March 2012

Vol 56

YOJANA

Chief Editor : Rina Sonowal Kouli
Editor : Manogyan R. Pal

Joint Director (Production) : V.K. Meena
Cover Design : Bimal Mohan Thakur
E-mail (Editorial) : yojanace@gmail.com
(Circulation) : pdjucir_ jcm@yahoo.co.in
Website : www.yojana.gov.in

Let noble thoughts come to us from every side
Rig Veda

CONTENTS

Our Representatives : Ahmedabad: Amita Maru, Bangalore: B.S. Meenakshi, Chennai: I. Vijayan, Guwahati: Anupoma Das, Hyderabad: V. Balakrishna, Kolkata: Antara Ghosh, Mumbai: Minakshi Banerjee, Thiruvananthapuram: VM Ahmad.

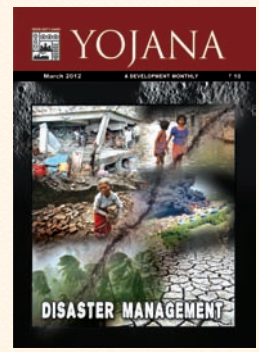
YOJANA seeks to carry the message of the Plan to all sections of the people and promote a more earnest discussion on problems of social and economic development. Although **published by the Ministry of Information and Broadcasting**, Yojana is not restricted to expressing the official point of view. Yojana is published in Assamese, Bengali, English, Gujarati, Hindi, Kannada, Malayalam, Marathi, Oriya, Punjabi, Tamil, Telugu and Urdu.

EDITORIAL OFFICE : Yojana Bhavan, Sansad Marg, New Delhi-110001 Tel.: 23096738, 23042511.
Tlgm.: Yojana. **Business Manager (Hqs.) :** Ph :24367260, 24365609, 24365610

For new subscriptions, renewals, enquiries please contact : Business Manager (Circulation & Advt.), Publications Division, Min. of I&B, East Block-IV, Level-VII, R.K. Puram, New Delhi-110066, Tel.: 26100207, Telegram : Soochprakasan and Sales Emporia : Publications Division: *Soochna Bhavan, CGO Complex, Lodhi Road, New Delhi -110003 (Ph 24365610) *Hall No.196, Old Secretariat, Delhi 110054(Ph 23890205) * 701, B Wing, 7th Floor, Kendriya Sadan, Belapur, Navi Mumbai 400614 (Ph 27570686)*8, Esplanade East, Kolkata-700069 (Ph 22488030) *'A' Wing, Rajaji Bhawan, Basant Nagar, Chennai-600090 (Ph 24917673) *Press road, Near Govt. Press, Thiruvananthapuram-695001 (Ph 2330650) *Block No.4, 1st Floor, Gruhakalpa Complex, M G Road, Nampally, Hyderabad-500001 (Ph 24605383) *1st Floor, 'F' Wing, Kendriya Sadan, Koramangala, Bangalore-560034 (Ph 25537244) *Bihar State Co-operative Bank Building, Ashoka Rajpath, Patna-800004 (Ph 2683407) *Hall No 1, 2nd floor, Kendriya Bhawan, Sector-H, Aliganj, Lucknow-226024(Ph 2225455) *Ambica Complex, 1st Floor, above UCO Bank, Paldi, Ahmedabad-380007 (Ph 26588669) *KKB Road, New Colony, House No.7, Chenikuthi, Guwahati 781003 (Ph 2665090)

SUBSCRIPTION : 1 year Rs. 100, 2 years Rs. 180, 3 years Rs. 250. For neighbouring countries by Air Mail Rs. 530 yearly; for European and other countries Rs. 730 yearly.
No. of Pages : 60

About the Issue



History shows that India is exposed to national disasters. Cyclones, floods, earthquakes, droughts and floods are major threats. About 60 percent of the landmass is prone to earthquakes of various intensities, over 40 million hectares is prone to floods and 68 percent of the area is susceptible to drought. This not only results in loss to thousands of lives, but also in terms of loss in private, community and public assets.

While substantial scientific and material progress has been made, the loss of lives and property due to disasters has not decreased. Government of India has now brought about a paradigm shift in its approach to disaster management, from being relief centric to one with greater emphasis on preparedness, prevention and mitigation. This approach proceeds from the conviction that development cannot be sustained unless disaster mitigation is built into the development process. Another cornerstone of the approach is that mitigation has to be inter- disciplinary spanning across all sectors of development. Disaster Management occupies an important place in the policy framework as it is the poor and underprivileged who are worst affected on account of calamities and disasters.

Disaster Management is a multi-disciplinary area in which a wide range of issues that range from forecasting, warning, search and rescue, relief, reconstruction and rehabilitation are included. It is multi-sectoral as it involves administrators, scientists, planners, volunteers and communities. Their roles and activities span the pre-disaster, during disaster and post-disaster plans. All these activities are complementary and supplementary to each other and here is a critical need for coordinating these activities.

Natural disasters directly impact economies, agriculture, food security, water, sanitation, environment and health. It is therefore one of the single largest concerns for most of the developing nations. Apart from the economic aspect, such disasters also have social and psychological dimensions that needs to be studied and appropriate strategies for mitigation developed.

Today, we have a range of early warning systems for a range of natural hazards. However, it is not enough to ensure that communities are safe from disasters. This is where disaster mitigation can play an important role.

In this issue of Yojana, experts write on how India responds to disasters, its preparedness to deal with them and strategies for its mitigation, the challenges that are before us and how we can rise beyond crisis situations and thereby safeguard precious lives and property and reduce losses to the development gains of the country. ❑

Managing Disasters in India

T Nanda Kumar

With better planning, preparedness awareness and mitigation measures we can significantly reduce the impact of disasters for our people in the near future

