected on lands upto 500 meters from the original location so that the linkages with livelihood/ occupational opportunities and other social linkages are maintained. Environmentally suitable, less vulnerable lands to be

...contd. on page 70

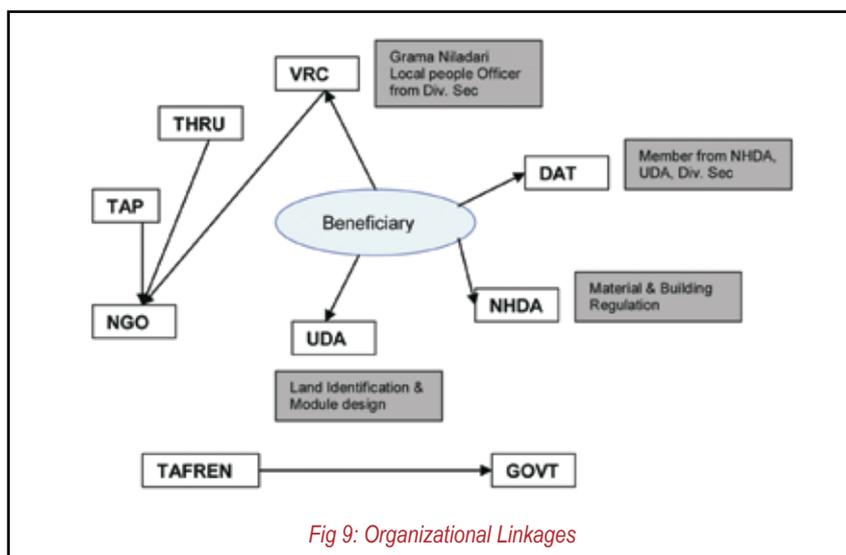


Fig 9: Organizational Linkages

# Creating Safer Cities and Communities



*Prof. S.K. Modak\**

According to the International Urban Development Association, more than half the world's population is living in cities and urban areas today and this number will certainly grow in cities of low income countries. Of our immediate concern is the fact that out of the 23 mega cities of the world, six cities sheltering eleven crore people will be located in South Asia and at least 3 of them viz. Mumbai, Calcutta and New Delhi will be located in India with populations exceeding 164 crore, 133 crore, and 128 crore respectively.

An explosive growth of population in our mega cities will naturally create a huge imbalance between the supply and demand of all kinds of public utility services including supportive safety management systems. The prospective mega cities in India will therefore need careful watching and advance preparation in terms of preventive counter measures against different kinds of natural and man-made disasters. The slogan 'A safe city is a just city' should therefore be the sole driving factor in planning and allocating funds for mega cities in future.

Disasters are of varied nature. They may come in the

natural form of floods, draughts, famines, earthquakes, avalanches or a tsunami. But disasters could also be in the form of building collapse, bomb explosions by terrorists, road and rail accidents, air crashes, landslides etc. Disasters can take place on a small scale or a large scale.

Some of them can certainly be foreseen by using modern advanced technologies like remote sensing and geographical Information system and taken care of by issue of pre-warning signals and activating a pre-determined action plan to mitigate and minimize possible damage to populace. Experts in the field of design, construction and maintenance of urban infrastructure, urban safety engineering and disaster management therefore need to come together and identify suitable new technologies for bracing up with problems of mega cities in India and Asia.

Most of the large cities including the mega ones have today reached saturation levels of population and are suffering from urban poverty, unemployment, housing shortage, crises in social services, high incidence of crimes, thefts, burglaries, ransom threats, large scale human

women and children. All this has led to degeneration of social life in these cities.

## **Mega cities in India**

The question is, after 60 years of independence how is India placed to effectively grapple with 'safety' issues in its mega cities and urban agglomerations? Each major city in our country today is aspiring to transform itself into a world-class city. Ahead in the race for such status are Mumbai, Kolkatta, and Delhi having a crore plus population, followed by Chennai, Hyderabad and Bangalore having a 50 lakh plus population, and Ahmedabad, Pune, Kanpur, Nagpur, Lucknow, Surat and Jaipur waiting in the wings with 20 lakh plus population. All these cities face serious problems of housing, slums, transport, water supply, sanitation and public hygiene, air and water pollution, and very poor social infrastructure in terms of schools and public hospitals.

According to 2001 census there were as many as 35 mega and million plus cities in India accounting for 10.79 crore persons. About 38 percent of the total urban population lived in these 35 cities. Greater Mumbai ranked first with 1.64 crore

\* Director, Education and Innovation, Akurdi Citygold Institute of Infrastructure Management, Mumbai



population, followed by Kolkatta 1.33 crore, Delhi 1.28 crore, Chennai 64 lakh, Bangalore 57 lakh, Hyderabad 55 lakh, Ahmedabad 45 lakh, Pune 37 lakh, Surat 28 lakh, Kanpur 27 lakh, Lucknow 22 lakh, Jaipur 23 lakh, and Nagpur 21 lakh. These cities with exploding populations have now become vulnerable to all kinds of disturbances and disasters. It can therefore be a worthwhile exercise to calculate the correlation coefficient between the degree of urbanization on the one side and degree of unemployment, increase in slum population, number of road accidents, traffic offences, incidence of cognizable offences like thefts, robbery, rapes, grievous injuries, murders, abductions, ransom cases, violence against women and children etc. on the other for each of these cities. It will also conform whether these cities are becoming increasingly unsafe or not.

It is a fact that crime is on the rise in the 35 mega cities of India. According to reports, one person is murdered every 16 minutes and one kidnapping followed by demand for ransom money takes place every 23 minutes. We have one of the lowest police to population ratio in the world resulting in the law and order situation going from bad to worse. The accompanying tables are illustrative of the gravity of the situation.

### Government initiative

Realizing the need to empower our large cities to act as catalysts for growth, a new initiative was taken by the Ministry of Housing & Urban Poverty

#### Crime in 35 mega cities

Year	Incidences	Rate per lakh of population
2001	289715	277.0
2002	297679	275.9
2003	291246	270.0
2004	309929	287.3
2005	314708	291.7

#### Police per lakh of population

Italy	559
Malaysia	354
South Africa	287
United States	244
England & Wales	234
Sri Lanka	178
India	122

Source: Sunday Times of India, August 19, 2007

Alleviation, Government of India in 2005-2006 by way of setting up the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Its objective is to fund projects of urban infrastructure upgradation. Recently it released the biggest largesse to Maharashtra and to Greater Mumbai, the compelling reason being the 944 mm rainfall on 26<sup>th</sup> July 2005 causing an unprecedented deluge in the city and loss of life and property on a never-before scale. One spill-over effect of the deluge was the debate it triggered throughout the country on the urgency to provide funds not only for civic amenities in urban agglomerations but also to keep ready disaster management plans for all kinds of calamities that may befall them. It also shows that what is lacking among our civil administrations is not resources, but the vision to foresee and forestall disasters through advance preparation.

A careful review of the mission statement of JNNURM however shows that although it gives a long list of sectors and

projects like slum improvement, water supply, sewerage, drainage, community toilets, storm water drains and solid waste management etc. as eligible for financial assistance, it takes no specific cognizance of projects for disaster management or damage control systems.

Of course, there is a National Disaster Management Division operating under the Ministry of Home Affairs which claims to have brought about a paradigm shift in the approach to disaster management. The new approach is multi-disciplinary and includes in its framework disaster prevention strategy, early warning system and disaster mitigation, and brings within its fold various agencies at the national, state and district levels. It highlights the fact that it is mostly the poor and the underprivileged which are worst affected by natural calamities and therefore need special attention. All this however may ultimately prove rhetorical if effective coordination is found wanting between the Ministry of Housing & Urban Poverty Alleviation and

Ministry of Home Affairs at the time of calamity. The decision to set up a National Disaster Management Authority to coordinate government policies for disaster reduction and mitigation is alright as far as it goes. It is welcome too, but whether it will really prove effective or remain an expression of pious platitude is for time to tell.

### **What makes our cities unsafe and unjust?**

It is necessary at this stage to enumerate the situations which are making our cities increasingly unsafe and unjust. One of them is lack of social justice. Building a just society signifies something more than mere administration of laws. It means, every individual, group or community must get a fair treatment and a just share of the fruits of development. Social justice ultimately means being entitled to the same rights and services as other citizens. But this is not happening.