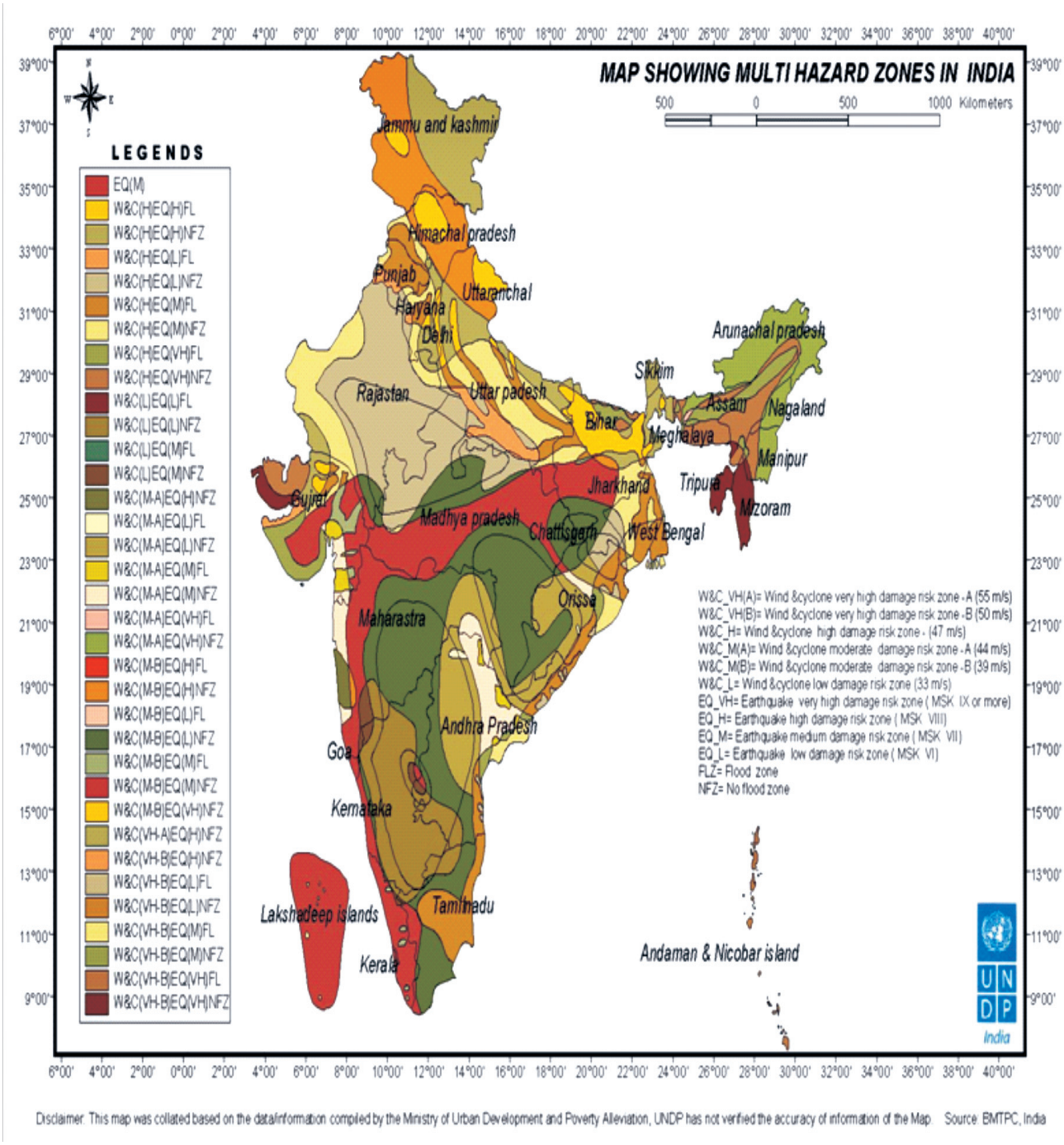
DISASTERS AFFECT almost every part of the world. According to a World Bank report titled "natural hazards, unnatural disasters," floods and storms are the most widespread while droughts are prevalent more often in Africa. Regions which suffer from frequent droughts and floods are also home to most of the hungry in the world. Climate change is expected to exacerbate the situation. There is, therefore, a need to recognize hazards and vulnerability in a comprehensive manner and take effective steps for prevention, mitigation and management.

In the case of India, natural disasters like floods, cyclones and drought occur repeatedly in different parts of the country. Many districts of India are prone to multiple hazards and face different disasters around the year. Earthquake, hailstorms, avalanches, and landslides also occur in some parts of India but the impact depends on the magnitude of the event and the vulnerability of the location. Natural disasters which occurred during 1980-2010 in India are given in Figure-I.

Developed countries which have modern early warning systems and effective mitigation programmes are able to reduce the impact of natural hazards whereas countries with less preparedness and inadequate mitigation efforts suffer more from natural hazards. In the case of India, the human and economic losses from disasters are high in comparison to many other developing nations.

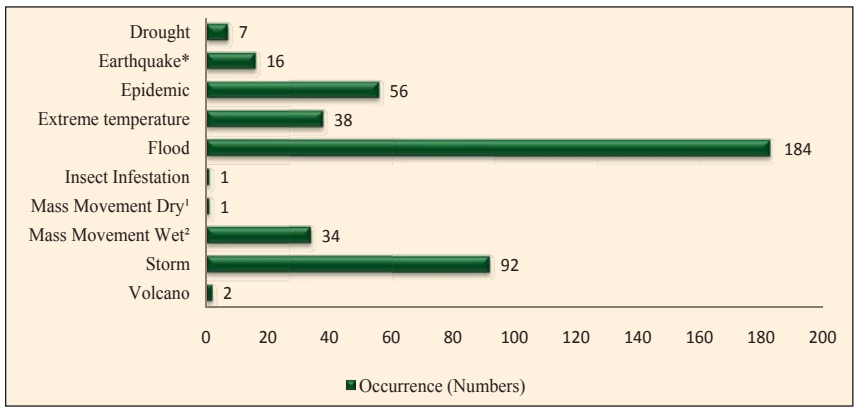
According to an estimate by the World Bank direct losses from natural disaster are upto 2 percent of the India's GDP. More importantly, the impact of most of the disasters is disproportionately high on the poor.

The author is Member, National Disaster Management Authority, Govt. of India.



The Hyogo Framework of Action (HFA) for action approved in 2005 by UNISDR to which India is a signatory, advocates mainstreaming disaster risk reduction into socio-economic development planning and activities by adopting five priorities for action through a fivefold process: viz., Political process requiring countries to develop policies and legislative and institutional frameworks for disaster risk reduction and commit resources for their prevention, mitigation and preparedness; Technical process which calls for application of science and technology for assessment, identification and monitoring of disasters and enhancing early warning of system; Socio-educational process aiming at increasing citizen's understanding and skills to build a culture of

Natural Disaster Occurrence Reported during 1980-2010 in India (Figure-I)



safety and resilience at all levels; Development process seeking to integrate disaster risk in all relevant sectors of development planning and programmes; and Humanitarian process which requires factoring disaster risk reduction in disaster response and recovery.

Government of India started work on some of these ideas as early as August 1999 when a High Powered Committee (HPC) on Disaster Management was constituted under the Chairmanship of Shri J.C. Pant, former Secretary of Agriculture to the Government of India along with experts and officials, to suggest measures to bring about institutional reforms in the field of disaster management. Keeping in view our federal structure, the Committee was also mandated to prepare comprehensive plans for National, State and District levels. Soon after its formation, the scope of the Committee was enlarged to include man-made disasters like chemical, industrial, nuclear and others.

India's Major Disasters

Sl. No.	Name of Event	Year	State & Area
1.	Drought	1972	Large part of the country
2.	Cyclone	1977	Andhra Pradesh
3.	Drought	1987	15 States
4.	Latur Earthquake	1993	Latur, Marathwada region of Maharashtra
5.	Orissa Super Cyclone	1999	Orissa
6.	Gujarat Earthquake	2001	Rapar, Bhuj, Bhachau, Anjar, Ahmedabad and Surat in Gujarat State
7.	Tsunami	2004	Coastline of Tamil Nadu, Kerala, Andhra Pradesh, Pondicherry and Andaman and Nicobar Islands of India
8.	Maharashtra Floods	2005	Maharashtra State
9.	Kashmir Earthquake	2005	Mostly Pakistan, Partially Kashmir
10.	Kosi Floods	2008	North Bihar
11.	Cyclone Nisha	2008	Tamil Nadu
12.	Drought	2009	252 districts in 10 states
13.	Leh Cloudburst	2010	Leh, Ladakh in Jammu & Kashmir
14.	Sikkim Earthquake	2011	North-eastern India with epicenter near Nepal Border and Sikkim

Barely two months had elapsed since the constitution of the High Powered Committee, that a Super Cyclone struck the Orissa Coast on 29th October 1999. This cyclone was unprecedented in its sweep and ferocity, killing nearly 10,000 people and affecting over 15 million people across 12 districts of Orissa. One year and four months later, the country experienced an earthquake with magnitude of 6.9 on the Richter Scale in Bhuj area of Gujarat State. In this disaster, nearly 20,000 people died, over 1,55,000 were injured, and 6 lakh people were rendered homeless.

The turning point in the thinking on disaster management was the Indian Ocean Tsunami of 26th December 2004. This disaster struck the country in more than seven states which highlighted the gaps in early warning, coordination and the management of disasters. In an All Party Meeting held on 9th January 2005, the need for national level legislation for management of natural and man-made disasters was highlighted. Consequent to this meeting, Government of

India decided to enact a law on disaster management to provide for a requisite institutional mechanism for drawing up and monitoring the implementation of the disaster management plans, ensuring measures by various wings of the Government for prevention and mitigation of disasters and for undertaking a holistic, coordinated and prompt response to any disaster situation. Accordingly a Bill was introduced in the Rajya Sabha on 11th May, 2005.

The Disaster Management Act, 2005 lays down institutional, legal financial and coordination mechanisms at the central, state, district and local levels. These institutions are not parallel structures and will work in close harmony. The new institutional framework is expected to ensure implementation of the national desire for a paradigm shift in DM from a relief-centric approach to a proactive regime that lays greater emphasis on preparedness, prevention and mitigation.

With the enactment of Disaster Management Act 2005 the National Disaster Management Authority was established under the Chairmanship of the Prime Minister. The Act also provide for establishment of State Disaster Management Authorities and District Disaster Management Authorities. Therefore, the Disaster Management architecture for the country has now been provided with legal backing and with clear delineation with rules and responsibility. The Acts also provide for budget allocation for disaster risk reduction and for response. With this architecture in place it is now upto the Central and the State Governments to utilize these provisions effectively to reduce the impact of disasters on our people and the country.

It is well recognized that the poor and vulnerable sections of the society are impacted disproportionately by disasters. Quite often they lose their homes, assets and livelihoods. While there is genuine concern about the adverse impact of disasters on GDP there is even more concern that our efforts to achieve 'inclusive growth' may not be successful unless Disaster Risk Reduction (DRR) is addressed. To achieve this, the following steps are necessary:

(i) Mainstreaming DRR into development

(ii) Strengthening early warning systems by leveraging science and technology.

(iii) Increasing awareness and preparedness.

(iv) Strengthening rescue and relief mechanisms.

(v) Better rehabilitation and reconstruction.

The Government of India administers a number of ambitious programmes in key sectors like agriculture, rural development, urban development, drinking water, rural roads, health, education and food security. These programmes have substantial outlays and are aimed at improving the quality of the life of our people. While these have contributed in some way to disaster risk reduction, specific components and interventions for DRR have largely been missing in many of these flagship programmes. The attempt now should be to introduce DRR as a specific component of these schemes.

While the contribution of agriculture to reduction in hunger and poverty is well recognized, the impact of bad weather on agriculture on the income and food security of small and marginal farmers and agricultural labourers has not been adequately addressed in any programme relating to agriculture. The Rashtriya Krishi Vikas Yojana(RKVY) is a flagship programme of the Ministry of Agriculture which provides adequate flexibility to include DRR components to take care of extreme weather events. Creating reserves of seeds, pest surveillance systems, providing water storage devices (in combination with MGNREGS) etc could be taken up as DRR components.

The schemes under Ministry of Rural Development have great potential in reducing the impact of disasters. Since most of the schemes are targeted towards the poor, small changes in the design of the schemes would make a significant impact. The Pradhan Mantri Gram Sadak Yojana (PMGSY) provides rural connectivity to habitations. These could also provide lifeline connectivity in the case of disasters to hospitals, food distribution centres, schools, etc. Villages with no connectivity at all due to seasonal or perennial rivers and rivulets can be provided access to economic activity, education and health by constructing small foot

bridges by suitably modifying the scheme. The Indira Awas Yojana (IAY) provides housing for the poor. Normally the Ministry earmarks a small percentage of funds for quick construction of houses to those affected by natural disasters. However the design and cost norms of the housing schemes do not permit addition of disaster resistant elements. A change in design norms to accommodate the need for strengthening the house vis-à-vis the vulnerability of the region needs to be introduced in the 12th Five Year Plan proposals. So is the case with Rajiv Awas Yojana (RAY).

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) provides for strengthening infrastructure in selected large cities in the country. While this has contributed to a remarkable improvement in urban infrastructure, attention to vulnerabilities and strategy for disaster management in the city development/master plans has been lacking. Given the fact that urban population in India is growing at a rapid pace and natural hazards in densely populated regions can increase vulnerability and economic losses and more attention to disaster reduction needs to be given in the planning and implementation of the urban development projects.

The Rajiv Gandhi National Drinking Water Mission (RGNDWM) provides safe and potable water to all the villages. In the event of a natural disaster, availability of drinking water and food demand immediate attention. The Department has earmarked a certain percentage in their outlay for sinking emergency tube-wells in the event of a disaster. While this is a welcome step, more thought needs to be given to the design, construction and location of the drinking water sources particularly in low lying flood prone areas. It would be worthwhile to construct these tube-wells on higher platforms in low lying and flood prone areas so that in the monsoon season and in the event of floods, these do not go under water and become unusable.