That the urban citizens are being denied social justice in a number of ways is evidenced by the various contributing factors such as:

- a) Lack of access to proper housing
- b) Lack of availability of safe drinking water
- c) Absence of adequate health-care and sanitation
- d) Poor street lighting systems
- e) Lack of proper signage or guidance systems at public places
- f) Discrimination based on caste, ethnic group or religion
- g) Continuous migration in-flows

- h) Inept and inert bureaucracy with vested interest in procedural delays
- i) Overburdened judiciary faced with mounting backlog of cases
- j) Understaffed and underpaid law enforcement machinery
- k) Short sighted vision of the political class, and
- l) Widespread corruption and nepotism infecting the entire system

This has led to a wide chasm between the privileged few and the underprivileged many, breeding jealousy and antagonism and culminating in agitations and violent demonstrations against the powers that be. Those who are victimized and marginalized feel helpless with no one legitimately championing their cause. Their simmering discontent, although invisible, can always flare up and endanger the peace and tranquility of the habited area. It is in this backdrop that one needs to examine how our population loaded urban agglomerations with high incidence of crimes can be turned into 'livable' cities.

It is obvious that no single recipe can work for all the situations, since the contextual basis will be different from city to city needing suitable alteration in the planning decision. But one point should be borne in mind that every decision must promote 'inclusive' growth, meaning that it takes due care of all those living an unsafe and disadvantaged life. The list of recipes can include provision of affordable and decent housing, clean and safe drinking water, efficient municipal governance, satisfactory

street lighting system, effective law and order enforcement, and implementation of schemes of slum redevelopment and their transformation into vibrant neighborhoods and so on.

### **The neighborhood concept and redevelopment strategy**

Neighborhood constitutes the basic building block of any town or country planning exercise. It does not approve the setting up of a sprawling single use residential buildings development; instead it recommends the establishment of residential housing area having a conveniently located centre which throbs with lively activities of different kinds. The centre should be at a walkable distance of quarter or half kilometer and have public buildings, shopping centers, open spaces, schools, parks, entertainment centers, libraries, places of worship and appropriate signage everywhere. The internal road network of the neighborhood should be pedestrian friendly and facilitate use of bicycles. A good neighborhood design should incorporate all these features leading to savings in time and money costs of movement, infusion of an atmosphere of friendship and brotherhood and a sense of security and wellbeing.

Government's housing policy, especially the one relating to slum rehabilitation, should therefore insist on the incorporation of the neighborhood concept in letter and spirit in every redevelopment plan. Care should also be taken to see that politics does not get mixed up with decision making, especially at the local level.



Slums are an intractable problem in all mega cities of India, since the inhabitants are considered as squatters and their occupation of land as illegal. For example, in Mumbai the squatters occupy private lands to the extent of 50%, state government lands 25%, municipal lands 20% and central government and housing board lands 5%. Until the 1970s the state government policy was to demolish slums, clear the land and make efforts to settle the dwellers at alternative locations. But this policy did not work. Around 1985, the policy of slum upgradation was implemented with assistance from World Bank. Under this, the slum dwellers were given the legal title of their properties and then allowed to improve their housing standards at own cost through setting up their own cooperative societies. The scheme had to be given up because the government could not sustain it financially.

This led it to think of taking the help of builders and developers through introduction of the innovative Slum Redevelopment Scheme. It amounted to its tacit withdrawal from the social responsibility of providing housing to the urban poor. Under this Scheme, private developers are expected to house slum dwellers in small flats of 225 square feet area on the same sites by rebuilding high density, new medium-rise apartment blocks having rehabilitation and free sale components, the latter including flats and shops for commercial sale in open market. This scheme, in operation since 1991 and based on the principle of cross-subsidization of

### BMTPC Board of Management Meeting held on 21.12.2006



housing for slum dwellers, has achieved limited success so far. The rehabilitated families are happy that they got new shelters, but they are facing several intractable problems related to governance and social justice. It is not enough that the developers provide shelter. They must also provide the physical and social infrastructure in terms of roads, schools, health clinics, street lighting and markets which are very slow in coming.

The end result is that a new colony does spring up in place of shanty hutments, but not a vibrant neighborhood. In short, the Slum Redevelopment Scheme has certainly offered a feasible solution to the problem of housing in our mega cities, but falls short in its implementation strategy. Commercial concern seems to outweigh the

human factor in social engineering. Neighborhood concept becomes a victim in our efforts to create safer cities and communities.

#### References:

1. Dutta, Pranati, (2006), "Urbanization in India", *Population Process in Urban Areas, European Population Conference, 21-24, June 2006.*
2. *Business Standard*, 18<sup>th</sup> July, 2007 p.3
3. [www.indiausp.org](http://www.indiausp.org).
4. U.N. Habitat (2006-2007) *State of the World Cities Report.*
5. *National Disaster Management Scheme, www.ndmindia.nic.in*
6. *Sunday Times of India, Mumbai, 19<sup>th</sup> August 2007.*
7. Binti Kantha and D. Parthasarathy, (2006) "Slums, Rehabilitation and Government Policy- The Case of the Slum Rehabilitation Program in Mumbai" *The ICFAI Journal of Urban Policy.*
8. *Institute of Town Planners, India (2007), Technical Papers on Reforms in Town and Country Planning Legislations, www.itpi.org.in.*

# Construction of Demonstration Houses under VAMBAY

**M**inistry of Housing & Urban Poverty Alleviation has entrusted BMTPC with Construction of Demonstration Houses using Cost-Effective Building Materials and Disaster Resistant Construction Technologies under Valmiki Ambedkar Awas Yojana (VAMBAY) - now merged with JNNURM. Presently, under this project, demonstration houses are being constructed in five states as mentioned below:

- 70 Demonstration houses in Nagpur, Maharashtra
- 100 Demonstration houses in Dehradun, Uttarakhand

- 100 Demonstration houses in Bilaspur, Chhattisgarh
  - 70 Demonstration houses in Kudalu, Karnataka
  - 100 Demonstration houses in Trichi, Tamilnadu
- The status on various projects is as under:

- a. Nagpur: The construction of 70 houses have been completed at Kalmna, Nagpur and handed over to Nagpur improvement Trust, the nodal agency of the State Govt.
- b. Dehradun: 100 houses at three locations in Dehradun, Uttarakhand have been completed. The lepers have

already occupied these houses.

- c. Bilaspur: The work upto ground floor roof level in all 8 blocks consisting of total 100 dwelling units has been completed.
- d. Kudalu: Structural work of all the 70 dwelling units have been completed. Finishing work is in progress.
- e. Trichi: Out of 100 houses, construction of 80 houses has been completed upto roof level. In balance 20 houses superstructure work is in progress.



**Completed Demonstration Houses under VAMBAY at Kalmna, Nagpur, Maharashtra**



***Completed Demonstration Houses under VAMBAY at Dehradun, Uttarakhand***



***Construction in progress at Bilaspur, Chhatisgarh***



***Construction in progress at Trichi, Tamil Nadu***



***Construction in progress at Kudalu, Karnataka***

# Development without Disaster : Spatial Planning Issues and Options



*J.B. Kshirsagar\**



*Pawan Kumar\*\**

India has experienced high growth rate of urban population in the past decades. Economic reforms and liberalization during 1990s, massive inflow of foreign capital, increase in employment etc. provided an impetus to urbanization. Amongst the States and Union Territories, the National Capital Territory of Delhi is the most urbanized with 93% urban population followed by the UTs of Chandigarh (89.8%) and Puducherry (66.6%). Himachal Pradesh on the other hand is the least urbanized state (9.8%) followed by Bihar (10.5%) among all states and UTs as per Census 2001.

The management and reduction of disaster risk in highly organized cities has not got the required attention. Disaster management aspects have not been comprehensively addressed in the past and hence it is necessary to develop close relation between quantum of development and intensity of disasters.

The World Conference on Disaster Reduction held in January 2005 in Kobe, Hyogo-Japan, adopted a “Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters” commonly known as the Hyogo Framework for Action (HFA). This frame-

work incorporated five thematic areas that set an initial core of principles and goals, each one of them comprising several key components. The five priorities for action are:

- **Political Commitment and Institutional Development (Governance)** to ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
- **Risk Identification** to identify, assess and monitor disaster risks and enhance early warning.
- **Knowledge Management** including use of knowledge, innovation and education to build a culture of safety and resilience at all levels.
- **Risk Management Applications** to reduce the underlying risk factors, and
- **Preparedness and Emergency Management** to strengthen disaster preparedness for effective response at all levels.

The uncontrolled development in number, area, magnitude, etc. increases the vulnerability of the built environment in terms of structural damage. Uncontrolled and haphazard

There is no denying fact that  
**Table 1. Urbanization in selected Indian States, 2001**

S.N.	States	Urbanization Percentage	Category
1	Delhi	93.6	High Urbanized
2	Goa	49.8	More Urbanized
3	Mizoram	49.5	More Urbanized
4	Tamilnadu	43.9	More Urbanized
5	Maharashtra	42.4	More Urbanized
6	Gujarat	37.4	More Urbanized
7	Karnataka	34.0	More Urbanized
8	Haryana	29.0	More Urbanized
9	West Bengal	28.0	More Urbanized
10	Andhra Pradesh	27.1	More Urbanized
11	Nagaland	17.7	Less Urbanized
12	Orissa	15.0	Less Urbanized
13	Sikkim	11.1	Less Urbanized
14	Bihar	10.5	Less Urbanized
15	Himachal Pradesh	9.8	Less Urbanized

Source: Census of India, 2001

\* Director, Education and Innovation, Akruiti Citygold Institute of Infrastructure Management, Mumbai



development causes concentration of higher order physical, economic and social activities, complexity and interconnection of urban systems, location of human settlements in fragile/critical areas, urban environmental deterioration, structural inadequacies, poor construction and maintenance practices; etc. which further increase risk factors. The same is also associated with political and institutional shortcomings to create more complexity.

### **SPATIAL PLANNING APPROACH**

Development without disaster requires scientific and systematic approach to hazard analysis, vulnerability analysis, prevention measures, mitigation approach, preparedness planning, prediction, forecasting and warning, emergency response and recovery process. Disaster prevention, mitigation, preparedness and relief are the four basic elements, which contribute to and gain from the implementation of sustainable development policies.

### **Disaster Management Plan**

The Disaster Management Act, 2005 was enacted by the Govt. of India which provides the legislative framework for disaster management through establishment of Disaster Management Authority each at the national, state, and district level; an Executive Committee, each at national and state levels; and an Advisory Committee at district level. The Act has provision for specified functions at the local authority level as well as Guidelines for preparation

of disaster management plans at national, state and district levels.

### **National Plan for Disaster Management**

The National Executive Committee will prepare the plan in consultation with the State Govt. and the Expert Bodies or organizations in the field of disaster management. It will cover the entire country. The National Disaster Management Authority will approve this Plan and the same will be reviewed and updated annually. However, Disaster Management Plan of various Ministries and Departments of Govt. of India must be prepared by incorporating the specific measures to be taken by the Department concerned for prevention and mitigation of disasters in accordance with the national Plan; mitigation measures; department's role and responsibilities; etc.

### **State Plan for Disaster Management**

The State Executive Committee will prepare the State Disaster Management Plan and State Authority will approve the same. It will be reviewed and updated annually. It will include the vulnerability of different parts of the state to different kinds of disasters; prevention and mitigation measures and their integration with development plans and projects. The disaster management plan of various Ministries and Departments of the State Govt. may also be prepared.

### **District Plan for Disaster Management**

Every district of the state will prepare a disaster management plan. It will be prepared by the District Authority, after consultation with the local authorities and having the regard to the National Plan and the State Plan. It will be approved by the State Authority and reviewed and updated annually. District Management Plans of different offices and authorities at district level may also be prepared.

### **Comprehensive Urban Management**

Town and cities are “Centers of Civilization and Engines of Growth” due to social, cultural, economic and scientific advancement. But rampant urbanization enhances the vulnerability of the society. Demand for land in most of the urban areas leads to use of unsuitable terrain prone to natural hazards, which makes cities unsustainable. Land that is unsuitable for buildings, close to industrial installations, flood prone areas, contaminated ground, etc, is available only to the urban poor which are prone to the effects of natural and manmade hazards. Unsafe structures on the unsuitable terrain further increase vulnerability. Hence a comprehensive urban management strategy is required to be developed by local authority to reduce vulnerability and to achieve healthier livable and sustainable society.

The development policy deals with economic, social and environmental goals. A Disaster prevention/mitigation policy should be formulated as a part of national policy which guides location and spatial distribu-

tion of development. Regional policies control the location of activities within a region as well as regulate activities of the private sector through location restrictions and minimum standards; which serve as a means of mitigating disasters.

Local policies have their own importance because of which specific hazard mitigation programmes are to be implemented. Land use micro zoning establishes a detailed land use pattern within the natural hazard micro zoning framework. Natural Hazard Micro Zoning is a detailed study of the probability of natural hazards in a given site based on study of sub-soil conditions. It identifies probable intensity, frequency or return period of disasters. In fact, it helps to decide land use zones, zoning ordinances, building codes, etc. for better prevention and mitigation measures.

### Master Plan Approach

Master Plan is a coordinated set of proposals for physical development of the town as a whole rather than parts of it, and taking into account not only the present needs but also the future requirements. The Master Plan of Delhi, Perspective 2021 was notified on 7<sup>th</sup> February, 2007. According to the India Seismic Zone Map, Delhi is in Seismic Zone-IV which means high damage risk zone. In the past, NCT of Delhi has experienced several earthquakes of magnitude 5.5 to 6.7 on the Richter scale. Two major lineaments, namely Delhi-Haridwar ridge and Delhi-Moradabad faults pass through the area, both having potential of generating earthquakes of

the magnitude upto 6.5 to 6.7 in future. Such natural and man made disasters neither can be prevented nor predicted. However, with technological advancements to some extent, mechanisms can be developed to mitigate the effects of the disaster. Areas of vulnerability can be identified and necessary measures can be proposed by the agencies concerned. The concerned local bodies should keep updating the building bye-laws to safeguard against disasters and ensure effective and strict enforcement. The following policies and strategies for disaster management need to be incorporated:

#### Pre-disaster Preparedness

- i. Micro-zonation surveys should be referred for land use planning and be considered while preparing the Zonal Plans and Layout Plans. Seismic micro-zonation for selected areas having high growth rates should be taken up on priority. On the basis of vulnerability studies and hazard identification, which includes soil conditions, probable intensity of earthquake, physiographic conditions of the area, fault lines, etc. local level land use zoning and planning should be undertaken.
- ii. Building Bye-laws should incorporate the aspects of Multi Hazard Safety, and Retrofitting. Priority should be given to public buildings (such as hospitals, educational, institutional, power stations, infrastructure, heritage buildings/monuments, etc., and those structures which are

likely to attract large congregation) for their ability to withstand earthquake of the defined intensity. Suitable action should be taken for retrofitting and strengthening of structures identified as vulnerable as per earthquake manuals and National Building Code. A techno-legal regime has to be adopted for provision on Multi Hazard Safety aspects.

- iii. Delhi Fire Services being the nodal agency for disaster management should identify vulnerable areas such as areas with high density and poor accessibility in the city and propose suitable measures. Proposed Disaster Management Centres should be established in every zone to deal with disasters, including bio-chemical and nuclear disasters.
- iv. Sensitize people, particularly school children, about the after effects of disaster.
- v. Make people aware through media campaigns and advertisements about emergency procedures and location of emergency shelters etc.

#### Post Disaster Management

It has been observed that disaster is generally followed by break down of communication lines and disruption of essential services. Therefore, the key communication centres should be protected from natural disasters i.e. flood, fire and earthquake etc. and service restoration should be taken up on top most priority. Necessary set up should be created in each department concerned for such eventualities. Standard



type designs and layout should be prepared by the local bodies and made available to the people so that crucial time is not lost in approval of layout plans and building plans after disaster. Disaster Management Centres have been proposed to serve people in the case of disaster and provide emergency shelters.

### **Community Based Approach**

Community based disaster preparedness is one of the important tools for development without disaster. In fact, it is a process in which risk communities are actively engaged in identification, analysis, treatment, monitoring and evaluation of disaster risk in order to reduce their vulnerabilities and enhance their capacities. The involvement of most vulnerable segment of the society due to disasters is paramount and the support of such vulnerable society is necessary both in mitigation and supportive approach. Community participation provides the opportunities to take control of self reliance. In this context, Panchayati Raj Institutions help to handle the entire development process. Knowledge of local social structure, culture, skills and economy of the area help the local authority or agency to adopt the process of development as per their social norms and beliefs. It provides a base for socio cultural acceptability of the decision making process.