Similarly the health sector has a flagship programme called National Rural Health Mission. While our experience in handling epidemics and pandemics has been good, areas like hospital safety, surveillance mechanism for infectious diseases, trauma care, management of mass causalities, etc., need more attention.

Disaster Risk Reduction needs to be included in the curricula in Schools and Colleges to inculcate the culture of safety and prevention among the children. In addition, a thorough review of the safety of the School buildings needs to be undertaken. To ensure safety of all the Schools in the country, a legislative framework will have to be set up. There is also a shortage of qualified professionals in many areas related to DRR. This needs to be addressed on priority.

Setting up of suitable early warning systems is probably the best intervention which can be made in the next five years. While we have substantially stepped up our capabilities for Tsunami warning the same cannot be said for other efforts. Systems for weather forecasting, though have improved substantially over the last five years, still needs higher investments, equipments and man power. It should be possible to warn communities in any part of the country about extreme weather conditions substantially well in advance to enable them to save the lives and property. Satellite imagery has become an important tool for decision makers in getting alerts for disasters and in assessing the situation pre and post disaster. These capabilities need further refinement and intensification to enable functionaries at the district level to take appropriate and timely decisions. Therefore, the three departments viz., Science & Technology, Earth Sciences and Space and the organisations under them viz., IMD, INCOIS, NRSC, and SOI need to step up their investments in equipments and human capabilities to provide advance and effective information on disasters. These have to be supported by other scientific departments and organisations like ICAR, ICMR, CWC, GSI, etc. It is also necessary to create a national platform for sharing, using and disseminating the data. (for example the data on heavy rainfall needs to be combined with the data on river flows to develop flood inundation models and early warning systems. This could be supplemented by satellite imagery).

Lack of awareness about many things that the Community does or does not do has also

contributed responsible for the extensive damages caused by disasters. For example it is often said that "*earthquakes do not kill, but buildings do*". In spite of this, our adherence to norms in the case of buildings in seismic zone-IV and V has been quite poor. In fact building collapse even without an earthquake. Similarly our compliance with fire safety norms has also been found to be awfully inadequate. While it is necessary to strengthen inspections and management by Government agencies it is also important for the citizens to be aware of the danger and be responsible for some of these activities. it is public awareness and pressure which brings in the desired results in such situations. Our preparedness regime needs strengthening both at the Government level and at the community level. In fact community preparedness is still an alien concept in the country. An intensive campaign to strengthen community preparedness will have to be undertaken.

Our traditional response in any disaster has been one of rescue and relief with a series of quick but adhoc actions. Rescue and relief cannot remain adhoc actions but have to be systematic and well planned. This will require proper planning and standard operating procedures for all eventualities that could be foreseen with clear responsibilities for each of the functionaries who are expected to deliver in such a situation. If effective systems could be put in place at the National, State, District, Municipality and Panchayat levels, many lives can be saved and the economic damage reduced.

Post disaster rehabilitation and reconstruction is an important activity, though not discussed here.

The important message, therefore, is that all hazards need not become disasters. With better planning, preparedness awareness and mitigation measures we can significantly reduce the impact of disasters for our people in the near future.

Abbreviations

DM	–	Disaster Management
HFA	–	Hyogo Framework of Action
UNISDR	–	United Nations International Strategy for Disaster Reduction
HPC	–	High Powered Committee
DRR	–	Disaster Risk Reduction
RKVY	–	Rashtriya Krishi Vikas Yojana
MGNREGS	–	Mahatma Gandhi National Rural Employment Guarantee Scheme
PMGSY	-	Pradhan Mantri Gram Sadak Yojana
IAY	–	Indira Awas Yojana
RAY	–	Rajiv Awas Yojana
JNNURM	–	Jawaharlal Nehru National Urban Renewal Mission
ICAR	–	Indian Council of Agricultural Research
ICMR	–	Indian Council Medical Research
CWC	-	Central Water Commission
INCOIS	–	Indian National Centre for Ocean Information Services
NRSC	-	National Remote Sensing Centre
SOI	–	Survey of India
IMD	-	Indian Meteorological Department
GSI	–	Geological Survey of India ❑

YOJANA invites its readers to send in their valuable feedback and suggestions about the articles carried in the journal at the e-mail id yojanace@gmail.com

Traditional Values that helped Ladakhis rebuild their Lives

Chetna Verma

The Ladakhis simply accepted the challenges of this natural calamity and voluntarily launched a community-wide support to help those affected

THE NIGHT of August 5, 2010 bestowed nation-wide fame on the sleepy town of Leh and its neighbouring villages when it woke its residents to the cruel devastation of a cloudburst that engulfed several lives and rendered many injured, homeless and missing. The cold desert was ravaged by a vast river of rock and mud ripping apart houses and razing shops and structures to the ground. The destructive floods lasted less than two hours but caused havoc that would take years to recover from. Everyone expected a drastic change not only in the landscape but in the lives of its shocked survivors.

Eighteen months later, belying all doomsday predictions, the Ladakhi community in and around Leh stands on firm footing. The beautiful landscapes complement the rough terrain, as people go about their daily chores, celebrating life with enthusiasm and characteristic hard work to rebuild a vibrant town, continuing their tradition of welcoming tourists with open arms. It would seem that the newspaper reports and television news channels broadcasts were tales of a different land.

The scars will take time to heal, though, and reconstruction is following a slow but steady path. As one walks down to the inner regions, remnants of the devastation become visible – large mounds of mud and rocks spread over vast expanse of land, broken houses, and remnants of cars, buses, shelters, and houses – all narrating the incident of that dreadful night. If the intensity of the cloudburst was so strong, what drives the people of Leh to recover and find happiness, allowing them to carry on their lives in such a short span of time?

The secret lies in the traditional lifestyle of Ladakhis that is based in the fundamental values of humanity. For them their true duty is not only towards the almighty but also towards mankind and that is certainly a reason why Ladakhis, known for their hospitality worldwide, succeeded in recovering from the devastating natural calamity. They have always believed in community efforts, whether it is about maintaining their natural and cultural heritage or about building new prospects.

The storm that conquered the night presented an even more tragic morning. The Ladakhis simply accepted the challenges of this natural calamity and voluntarily launched a community-wide support to help those affected.