### **DEVELOPMENT WITHOUT DISASTER IN THE CONTEXT OF JNNURM**

Realizing the urgency of

addressing urban problems in the existing scenario, and to augment urban infrastructure backed by strengthening urban governance of towns and cities, the Ministry of Urban Development, Government of India, launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in December, 2005. The Mission aims at creating economically productive, efficient, equitable and responsive cities in an integrated framework with focus on economic and social infrastructure, basic services for the urban poor and implementing urban sector reforms for strengthening the urban local bodies. The Mission is essentially a reform linked Mission. Reforms are envisaged both at the State Government and Local Government level. Both are required to undertake over a specific time period in order to avail substantial central assistance. The JNNURM consists of two sub-missions:

- Urban Infrastructure and Governance, and
- Basic Services to the Urban Poor.

JNNURM has an estimated provision of Rs.50,000 crore over a seven-year period starting from 2005-06, making it the single largest central government initiative in the urban sector. During this period, funds would be available to ULBs and para-statal which may utilize these funds for implementing projects that meet the Mission's requirements. The Mission covers 63 cities, consisting to seven mega cities, twenty-eight million-plus cities/UA and twenty-eight cities/UAs with less than one million population. These cities

need to have elected bodies in position to access funds.

The following components are admissible for funding under the Sub-Mission on Urban Infrastructure and Governance.

- Urban Renewal i.e. redevelopment of inner (old) city areas. This includes widening of narrow streets, shifting of industrial/commercial establishments from "non-conforming" to "conforming" areas to reduce congestion, replacement of old and worn-out water pipes by new/higher capacity ones, renewal of sewerage/drainage/solid waste disposal systems, etc.
- Water Supply (including desalination plants) and sanitation.
- Sewerage and Solid Waste Management.
- Construction and improvement of drains/storm water drains.
- Urban Transport, including roads, highways/expressways/ MRTS/metro projects.
- Parking lots/spaces on Public Private Partnership basis.
- Development of heritage areas.
- Prevention & rehabilitation of soil erosion/landslides only in case of Special Category States where such problems are common and
- Preservation of water bodies.

Additionally, Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) a sub-component of JNNURM broadly covers vari-

ous infrastructure components such as water supply, sanitation, drainage, prevention & rehabilitation of soil erosion/landslides (only in case of special category States), etc. for betterment of the cities and towns. Suitable disaster risk prevention and mitigation measures are considered in Urban Infrastructure Projects such as:

- I. The urban development projects having long gestation coupled with huge outlays are associated with large social benefits drawn upon potential disaster risk management plan on case to case basis. This ensures, in a major way, the preparation of a forward plan against the risks associated with the project proposals. Currently, Environmental Impact Assessment (EIA) is mandatory for major projects. Similarly, a Disaster Risk & Mitigation Plan (DRMP) may be made mandatory for major infrastructure projects and to this would greatly ensure quality & better manageable urban infrastructure projects for the city development in overall towns.
- II. In post-disaster phase, an emergency plan for water supply, roads, sewerage, etc. is important for sustenance in the long run. However, it will give relief to survivors and help to carry out further relief and rehabilitation works. In this context, EMERGENCY PLAN for various components of infrastructure must be prepared well in advance and should form part of the final detailed project report

including addressing to organizational needs of Man-Power component and Community groups.

- III. In City Development Plan (CDP), the areas vulnerable to disasters should be identified by the authorities and entrusted with the task of preparation of development plans of those areas. For preparation of the proposals for development in disaster prone areas, town planning department should take specialized advice of the agencies such as Geological Survey of India, Meteorological Deptt, Earthquake Engg. Deptt, Structure Engg. Research Centres, etc. This should be followed by preparing special schemes for water supply, sewerage, , open space , keeping in view the distinct characteristics of the areas and ensure that the buildings and other constructions, conforming to specifications governing such construction.
- IV. Development Control particularly Zoning Regulations and Landuse Sub-Division, which are an integral component of Master Plan and CDP, should include provision for treatment of such disaster mitigation measures. The municipal byelaws should provide for safety measures in such areas in the construction and maintenance of water lines, sewer lines, etc.

### CONCLUSION

Economic growth and sustainable development cannot be achieved without adequate measures to reduce disaster losses.

It is estimated that deaths due to natural disasters on account of earthquakes are 51%, floods 29%, cyclonic storms 17%, volcanic eruption 2%, Tsunami 0.8% and landslides 0.2%. Economic losses due to natural disasters are increasing at an alarming rate of 400% per decade. Similarly, built environment causes maximum damage during natural disasters. It is the primary responsibility of the Government. to demonstrate a strong commitment to frame policy for protecting its people, infrastructure and other national assets from the impact of natural disasters.

The Hyogo Framework for Action (HFA), etc. is a milestone depicting growing international concern to reduce the impact of natural disasters. International agencies like UN – DHA (UN – Department of Humanitarian Affairs), FAO (Food and Agriculture Organization), UNDP, UNESCO, WHO, World Bank, etc. provide assistance in pre disaster stage, response operations, recovery programmes as well as in future development. In many cases, international assistance in post-disaster recovery may merge into long term development programmes. The process of assistance depends on understanding between the agencies and national government. Hence it is necessary to develop a healthy mutual relationship throughout the process of preparedness, response and recovery between nation's agencies.

The report of the 2<sup>nd</sup> Administrative Reforms Commission emphasizes the need to assist the civil defense structure for



working with the community for disaster related activities and has suggested a target of generating trained volunteers from the community to the extent of 1% of the population. Efforts are on to revamp the civil defense structure of the country to bring it in sync, with present needs and make it an effective instrument for Disaster management.

In 2001, the Ministry of Urban Development and Poverty Alleviation published a notification regarding structural design of foundation, masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete and structural design to be carried out in accordance with the various provisions mentioned in the National Building Code of India prepared by the Bureau of Indian Standards, Ministry of Consumer Affairs, Govt. of India. It is also stated that the various codes related to earthquake protection of buildings are also required to be adhered to. The Notification further states that the building drawings submitted for obtaining building permission shall be signed by the owner, architect and the structural engineer. The building plan must satisfy the safety requirement as stipulated in local building bye-laws and the information given therein must be factually correct. However, it should also be certified that the structural design including safety from natural hazards based on soil conditions has been duly incorporated in the design of the building and these provisions should be adhered to during the construction and the structural engineer and architect will be responsible for structural safety

in the event of natural hazards by way of earthquake. It is the responsibility of the owner to ensure that the building should be constructed according to the sanctioned plan and structural design which incorporates the provisions of structural safety as required. Any subsequent change from the completion drawing shall be the responsibility of the owners.

The formulation and implementation of building bye-laws comes under purview of urban local bodies concerned. A building bye-law is a local law framed by a sub-ordinate Authority. It regulates the construction aspects of the buildings. The main purpose of building bye-laws is to secure convenience, safety and general welfare of the community. Building bye-laws are tools used to regulate coverage, height, building bulk, architectural design, and construction aspects of the buildings so as to achieve orderly development. Their mandatory nature can serve to protect buildings against fire, earthquake, noise, structural failures and other hazards.

The Tsunami of December, 2004 was a black day in the history of disaster particularly for India. In India, 12,400 persons died or went missing in 38 affected islands of Andaman & Nicobar. About 50,000 people were affected. It was estimated that 10,000 Ha of agricultural land was lost and 354 km. roads were damaged. Around 24 jetties, 85 schools, 34 primary health centres, 37 MW power projects and water supply in 257 villages was badly affected. The Town & Country Planning

Organization, Ministry of Urban Development, Govt. of India of prepared the Layout Plans for Permanent Settlements at 72 locations in various islands. The layout plans for permanent settlements in A&N Islands were taken up in accordance with current town planning norms and as these settlements are come up as model townships, catering to the requirements of all facilities and amenities like schools, shopping centres, health centres, open spaces, government and semi-government establishments, etc. As such the plans prepared by TCPO took into account the topography, socio-economic characteristics, forest resource, etc. and, above all, are responsive to the needs and requirements of the local community, keeping in mind future requirements.

With the 73<sup>rd</sup> and 74<sup>th</sup> Constitution Amendment Act, 1992 local bodies have been empowered to take up planning and implementation of development programmes within their jurisdiction. These bodies also have powers to raise local resources through taxes, etc. The process of empowerment of panchayats involves transfer of schemes with their resources and personnel to panchayats by the concerned line departments. The States are at different levels of devolution. However, panchayats and gram sabhas are already playing a role in the implementation of a number of key programmes like poverty alleviation, wage and self employment programme as well as identification of beneficiaries for receiving benefits under government programmes including

disaster relief.

Development without disaster requires community mobilization. It requires awareness generation at local levels through media, civil society, community leaders and other catalysts. A phenomenon which is emerging in rural area is self-help groups (particularly among women, user groups, agriculture labourer etc.). These groups are bringing social, political and economic empowerment of the weaker sections and are generating a climate of confidence and self-help. A good degree of social mobilization has been made possible because of the pro-active positioning of social mobilization in poverty alleviation, self and wage employment, etc.

In Disaster prone areas, location of development, change in land use, as well as emergence of new settlements are the main areas of concern for preventing disaster. Town Planners are often able to encourage development away from hazardous areas by investing or creating favourable environment for investment in less vulnerable regions. This is possible by extending economic incentives in terms of allocation of land in safer areas, loan and grants for disaster resistant construction, favourable credit, favourable taxation, technical assistance, etc.



... from page 57

identified for Resettlement sites. Desirable to locate the site such that it is atleast 5 meters above the mean sea level. Lands if not available with government should be purchase from the market so that the constructions of the permanent shelters can starts immediately.

Micro finance in form of small loans at low rate of interest for community members to start small businesses is required. This loans need to be provided without any colaterals.

d) The Reconstruction programme should be based on original tenure, size of plot, size and quality of the built space. Guidelines need to be specified with reference to the maximum size of units that the NGO's should provide.

Efforts to be made to have least disparity among the quality and size of construction by different NGO's.

Opportunity to be provided to people to construct their own homes in an incremental fashion by providing cash assistance.

Material banks need to be set up and located near to the rehabilitation site.

## REFERENCES:

1. Mukhopadhyay, Suvasish; Delhi: Shipra Publications, 2005; Tsunami: the biggest bane.
2. Dudhiya Saahil; Unpublished students work in CEPT University, 2006; Reconstruction strategies for Tsunami affected areas of Tamilnadu
3. Ray C. N.; Ahmedabad: School of Planning, CEPT University, 2001; Earthquake Relief and Rehabilitation Gujarat: issues in disaster management
4. World Bank, Washington D.C. Asian Development bank; Delhi: Gujarat Govt and Government of India, 2001; Gujarat earthquake recovery programme: assessment report March,14 '2001.
5. Gujarat Revenue Dept; Gandhinagar: Gujarat Govt, 2001; Earthquake 2001 rehabilitation package for affected areas.
6. Choudhary Siddhartha; Ahmedabad: School of Planning, CEPT University, 2003; Gujarat earthquake reconstruction and rehabilitation project: documentation of the Indo-US-fire-D's GUDC portfolio.
7. Sinha, Prabhas Chandra; New Delhi: S.B.S. Pub & Distr. Pvt. LTD, 2006; Disasters, Vulnerability and risks: trends, concepts, classification and approaches.
8. *Bharti, Madhu and Sharma, Utpal; School of Planning, CEPT University, 2005; Socio Impact Assessment of GEERP programme.*



## Technical Workshop on Building Byelaws for Safety Against Natural Hazards

The Ministry of Home Affairs entrusted BMTPC to organize one day Technical Workshops on Model Amendments in Town and Country Planning Act, Zoning Regulation, Development & Control Regulation and Building Regulation for safety against natural hazards in various States to assist them in modifying their existing Building Byelaws.

The Council in earlier years organized workshops in the State of Assam, Arunachal Pradesh, Bihar, Chhatisgarh, Himachal Pradesh, Manipur, Meghalaya, Tamil Nadu, Tripura and Uttar Pradesh.

More Technical workshops were organized in the following States:

- a. Aizawl, Mizoram (October 24, 2006)
- b. Kohima, Nagaland (November 23, 2006)
- c. Port Blair, A&N Islands (January 17-18, 2007) and
- d. Gangtok, Sikkim (February 16, 2007)
- e. Chandigarh (June 7, 2007)

Officials from various State Govt. departments including engineers and architects attended these workshops. State specific amendments in their Building Byelaws were discussed in detail. State Governments are taking actions to modify their respective bye-laws on the basis of recommendations of the Expert Group set by MHA.



# vkn' kZuxj



## jt u dēkj\*

ekuo cl ko l aakh igyka dls bu 'lgjka us c[keh vahdlj fd; k gā ijUrq; g dgus ea Hh l adkp ugha glōkfd bl izlj dh l adYi ukvka dk vHko nsk ds vU; inśka dh jkt /kfu; kal st M/NH/cM uxjka ea gā fnYyh , oa bl ds vki kl fodfl r gsjgh izkkyh dk mi; k Q ogkjd rky ij inśka dh jkt /kfu; ka ea c[keh vahdlj djus ea vc foyEc ughadjuk plfg, A l kfk gh; g Hh t: jh gSfd ekVj Iykur\$ kj djrs le; dffkr 'lgj ds l kfk l kfk vki kl c l s 'lgjka ds fu; kt u dh ifdz k dh Hh l eh{k dh t kuh plfg, ft l l s dkyarj ea fofo/k ukxfjd l qo/kvka ds fy, uxjka ds chp vki l h l ka L; l qfkr g l dā cM 'lgjka ds l keus vk jgh , oa Hkoh l eku l eL; kvka dk funku djus ds fy, 'lgjka ds feyt q dj dk Zdjus dh t: jr gā

Xyky olfez , oa iznk k ij fo'o ds vudl 'lgj igys l s gh feyt q dj dk Zdj jgsgā bl ds l kfk gh vU; rdudh {k-ka ea Hh vudhka ds cgn Lrj ij chVus dh rjar vlo'; drk gā bl l aak ea forj.k , oa [kir Lrj ea mt Z dscgrj mi; k 'lgjh dM dpjs dk fui Vku] i; k j.k vudly Hou fuelZkl lexh dkmRi ku] i k dfrd foinkvads l e; t kueky dh {kr dksde djus ds fy, cgrj rdudh vkn dk jkVt; Lrj ij fofHū

**vkn'** kud uxj i phu dky ds dLcha dk mūr : i gā uxjhdj.k ifdz k ea vfkZl l kelt d o /kfeZl dkj.k egrbi vZjgsgā uxjkaeam | kx / kkh fofHū izlj dsvlok | foi.ku izkkyh ; krk kr ds l kku] vud /lekZq k; ; ka dk l kfk l kfk jguk , oajkt dh l Rrk dkl kelt; vkn nś kus ds feyrk gā uxjh; izkkyh fdl h Hh l H rk dk fodfl r : i n' kZ h gā

Hkjrh; t ux.kuk 2001 ds vud kj 10 ykkl svf/kl vlcnh okys 'lgjka dh l ā; k c<dj 35 gk xbZ gā 'lgjka ea r t h l s gk jgh c<krjh , oa vfu; ktr vsk khdj.k rfk xkoka l s 'lgj dh vky iyk u izfr us nsk ds uxjka , oa egluxjka ea fofHū izlj dh l eL; k amRū ū dj nh gā t s s vlok dh del dkuw o Q oLFk dh fcxMh flfkr] xjch] cjkt xkj l LopNrk dk vHko vkn izdqk gā bu l eL; kvka ds dkj.k fuokl ; ka ds l kelt d t hou , oa i; k j.k; xqoRrk ij foijr iHko iMk gā tul ā; keaof) ds dkj.k l qo/kvka ij vr k/kl nco o LFKu; fudk; ka dh dk Zerk ij ifrdy iHko l s izfr ck/kr gk h gā , l knś kx; k gSfd ykka ds fofHū izlj dh l qo/k; a eg\$ k dj kuseal jdkjh rā foQy l kcr gk jgk gā