With the help of the Army and ITBP which were at the forefront of the rescue work, civilians pitched in for rescue and relief works. The floods were unable to destroy the social fabric of the region – it served as the basis of their recovery. Everyone contributed to the extent of their ability – a few helped dig out houses, searched for bodies and survivors buried under the mud. The distinction between locals and tourists was washed away by the floods. Owners of the guest houses welcomed people whose homes were gone. They offered not only shelter, but food and medication, without caring for monetary gains. Youth started volunteering in hospitals, unfazed by their lack of formal training. One could see Ladakhi of all ages working day and night in the relief camps, community kitchens and in the field, saving several lives every day.

"The army and other organisations helped the locals gain confidence by providing the means to help others. I remember one of the army persons appreciating the way Ladakhis cooperated during the rescue work - it was a crucial factor behind the success of the emergency relief," said one of the volunteers.

Coping with fears, and rumours born of such fears, also needed to be addressed. People would get rattled at the slightest news of rains coming again and would rush to take shelter. After one such rumour, thousands of frightened people clustered at the Shanti Stupa, built on a rocky outcrop above Leh. It was amazing to watch the *joie de vivre* among the group despite their fears. Folk songs sung by the Ladakhi women lit up the darkest nights. Over time, the fearful conversations were replaced by chanting of the "*Om Mani Padme Hum*". That is the magic of a land which reflects living Buddhism.

Donations started pouring in, several NGOs stepped in to organise relief work, and the Government announced compensation for the dead, injured and missing. Land was allocated to those who lost their land in the floods. The most interesting initiatives were taken by individual villages. Local bodies were formed that collected funds for the unfortunate households. They distributed medicines, clothes and food to those residing in the relief camps. It was an efficient response from a highly sensitive community.

Floods not only washed away the agricultural land but covered it with infertile mud. The government provided three to four bulldozers to each village to remove the mud off the agricultural terrain. It was a difficult task. People could have easily avoided this tedious task of removing mud from the land, since it was not their only source of livelihood but they chose to remove the mud and sow the crop of hope again. Today, Ladakhi housewives, still working in the agricultural fields, grow the local crops. Land productivity has suffered a downfall, but with continuous efforts they are hopeful it will recover.

Nature signifies power – no one has control over it. Whenever, in the history of the world, a natural disaster has struck, the results have always been devastating and will continue to be so unless we learn to respect Nature's power and manage such calamities. Ladakh has set an example by minimising the loss which otherwise could have yielded highly devastating results. It was the traditional lifestyle and belief systems of the Ladakhi community that their humane quality provided them the inner strength to not only tolerate the blow of Nature but, in that dark hour, help their counterparts struck by the disaster. More than physical strength, it was their emotional strength that connected them together and helped manage the disaster. ❑

Charkha Features

Challenges in Disaster Management

N Vinod Chandra Menon

Good governance and responsive administration have to be seen as non-negotiable features of a dynamic process of effective interface with the communities at risk from the devastating impact of disasters

ACCORDING TO the World Disaster Report 2010 published by the International Federation of Red Cross and Red Crescent Societies (IFRC), during the period 2000 to 2009, as many as 85 percent of the people affected by disasters belonged to the Asia Pacific region. The Global Assessment Report 2011 published by the United Nations International Strategy for Disaster Reduction (UN ISDR) estimates that more than 90 percent of the global population exposed to floods live in South Asian, East Asian and the Pacific countries. Among the disaster-prone countries in South Asia, India and Bangladesh are highly vulnerable due to the large population exposed to disasters in India and the geographical, riverine and topographical features of coastal areas of Bangladesh vulnerable to floods and cyclones. In India as many as 200 million people are exposed to recurring floods every year. The high disaster risk and exposure of millions of people in India living in vulnerable areas prone to geological disasters, hydro-meteorological disasters and man-made and technological disasters makes it imperative that a national campaign on mission mode is launched to strengthen disaster preparedness, prevention and mitigation efforts in India. The Vulnerability Atlas prepared by the Building Materials Technology Promotion Council (BMTPC) highlights that 58.6 percent of the geographical area in India falls within seismic zones III, IV and V which could face earthquakes of moderate to very high intensity. 12 percent of the geographical area, covering more than 40 million hectares, faces recurring floods, changing course of rivers and river erosion. Along the 7516 km coastline, about 5700 km are vulnerable to storm surge,

The author is a former Member of the National Disaster Management Authority.

cyclones and tsunami. More than 68 percent of the cultivable area is vulnerable to drought. Landslides and snow avalanches in unstable slopes and high altitude terrain also occur frequently. Due to the pressures of the fast pace of urbanization, modernization and industrialization, the threats of man-made and technological disasters have also increased substantially as modern industrial units are processing, storing and transporting hazardous chemicals and hazardous materials.

According to the World Bank, during the period 1996 to 2000, India lost approximately 2.25 percent of the Gross Domestic Product and 12.15 percent of the revenue annually due to natural and man-made disasters. In the first decade of the 21st century, India faced devastating disasters like the Bhuj earthquake in 2001, the Indian Ocean Tsunami in 2004, the Kashmir earthquake in 2005, the Kosi floods in 2008, the Andhra Pradesh and Karnataka floods in 2009, the Leh cloudburst and the Uttarakhand floods in 2010 and the Sikkim earthquake in 2011. It is estimated that the cumulative losses from the Kosi floods in 2008, the Andhra Pradesh and Karnataka floods in 2009 and the Uttarakhand floods in 2010 as reported by the respective state governments amounted to about Rs. 80,000 crores. Given that the financial allocation made by the 12th Finance Commission for disaster management during the period 2005 to 2010 was only Rs. 21,333 Crores for the entire country, it is evident that the damages and economic losses caused by natural disasters are far exceeding acceptable levels and are wiping out the hard earned gains of development from the disaster affected areas. Further, the deployment of scarce resources for post-disaster relief, reconstruction and recovery are making a dent on resources which are required by sectors like health, education, social welfare, etc. It is in this context that an attempt is being made to analyse the issues and challenges in disaster management in India.

Fragile Institutions

The National Policy on Disaster Management prepared by the National Disaster Management Authority (NDMA), Government of India and approved by the Cabinet in 2009 was formulated with the vision to build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation and response. The National Policy envisaged a paradigm shift from the hitherto reactive post-disaster relief-centric regime to a more proactive and enabling environment of strengthened disaster preparedness, mitigation and improved emergency response capacities of all stakeholder groups. Mandated by the enactment of the Disaster Management Act 2005, institutional mechanisms like the National Disaster Management Authority (NDMA) chaired by the Prime Minister of India at the national level, State Disaster Management Authorities (SDMAs) chaired by the Chief Ministers of the respective State Governments at the state level and District Disaster Management Authorities (DDMAs) chaired by the respective District Collectors and co-chaired by the Sabhapatis of the Zilla Parishads at the district level were established. However, in many cases, these institutions are not active and operational except a few honorable exceptions. Similarly, even though the Disaster Management Act 2005 stipulated the setting up of the Disaster Response Fund and the Disaster Mitigation Fund at national, state and district levels, only the National and State Disaster Response Funds have become operational till now. The increasing frequency and damage to property, assets and infrastructure caused by recurring disasters makes it imperative that the provisions of the Disaster Management Act 2005 are enforced in letter and spirit.