'lgjh fodkl dk ka ea turk dh Hxmhj fdl h Hh dk; Zle dh l Qyrk dk eyea gā 'lgjh izkkl u dh l Hh xrfok/k; ka dk dñz euq; gS vr% bl s eV; gh

u gkdj eV; kēdk gkuk plfg, A euq; , d l kelt d izk h gS t k viuh l kelt d vlo'; drkva l s ijr gkdj dk Zdjr k gā 'lgjh izkkl u ea ukxfjd vky izkkl u nka dks l kfk feydj , d nwjs ij fo'okl djrsgq rfk, d nwjs ds iyd l e>rs gq dk Zdjuk vkt l e; dh iqlj gā egluxjka dsvrfjDr vU; l LFKu; ij uxj i p k rh Q oLFk fo | eku gā ; fn uxjka ea fu; kt u dk vHko jgs rks , d rjQ vQ oLFk gkch rfk nwjh vky egluxjka o fodfl r 'lgjka dh vky iyk u t kjhgus ds l kfk l kfk c<skA bl l scM 'lgjka eat ul ā; k dknco c<sk ft l l s miyCkt u l qo/kvka ij Hkh Hkh iMkA dkyarj ea bu l qo/kvka dh xqoRrk , oa ek=k ea dVkh dh l Hkouk arks c<sk gh l kfk gh ekuo cl ko l st M/vU; i {kat s s i; k j.k ifjogul dkuw Q oLFk vijkhdj.k vkn Hh udjred iHko l s vNws ugha jgkA vr% 'lgjh us'ofdZ , oa l Ec) rk dh vr; ūr vlo'; drk gā

fnYyh , oaml dh l hek l st M/vU; jkt; ka t s s gfj; k k mRj inśkj jkt LFKu dsudVorlZ' lgjka dk mnlgj.k gā ; g ckr /; ku nsus ; k; gSfd fnYyh ea c<rsfodkl dh ifdz k l s ; s fudVre 'lgj vNwsughnjgsvky fnYyh dsfodkl dhygj dk Qk nkbu 'lgjka us [k mBk; ka fnYyh dh fodfl r t hou l adfr , oa t hou Lrj dh >yv vkt bl dsvki kl ds 'lgjka ea Hh nś h t kl drh gā fnYyh ea l Qy dbZi fj; kt ukvka drkva , oavU;

\* izakl jkVt; vlok cñ] ubZfnYyh



'lgjla ds clp vki l h l g; sx , oa 'lgj Lrj ij xj jkt; vfhdrkz/kj LFKuh; l LFKvka , oal Hh izlkj dh Lo; a l sh l LFKvka grq dQ dk Zbl izlkj gA (1) dkuw Q oLFk ea l qkij , oa vijk/hdj.k dh jkdFke (2) ifjogu Q OLFk (3) f'kfk (4) LokLF; (5) i; kZj.k bl ds fy, t: jh gS fd fofHku cMs 'lgjla ea izkkl u ds ckgz l eFkz feyA bl ds fy, efm; k ij izlkj.k fofHku xj&l jdkjh l xBuka, oal jdkj ds fofHku i {kha ds clp cBd , oal feukj j t Hw/ oS/Qs j , l kfl ; 'ku , oal jdkj ds clp i k j n f' kZ k l j d k j & u k x f j d l g H f x r k ij d k Z k y k v a v f n d k v k k t u t : j h g A

; fn ge l ve Lrj ij {kerk fuekZk ds l nHZeans larkns k ea vufxur mnlgj.k ekf w gA t gla xj&l jdkjh l xBuka , oa Q fDr; ka us vius Lrj ij izkl djrs gq l a f / k r { k s e a t h o u L r j l q k j u s l e k f t d c j k b ; k a d s n y d j u s x j l c h n y d j u s u b Z r d u h d f o d f l r d j u s v k n d s f y , l Q y f o y { k k i f r H k d k i n ' k z i f d ; k g A t : j r b l c r d h g S f d l H h l Q y l e g ; k t u k v a d k n L r o t h d j . k f d ; k t k r F k l H h l j d k j h v j x j & l j d k j h e p l a i j y k l a d s l l e u s b l g a i Z r q f d ; k t k r F k f o f H k u N W & c M s ' l g j l a e a b l i z l k j d h l e g i f j ; k t u k v a d s i k R l k f r f d ; k t k r f d u d o y N W s c M s ' l g j l a d s c l p v k i l h l g ; l s x h d h g e l j h i f j d Y i u k ' l q v k r h n l s e a i n s k d j l d s x h c f y d u k x f j d l a d s t h o u L r j d s l q k j u s e a H h d k j x j l k f r g k l d s x A f o x r n s n ' k d l a e a x j & l j d k j h l x B u k a u s l e k t l q k j d h f n ' k e a m Y y s l u h d k Z f d ; k g A v k t l j d k j u s H h b l r F ; d s L o h d k j f d ; k g S f d v x j m l s v i u h t u ; k t u k v a d s l Q y c u k u k g S r k s x j & l j d k j h l x B u k a , o a t u r k d h H x h n l j h d s l k F k y d j p y u k g l a f n Y y h l j d k j u s v H h g y g h e a H x h n l j h ; k t u k ' l q d h f t l e a H k j h l Q y r k f e y l A

'lgjla l s t Q s f o f H k u i { k h a , o a

'lgjla ds l e { k m i f l F k r l e L ; k v l a d s f u n k u d s f y , ' l g j l a d s c l p v k i l h l g ; l s x , o a ' l g j L r j i j x j j k t ; v f h d r k z / k j L F K u h ; l L F K v k a , o a l H h i z l k j d h L o ; a l s h l L F K v k a g r q d Q d k Z b l i z l k j g A ( 1 ) d k u w Q o L F k e a l q k j , o a v i j k / h d j . k d h j k d F k e ( 2 ) i f j o g u Q O L F k ( 3 ) f ' k f k ( 4 ) L o k L F ; ( 5 ) i ; k Z j . k a b l d s f y , t : j h g S f d f o f H k u c M s ' l g j l a e a i z k k l u d s c k g z l e F k z f e y A b l d s f y , e f m ; k i j i z l k j . k f o f H k u x j & l j d k j h l x B u k a , o a l j d k j d s f o f H k u i { k h a d s c l p c B d , o a l f e u k j j t H w / o S / Q s j , l k f l ; ' k u , o a l j d k j d s c l p i k j n f ' k Z k l j d k j & u k x f j d l g H f x r k i j d k Z k y k v a v f n d k v k k t u t : j h g A

; fn ge mDr l a Y i u k d s f o L r r : i e a n s l a r k s j k V t ; L r j i j f o f H k u n s k a d h l j d k j k f o f H k u n s k a d s u x j k j f u t h , t a l ; k a , o a v U ; l a f / k r i { k h a d s l g ; l s l s f O ; k R e d l p u k , o a K h u r a d h L F k i u k d h t k u h v f u o k Z g S r k f d l Q y , o a v l Q y n k u l a i z l k j d h l p u k v a , o a K k u d k Q k i d f o L r k j l { k e : i l s g k l d s r F k ' l g j & n j & ' l g j l g ; l s x d h l d k j R e d i f j d Y i u k e w Z : i / k j . k d j l d a v r e a ; g H h t : j h g S f d f o d f l r u x j l s t Q s v U ; f o d k l ' k y , o a v f o d f l r u x j k a d s c g r j f o d k l d s f y , f o d f l r u x j v k F k z l : i l s l g k r k d j a v U ; F k d k y k r j e a f o d f l r u x j k a d s l a f B r f o d k l i j c q k i H h o i M a k A v k v k g e l H h ; g ' k i F k y a f d g e v i u s u x j , o a n s k d h f o d k l i f d z k d s c g r j c u k u s d s f y , v k i l e a l g ; l s x d j r s g q , d t v g l d j d k Z d j a s o v i u s u x j k a d s v k n ' k Z u x j c u k , a A

**PERFORMANCE APPRAISAL CERTIFICATION SCHEME OF BMTPC**

The Council is operating Performance Appraisal Certification Scheme (PACS), which is a third party operated voluntary scheme for providing Performance Appraisal Certificates (PAC) to a manufacturer/supplier/installer of a product which includes building materials, products, components, elements, systems, etc. A renewed thrust has been given to reach the large segment of the stakeholders. The PACS runs under the guidance of a Board of Agreement and Technical Assessment Committee set up by the Ministry of Housing & Urban Poverty Alleviation.

In recent past, the Council has received following applications for obtaining PAC and the same are under various stages of processing:

1. Riya Enterprises, Gandhidham, Gujarat for Finger Jointed Wooden Doors
2. Sintex Industries, Kalol, Gujarat for nine products on doors & safety tanks
3. Contech Chemicals, Paldi, Ahmedabad for six products on cementing adhesives
4. Right Vision (India) P.Ltd. , New Delhi for HDPE Covers
5. Ishan Enterprises, Bilimora, Gujarat for Heat proof tiles for roofing
6. Reliance Industries, Hoshiarpur, Punjab for RECRON 3S Fibre
7. V.K.Plastics, Manesar, Gurgaon for Roofing sheets.



# Capacity Building Programmes

**B**MTPC has continued its efforts in organizing structured training programmes on various themes relating to new building materials and advancement of technologies and the need for disaster resistant construction to mitigate the effect of natural disasters. These programmes gives opportunities to working professionals for regularly updating their knowledge and understanding of subjects.