Good governance and responsive administration have to be seen as non-negotiable features of a dynamic process of effective interface with the communities at risk from the devastating impact of disasters. This process must be driven by transparency and accountability of public functionaries and their ownership of the transition to the paradigm shift rather than continuing with a "business as usual" attitude. In the event of a sudden disaster, the restoration of disrupted services, the effective and efficient delivery of services to the disaster-affected communities

and the setting up of a transparent mechanism of ensuring that the disaster affected people receive the relief entitlements which are intended for them have to be necessarily integral components of a good governance and responsive administration at the district, state and national levels. With the good practice examples of deployment of information technology innovations like biometrics and smart cards in humanitarian assistance in recent disasters in some of the countries affected by disasters, our administrative machinery has to explore ways of ensuring efficiency and effectiveness in the delivery of services, minimising inordinate delays, red tape and extraneous pressures of excluding real victims and accommodating false claimants. Community Based Organisations and Non-Governmental Organisations can play the role of watchdogs in creating a level playing field for the victims affected by disasters. Wherever expedient and unavoidable, justice has to be ensured by resorting to the instruments of good governance like Right to Information and legal options like Public Interest Litigation. The recent examples from Nepal, Thailand and China of public functionaries being legally challenged for their alleged acts of commission and omission indicate that fixing the accountability for the consequences of inaction is increasingly becoming a strong feature of civic action for legal remediation in disaster affected areas.

Weak Compliance of Policies

The National Policy for Disaster Management approved by the Cabinet and released by the Prime Minister of India has to be seen as a statement of intent by the Government of India in working towards a disaster resilient India. As envisaged in the Disaster Management Act 2005, several formidable Guidelines have been prepared by the National Disaster Management Authority in consultation with the best domain experts in the country with suggested corrective action to address the critical gaps which are responsible for the weaknesses in the management of disasters in our country. However, the follow up action expected from the nodal agencies in preparing Plans to address these aspects of strengthening preparedness, prevention, mitigation, emergency response and recovery efforts in these critical sectors remains to be initiated. The recommendations of the National Disaster Management Guidelines on the management of various disasters and cross cutting themes have to be reviewed by all stakeholder groups to ensure that the paradigm shift envisaged in the National Policy for Disaster Management does not remain as an aspiration.

Systemic Inefficiencies Influencing Processes

The Eleventh Five Year Plan document made a strategic and pioneering shift towards mainstreaming disaster management in development planning and made several strong suggestions in this direction. The Finance Ministry of the Government of India prescribed radical changes in 2009 in the formats for submission of plan proposals from Ministries and Departments of the Government of India and State Governments incorporating self-certification by the proposing officials to the effect that the proposals have factored in the disaster risk and vulnerability of the concerned geographical area. However, the continuing increase in the damage and destruction of property, assets and public infrastructure makes it necessary to carry out random audits of such proposals in areas affected by disasters and to fix accountability for the financial loss on erring officials. This has become necessary to streamline the process of mainstreaming disaster risk reduction in development planning. It is also unfortunate that most of the mitigation projects proposed in the Eleventh Five Year Plan have remained non-starters. It is extremely important that these proposed initiatives are incorporated in the Twelfth Five Year Plan (2012-2017) as these have been conceptualized to address some of the critical gaps in the effective management of disasters in India.

Need to Adopt Innovative Systems, Techniques and Technologies

Most modern nations have adopted innovative systems, techniques and technologies to improve the effectiveness of disaster management. The applications of Information

Technology, Information and Communication Technology (ICT), mobile communication for dissemination of early warning and alert messages, Geographical information Systems, Global Positioning System (GPS), General Pocket Radio Service (GPRS), Remote Sensing, Voice over Internet Protocol (VoIP), Radio over Internet Protocol (RoIP), Scenario Analysis and Modelling, biometrics for family reunification in disasters and complex humanitarian emergencies, Digital elevation Models and bathymetry for tsunami inundation modeling, early warning systems, Doppler radars, etc. are being increasingly used by many countries. In India, the Department of Information Technology's satellite-linked Common Service Centres (CSCs) can be used to disseminate critical life saving messages in local languages and dialects to disaster-prone communities instead of spending huge amounts of money on television channels for brief spots and incurring large expenditure on advertisements in newspapers and magazines. The printing of public awareness messages on postal stationery and on railway tickets and boarding passes of airlines will also have the desired impact because of the opportunity to familiarize those who handle such products in everyday routine use with life-saving messages. A judicious mix of indigenous traditional knowledge and modern technology is required to reach various stakeholder groups for greater public awareness on disaster risk and vulnerability.

Need to Strengthen Capacities of all Stakeholders

Capacity building of various stakeholder groups is one of the most formidable challenges in a large nation facing high risk from multiple disasters. Training, public awareness, research and education in disaster management must reach out to communities for strengthening disaster preparedness, prevention, mitigation, emergency response, disaster resilient reconstruction and recovery at local levels. It is necessary to involve civil society organizations, community based organizations, corporate sector entities, local administration officials, elected representatives and professionals in these activities. The experience of Andhra Pradesh and Karnataka in the 2009 floods of washing away of 7.5 lakh houses and 5.5 lakh houses respectively must compel public functionaries to ensure that all mass housing schemes like Indira Awas Yojana in the rural areas and Rajiv Awas Yojana in urban and peri-urban areas must comply with disaster resilience features so that we are not reconstructing risk in disaster-prone areas. The approach document of the 12th Five Year Plan has observed that "a major weakness of the Indira Awaas Yojana (IAY) has been the quality of housing. There have been complaints about weak foundations, poor roofing materials and incomplete constructions. There is a clear need for developing and popularising innovative, location-specific technologies, materials, designs and methods through a network of institutions, which could result in low-cost, environment friendly and disaster resistant houses as per local cultural preferences. Better systems for monitoring of the programme are also required."