Faculties for these training programmes are well known experts from academic institutions as well as practising professionals besides BMTPC's own officers. More than 300 professionals, in last one year, both from leading public and private organizations attended the training programmes. Following training programmes have been organized in recent past:

- Use of Chemical and Mineral Admixtures for Concrete Construction, New Delhi, April 27 – 28, 2006
- Water Proofing and Damp Proofing Materials and Techniques for Buildings and Structures” at Pune, May 25 - 26, 2006
- Retrofitting and Repair for seismic strengthening of buildings and Structures”, New Delhi, 14-16 June, 2006.
- Repair, Maintenance and Rehabilitation of Buildings & Structures, New Delhi, 22-23 August, 2006
- Concrete Making Materials,

Mix Design and High Performance Concrete, New Delhi, 6th to 8th September 2006.

- Team Building, New Delhi, November 9-10, 2006.
- 5-day training programme on field application of innovative technologies was organized at Vidisha from 26 Nov. to 3 Dec.2006.
- 7-days Skill Upgradation programme for semi skilled workers at Bhilai, 15-21 December, 2006.
- “Water Proofing and Damp Proofing Materials and Techniques for Buildings and Structures”, 22<sup>nd</sup> - 23<sup>rd</sup> January, 2007, Kolkata.
- The Council jointly with Nirman Vikas Anushandhan Sansthan, Raipur organized a One Month Training Programme for Capacity Building of 30 masons from rural areas near Raipur from 23<sup>rd</sup> March 2007 onwards.
- 7-days training programme for construction workforce

was organised at Srinagar, Garhwal from 12-18 August, 2007.

- Innovative Techniques for Construction Workers, Jaipur, 22-24 Sept.,2007.

In addition to the above, the Council organised a 5 days short term training course on “Earthquake Resistant Design and Construction of Buildings” during 18<sup>th</sup> to 22<sup>nd</sup> September 2006 in collaboration with IIT – Roorkee. It was the inaugural course of the series of short term courses conceived by the Council in joint associations with the institutions of excellence such as IITs. The training programme received overwhelming response and was attended by 39 senior officials from Indian Army, Indian Railway, NTPC, Rajasthan Housing Board, BHEL, offices of United Nations, BEL, Satluj Jal Vidut Nigam, CPWD, SAIL, PWD-Chennai and other various State Municipal Administrations/Boards etc.





# Activities in the North Eastern Region

**B**MTPC is actively involved in developing bamboo based technologies and to promote these technologies in the North-Eastern Region and other bamboo growing areas, by setting up of Bamboo Mat Production Centres for processing of bamboo, encouraging commercial production of bamboo based products, construction of demonstration houses etc. The Council is also engaged in providing training to the local artisans in processing of bamboo.

## Construction of Demonstration Structures in Mizoram and Tripura

BMTPC has undertaken construction of 10 demonstration structures, each, using bamboo based technologies in Mizoram

and Tripura. These includes houses, OPD buildings, Library buildings, Picnic huts, Schools, etc. The cost of construction is considerably reduced by 25% to 30% using bamboo based technologies for different types of structures as compared to conventional construction. During constructing various types of structures local contractors, masons, artisans were provided training.

## Bamboo Mat Production Centres

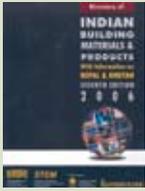
BMTPC, in cooperation with Cane & Bamboo Technology Centre (CBTC), Guwahati and State Governments, is establishing two Bamboo Mat Production Centres each in the States of Assam, Tripura, Mizoram and Meghalaya. The main objectives

of Bamboo Mat Production Centres are to provide uninterrupted supply of bamboo mats to the manufacturing units of bamboo based building components for increasing the productivity, quality, to provide training in mat production process and to create employment opportunities in the NE region. In the first phase, the Council is setting up Bamboo Mat Product Centres at Kowaifung, Tripura; Sairang and Bualpui, Mizoram and Sokhar Nongtluh Village, Meghalaya. The Council has already completed establishment of Bamboo Mat Production Centres at Kowaifung, Tripura, Sairang & Bualpui, Mizoram and Sokhar Nongtluh, Meghalaya.

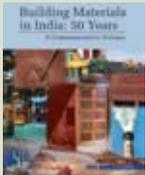




## Priced Publications of BMTPC



**DIRECTORY OF INDIAN BUILDING MATERIALS & PRODUCTS** (with information on Nepal & Bhutan) 2006  
550 pages, Rs. 1000 + 200 postage



**BUILDING MATERIALS IN INDIA : 50 YEARS** - 560 pages, Rs.1500 + 200 postage



**HOUSING AND KEY BUILDING MATERIALS IN INDIA - A LONG TERM PERSPECTIVE** - 98 pages, Rs. 700 + 75 postage



**INSTRUCTION MANUAL FOR APPROPRIATE BUILDING SYSTEMS**  
64 pages, Rs. 150 + 75 postage



**PRECAST BUILDING COMPONENTS**  
- 28 pages, Rs. 150 + 30 postage and packing



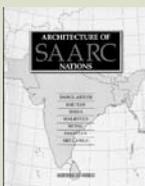
**BUILDING WITH COMPRESSED EARTH BLOCKS**  
28 pages, Rs. 60 + 30 postage



**STANDARDS AND SPECIFICATIONS FOR COST EFFECTIVE INNOVATIVE BUILDING MATERIALS AND TECHNIQUES**  
128 pages, Rs. 200 + 75 postage



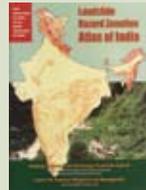
**DIRECTORY OF CONSTRUCTION EQUIPMENT AND MACHINERY MANUFACTURED IN INDIA**  
- 684 pages, Rs. 1500 + 200 postage



**ARCHITECTURE OF SAARC NATIONS.**  
196 pages, Rs. 250 + 75 postage



**VULNERABILITY ATLAS OF INDIA (First Revision – 2006)**  
- Earthquake, Windstorm and Flood Hazard Maps and Damage Risk to Housing, 900 pages, Rs. 5000 + 200 postage



**LANDSLIDE HAZARD ZONATION ATLAS OF INDIA**  
- Landslide Hazard Maps and Cases Studies, 125 pages - Rs.2500 + 200 postage



**MANUAL FOR REPAIR AND RECONSTRUCTION OF HOUSES DAMAGED IN EARTHQUAKE of Oct.91 in the Garhwal Region of U.P.**  
81 pages, Rs. 150 + 75 postage



**GUIDELINES FOR DAMAGE ASSESSMENT AND POST EARTHQUAKE ACTION - JABALPUR** (Three Parts)  
- Rs. 250 + 75 postage for each part



**GUIDELINES FOR DAMAGE ASSESSMENT AND POST EARTHQUAKE ACTION** (Two Parts)  
- Rs. 250 + 75 postage and packing for each part



**GUIDELINES FOR IMPROVING EARTHQUAKE RESISTANCE OF HOUSING**  
- 76 pages, Rs. 350 + 75 postage



**GUIDELINES FOR IMPROVING WIND/CYCLONE RESISTANCE OF HOUSING**  
- 50 pages, Rs. 350 + 75 postage



**EARTHQUAKE TIPS – LEARNING EARTHQUAKE DESIGN & CONSTRUCTION**  
- 58 pages, Rs.200 + 50 postage

## Promotional Publications of BMTPC

1. Areas of Activity
2. BMTPC Newsletters
3. Build Your Home with Earthquake Protection
4. Environment Friendly Building Materials & Construction Technologies
5. Guidelines for Cyclone resistant houses
6. Grah Nirman Mein Vishesh Savdhaniyan
7. Reconstruction of Earthquake Resistant Houses in Garhwal Region - Guidelines in Hindi
8. Retrofitting of Stone Houses in Marathwada Area of Maharashtra
9. Saste Makan: Vibhinn Vikalp Avam Suvidhain - in Hindi
10. Useful tips for House Builders
11. Strengthening Technological Base of the Building Materials Industry
12. Local Vegetable Fibres + Industrial & Mineral Waste for Composite materials
13. Machines developed by BMTPC
14. An Introduction to the Vulnerability Atlas of India
15. Performance Appraisal Certification Scheme
16. Catalogue for Machines
17. National Network on Building Technology
18. Green Houses for ITBP at Leh
19. Bamboo - A Material for cost-effective and disaster resistant housing
20. Corporate Brochure - in English and Hindi
21. Retrofitting of Hospital in Kupwara, Kashmir, J&K for Safety Against Earthquakes
22. Simple Ways to Earthquake Safety for Jammu & Kashmir - in English and Urdu
23. Bamboo in Housing & Building Construction - Initiatives of BMTPC

**Priced Publications may be obtained by sending Demand Draft, drawn in favour of BMT-PC payable at New Delhi**



## Films Produced by BMTPC

### 1. MAKAN HO TO AISA 15 min.

Film on improving buildings in earthquake prone areas of Garhwal. This is an instructional documentary film in Hindi for imparting training in repair and reconstruction of damaged houses using local materials and earthquake proof structures.