It has to be recognized by all stakeholder groups that the temptation to claim post-disaster relief by state governments without shifting the emphasis to strengthening disaster preparedness, prevention and mitigation is like a futile attempt to trying to drain an overflowing sink without looking at the root cause of the leaking tap. It would be more effective to make efforts to close the tap or change the washer to stop the leak, rather than simply trying to drain the sink. If we do not move in that direction, we will continue to be spending scarce resources on providing post-disaster relief for damaged property, assets and infrastructure and continue to take away resources from competing needs for provision of essential services like education, health care, power supply, water supply, sanitation, social welfare etc. for those sections of the society deprived of these basic needs for generations. "Faster, Inclusive and more Sustainable Growth" envisaged in the 12th Five Year Plan can be achieved only if our planners, administrators and policy makers realize this harsh reality. ❑

NORTH EAST DIARY

INDIA'S SECOND RUBBER PARK IN TRIPURA

India's second industrial rubber park has come up in Bodhungnagar in western Tripura to boost the country's elastic polymer industry. The park, a joint venture between the Tripura Industrial Development Corporation (TIDC) and the Rubber Board, is the second of its kind in the country after the rubber park in Irapuram, Kerala.

The park has been, created at a cost of Rs. 23 crore at the Bodhungnagar industrial growth centre, 15 km north of Agartala. At least 20 rubber-based industrial projects would be set up in the park in the next few years. The rubber park was built on an area of about 58 acres of land in the Bodhungnagar industrial growth centre and over Rs.75 crore are expected to be invested in the park over a period of three years.

A big rubber product development and display centre and a rubber museum have been set up in the park, which would lead to significant direct employment generation for 1,000 to 1,500 people. Tripura is the second largest rubber producer in the country after Kerala with 65,000 hectares of land so far brought under cultivation producing 30,000 tonnes of natural rubber annually.

The state has a potential to increase the production of rubber to 60,000 tonnes per year after five years. The products proposed to be manufactured in the rubber park include cycle and two-wheeler tyres and tubes, retreading of old tyres, auto components, flaps, chappals, sports goods, latex foam, coated fabrics, hot water bag, hose, mattresses and pillows, automotive rubber components and rubber threads.

Products from the park, funded by the union commerce ministry under the ASIDE (Assistance to States for Development of Export Infrastructure and Allied Activities) scheme, are expected to meet the needs of northeastern states and neighbouring countries. ❑

WORLD BANK LOAN FOR NORTH EAST DEVELOPMENT

The World Bank has extended a $130 million loan to India that will be used to fund rural development programmes in the North East region of the country. The money will be used to fund the North East Rural Livelihoods Project, which aims to enhance livelihoods of the rural poor, especially women, unemployed youth and the severely disadvantaged people in the North East region.

Eight districts of four states -Aizawl and Lunglei in Mizoram; Peren and Tuensang in Nagaland; South, West and 15 Panchayat wards of East District in Sikkim; and West and North Districts in Tripura will be covered under the project.

The project seeks to develop an institutional platform for the communities, which will help them link up with the private sector, public sector, and civil society and to acquire the institutional, technical, and financial capacity needed for improving their livelihoods.

Loan will be extended by the World Bank's concessionary lending arm the International Development Association. The concessional credit has a final maturity of 25 years, including 5-year grace period. ❑

Post Disaster Impact Assessment and Funding Mechanism

Santosh Kumar

It is also important to look into the other new funding options which may further enhance the process for disaster risk reduction and sustainable development in a more integrated format

I KEEP THINKING about disasters which are occurring all across the globe leading to deaths, injury, devastation leading to large scale displacement and long term impact of the event. Always, my mind wonders why it all happens? Is there any method to reduce its impact or it is a completely natural phenomenon so it is beyond the human capacity to address and hence we leave everything to God and become fatalistic? Over the years, disasters has been defined and understood differently by different people with the broader consensus that hazards are natural but disasters are un-natural. In the present paper I would like to unfold the 'Disaster' and see how a natural hazard gets converted into disaster? How disaster impacts are being assessed? What development implication it has and how we should start understanding and treating disasters and its risk differently?

First let me explain that all disasters are human induced. No disaster is natural. Earthquakes, Cyclone, Floods, Cloudburst, Tsunami, Droughts and Landslides are natural hazards or natural activities which have been occurring since the existence of the mother Earth. If these events takes place in no man's land it is not called as disaster or not even noticed. However on the contrary, if the same activity occurs where it interfaces with human existence and the entire infrastructure created around by the people leading to lot of damages, deaths and millions getting affected, we call it a Disaster. So it is not the natural activity (a Hazard) that kills people and leads to colossal damage of the property, but it is the weak infrastructure which has been created created by us all around us in all the sectors for achieving larger 'developmental' goals. And, this has been created without the acknowledgement of the natural activities which have occurred or have being occurring in the vicinity and hence facing the consequences of natural activities as disaster. Development planners and society as a whole is not able to

The author is Professor & Head, Policy, Planning & Cross Cutting Issues Division, National Institute of Disaster Management, New Delhi.

protect development infrastructure (housing, hospitals, roads, bridges, irrigation facilities, schools, water, electricity etc.) created over the years for the attainment of development goals, instead faced disasters. These natural activities are certainly having potential to damage and that is why it is termed as hazard, not disaster. It is called disasters only after it has adverse impacts. Let me explain this with example of the Gujarat earthquake which took place on the 26th January 2001 which is still alive in the memory of many. The earthquake which created huge impact on the lives, property and eroded development initiatives completely in the Kutch area. On the other hand, a bigger earthquake took place in California just after the week of the Gujarat earthquake which went unnoticed. Nobody even noticed and remembers the incident. The question is why California earthquake went unnoticed and not considered as disaster even though it was bigger on the Richter scale? The answer is very simple. Only those events are remembered which have larger impact in terms deaths, injury, number of affected people and colossal damage of property. South-Asian Tsunami 2004; Kashmir earthquake 2005; Kosi floods, 2008; Pakistan floods 2010; Katrina hurricane 2005; Haiti earthquake 2010 and Japan Tsunami 2011 are a few examples. The California earthquake was not converted into disaster because infrastructure could withstand the force of earthquake; people have developed their resilience (capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in functioning and structure). This is determined by the degree to which the social system is capable of organizing itself, and the ability to increase its capacity for learning and adaptation, including the capacity to recover from a disaster). Hence we may say that hazards are natural but disasters are un-natural. The size and scale of disasters are determined by us. And hence power to reduce its impact is also within our hands and not only in the hands of nature alone. It is not the act of God, it is our creation.