### 2. ABHIVARDHAN 30 min.

Film on nature of damages and what needs to be done for making houses disaster resistant in the Uttarkashi region. The film focuses directly on the needs of households and artisans to reconstruct their houses using traditional techniques with a catalytic input of modern materials and design techniques

### 3. A BETTER WAY TO BUILD 25 min.

This film focuses on technology delivery system for cost-effective housing. It highlights the activities of Building Centres as technology transfer agents for improving housing delivery system at grass-root level. Building Centres are being set up in different parts of the country under a Central Scheme of the Ministry of Urban Affairs and Employment. Nearly 250 Centres have already been set up in different states and these are making useful contribution to promoting cost-effective innovative building materials and construction technology for house construction.

### 4. AASHRAY 28 min.

Film depicts the application of low cost building materials and technologies. It also gives guidance to common man to procure financial support and a house.

### 5. LESSONS FROM LATUR 20 min.

Film is a rapid survey of causes, nature and extent of damage due to the earthquake in Latur and Osmanabad districts of Maharashtra and Gulbarga district of Karnataka in September 1993. The film is available in Hindi, English and Marathi. The direct relationship between housing structure and materials used in affected areas and the enormity of the impact of the disaster have been reflected through illustration and interviews with affected people. Rescue, immediate relief and temporary rehabilitation have also been shown in the film. The film also discusses measures for constructing earthquake resistant buildings. Alternate layout plans for reconstruction of villages, retrofitting of existing structures which are disaster prone, different technological options and social tensions arising out of the process of resettlement/relocation, etc., are covered.

### 6. HOMEWARD BOUND 16 min.

This film was produced on World Habitat Day, October, 1993 on the UNCHS (United Nations Commission on Human Settlements) theme Women and Shelter Developments. The film covers significant contributions and achievements made by India by encouraging participation of women in shelter process in different parts of the country.

### 7. FLYASH UTILISATION 20 min.

Nearly 40 to 45 million tonnes of flyash is being generated annually as waste by 70 thermal power stations in the country. Apart from covering large areas of useable land it leads to environmental problems by contributing to air-borne

and sub-soil water pollution. The film shows various methods of utilising flyash to manufacture building materials. This can convert waste to wealth as country is facing severe shortages of building materials, especially for housing. The film covers various on-going activities of flyash utilisation through small, medium and large scale production of flyash-based building materials in different states.

### 8. SEISMIC RETROFITTING 20 min.

This film, in four parts, is a series of training films on the techniques of strengthening of houses in the earthquake affected regions of Marathwada in Maharashtra. This film was produced under guidance and direction of Dr AS Arya, Professor Emeritus (Earthquake Engg.), University of Roorkee.

- Part 1 Installation of headers
- Part 2 Reduction of weight on the roof
- Part 3 Installation of knee braces
- Part 4 Installation of seismic bands

### 9. A STITCH IN TIME 15 min.

This film is a capsule on the techniques of strengthening partially damaged houses in the earthquake affected Marathwada district of Maharashtra, India. The programme is an illustrated lecture by Dr AS Arya (Professor Emeritus, Earthquake Engineering and UGC Emeritus Fellow, University of Roorkee)

### 10. PHOSPHOGYPSUM-BASED BUILDING MATERIALS 14 min.

Phosphogypsum is generated as a by-product of the phosphoric acid based fertiliser industry. The interaction of ground phosphate rock with sulphuric acid produces 10- to 40 per cent free moisture along with phosphogypsum. Nearly 4.5 million tonnes is generated per year. Over 10 million tonnes has accumulated at plant sites. The fluoride contents of phosphogypsum causes land and water pollution. This film shows the various methods of utilisation of phosphogypsum in production of building materials for ceiling, partition walling, etc.

### 11. BUILDING THE FUTURE BLOCK BY BLOCK 28 min.

Film on the activities of various Building Centres located in southern India and the ways they are helping in promoting cost-effective technologies.

### 12. BUILDING CENTERS: DELIVERING TECHNOLOGIES TO THE MASES 15 min.

A brief film on the Rajasthan Building Centre, and the manner in which they are helping to develop and promote innovative building materials and cost effective technologies which have been adopted by the Centre in their construction.

### 13. IN SEARCH OF HOME 28 min.

A film on the theme of 'Home and the Family' on the occasion of World Habitat Day, 1994. It shows the poor civic amenities in substandard shelters and outlines the possibilities for improvement by using alternate cost-effective and eco-friendly building materials and technologies to convert a shelter into a home.

### 14. SHANKER BALRAM SEPTIC TANK 21 min.

This film in Hindi describes the method of constructing the maintenance free Shanker Balram Septic Tank for low cost sanitation. It also explains the advantages of this tank over the conventional septic tanks available in India. This was based on a rapid survey carried out by WordSmithy on behalf of BMTPC.

### 15. A SUCCESS STORY OF PLASTICS

### WASTE MANAGEMENT 25 min.

Plastics are being used in every walk of life and in the end results in wastes. This film shows various aspects of plastics waste management and the ways to recycle it.

### 16. ROOF FOR THE ROOFLESS 18 min.

A film on Gram-awaz 95 held during the India International Trade Fair 1995. The film shows shortage of housing in the country, various housing schemes launched by the Government of India and the cost-effective innovative building material and technologies for the rural poor.

### 17. TARA CRETE — A ROOF FOR MILLIONS 18 min

The film details the introduction, the manufacturing technology of Micro Concrete Roofing Tiles (MCR), the benefits of Tara Crete Roof, how to build with it and how much it would cost.

### 18. HOUSING AND INFRASTRUCTURE 18 min.

The film shows the various aspects of housing and cost-effective innovative building materials and technologies developed in India.

### 19. BUILD A SAFER TOMORROW 12 min.

The film covers the natural disaster preparedness and mitigation strategies covered in the Vulnerability Atlas of India prepared by the Council.

### 20. BUILD A SAFER TOMORROW ON CD ROM 12 min.

21. REKINDLING HOPE 12 min.  
The film shows the activities of BMTPC in the rehabilitation after Gujarat earthquake.

### 22. MICRO ENTERPRISES THROUGH BUILDING COMPONENTS PRODUCTION 15 min.

The film covers the activities of demonstration cum production units set up by the Council at various locations for generating employment and micro enterprises.

### 23. BMTPC - PROTECTING HOME AND LIVES 15 min.

A film on multifarious activities of BMTPC.

RS. 1000 EACH FILM + PACKING AND POST-AGE CHARGES RS. 100. TO PURCHASE ANY OF THESE FILMS, PLEASE WRITE TO BMTPC.



**Published by:**  
BMTPC, New Delhi

**For Further Details write or contact:**  
The Executive Director  
Building Materials & Technology Promotion Council  
Ministry of Housing & Urban Poverty Alleviation  
Core-5A, First Floor, India Habitat Centre,  
Lodhi Road, New Delhi - 110 003  
Tel.: 91-11-2463 8096  
Fax: 91-11-2464 2849  
E-mail: bmtpc@del2.vsnl.net.in  
info@bmtpc.org  
Website: www.bmtpc.org

**The Building Materials & Technology Promotion Council (BMTPC) was setup in 1990 as an inter-ministerial apex organisation to develop and operationalise a comprehensive and integrated approach for technology development, transfer and investment promotion to encourage application of environment-friendly & energy-efficient innovative materials, manufacturing technologies and disaster resistant construction practices for housing and buildings in urban and rural areas.**

**The Council with its multi-disciplinary character is structured to promote investment and technology transfer nationally and internationally by networking its activities with institutions, centres of excellence and expert groups engaged in R&D, standardisation, housing finance, industrial promotion. The Council supports strengthening of SMEs in the building materials sector through development and promotion of eco-friendly and energy-efficient products, manufacturing technologies and appropriate support service to entrepreneurs.**



**bmtpc**