Geo-climatic and socio-economic vulnerabilities and bad development practices make India prone to various disasters. People get deprived of the outcomes of development. More than 360 natural disasters have been recorded over the past 35 years. Within the first nine years of the 21st century alone, various natural disasters claimed nearly 400 thousands lives and 247,480 thousand got affected. People who lost their lives are mostly poor. Natural disasters have a great impact on the Indian economy. The reported direct losses on public and private economic infrastructure in India have amounted to around $30 billion over the past 35 years. Reported direct losses from natural disasters has more than quadrupled during the 15 –year period 1981-1995 ($13.8 billion) compared to the losses reported during the previous 15-years($2.9 billion). This alarming trend continues; the total losses reported in most recent six years period (1996-2001) of US $ 13.8 billion have already exceeded total losses incurred over the last fifteen year period. The Gujarat earthquake alone is estimated to have caused a US$491-655 million loss of output and a US$2.2 billion negative impact over three years on the state's fiscal deficit loss to property and infrastructure has been estimated at US $ 4800 crores. Losses are 20 times greater as percentage of GDP in the developing countries than in industrialized (MHA: 2011 p.4). Sudden onset and low frequency natural catastrophes (the subject of this study) in India have primarily been associated with flooding, windstorm, and earthquake and have had significant stock impacts. Flooding triggered by torrential and heavy monsoon rains has been a significant source of losses, reported at more than US $13 billion over the past decade. Strong tropical storms and cyclones have inflicted disasters losses of approximately $6.6 billion while earthquakes have inflicted damages of close to $5 billion over the past ten years (WB Report, 2002).

The economic costs of the disaster deserves our attention also because disaster erodes all development gains and cuts across the political boundaries created by man. Disaster incident of one country may have serious impact on the other geographical regions of the world. It is very true in the case of India and South Asia region (eg. heavy rains in Nepal may flood India). These natural catastrophes pose a serious and growing challenge to development.

Disaster losses include not only the shocking direct effects that we see in news, such as the loss of life, housing and infrastructure but also indirect effects such as the foregone production of goods and services caused by interruptions in utility services, transport, labour supplies, suppliers, or markets lives lost, social networks disrupted and capital investments destroyed. Funds targeted for development are reallocated to finance relief and reconstruction efforts, jeopardizing long-term development goals. Post disaster-reconstruction activities strain public finances and divert funds from economic development, which further escalates the losses

which are often nt directly accounted for by the different government bodies.

Hence, it is important for the development planners to understand that how disaster may impact development. To take the agenda of prevention forward, it is also important to know that how the potential or probable risks are known and quantified? And, how much impact it may create? Accordingly, initiative may be designed to reduce the risks to minize the impact of potential disasters. A few questions may be emphasized as how the impact of any disaster in India is captured and documented. What are the tools applied and who all are the persons engaged in capturing the impact? Are we getting the real picture of disaster impact? And do we have some alternatives?

Having understood the imperatives of the economic losses on the developmental economy of a country, let us review the process of disaster impact assessment in India. Disaster impacts are difficult to quantify. Soon after the event of disaster the first attempt is to make a situational report so that relief and response could be made effective. After the situational report, the detailed damage assessment reports are made by the affected state government and submitted to Central Government. Most of the post disaster damage assessments have been done in the country on the basis of direct loss basis with the replacement value on current price basis. Assessment of indirect loss is not a practice in the country unless it is funded by multilateral support for long term recovery. These losses of assets and the impact on flows of goods and services are important to quantify and assessed. Direct and indirect loss assessment and their effect on the different sectors of the economy are done in distinct ways. Present method only makes an assessment of infrastructure (stock) but does not cover the revenue loss (flow) and assess the overall economic impact of disaster. Further, this also does not give any alternative to the decision maker for prioritizing long term recovery investment.

In many other countries, Economic Commission Latin America and Caribbean (ECLAC) methodology has been applied which was evolved in 1972 in the Latin America and Caribbean region. The methodology has also been applied in other regions of the world, most notably in Asia and, recently, in Africa to quantitatively determine the effects of major disasters. A damage and loss assessment following disasters can be used advantageously to determine post-disaster needs, including economic recovery planning and reconstruction program design. It can also be used later for monitoring progress of economic recovery and reconstruction program. There are two distinct potential uses of the results of a damage and loss assessment: in the short term, to define government interventions for the immediate aftermath of the disaster, which aim to lessen peoples suffering and to initiate economic recovery. In the medium to long term, the assessment is used to define the required financial needs to achieve overall recovery and reconstruction. In addition to revealing the magnitude of effects caused by a disaster, the damage and loss assessment provides information to define effects and impacts on most geographical areas and sectors of the economy, as well as on overall economic performance.

Damage is defined as total or partial destruction of physical assets existing in the affected area. Damage occurs during and immediately after the disaster and is measured in physical units (i.e. square metres of housing, kilometres of roads, etc). Its monetary value is expressed in terms of replacement costs according to prices prevailing just before the event.

Whereas Loss is change in economic loss arising from the disaster. They occur until full economic recovery and reconstruction is achieved and in some cases lasting for several years. Typical losses include the decline in output, in productive sectors (agriculture, livestock, fisheries, industry and commerce) and lower revenues and higher operational costs in the provision of services (education, health, water and sanitation, electricity, transport and communications). Also considered losses are the unexpected expenditures to meet humanitarian needs during the post-disaster emergency phase. Losses are expressed in current values.

The value of damage is used as the basis for estimating reconstruction needs. The value and type of losses provide the means for estimating the overall socio-economic impact of the disaster and the needs for economic recovery. In India, estimation of post disaster damage loss and need assessment and making an analysis of its impact on development is not a practice. It is assumed that the need assessment is required only when country is planning to go for long term recovery. Hence, even after so many disasters are occurring in the country, we do not have assessment done which can give an understanding of disaster and its impact on development. We still are making speculations about the damage and losses occurring due to various disasters. For understanding disaster impact, India is still dependent on the single

study conducted by the World Bank 2001which has estimated India losing 2 percent of the GDP and 12 percent of the revenue per annum due to natural disasters.

The new dimension of disaster loss in global economy

It is being observed that in the time of globalization, disaster happening in one country is leading to huge loss in other countries. The damages of stock (infrastructure) are determining the flow (revenue) of either neighbouring or distantly located countries. For example, during the recent flood in Thailand, the Federation of Thai Industries estimated that the damage of the record flooding to industry will total $6.2 billion. Disruptions were felt in Japan and to a lesser extent, in United States because the closed industrial estates host high-tech and automotive manufacturers like Western Digital, Seagate, Nissan, Toyota, Isuzu, ON Semiconductor, and TDK Magnecomp. Four automotive factories, accounting for 630,000 Toyotas and 240,000 Hondas annually, have closed. Over 300 Japanese companies were directly affected by the disaster and estimates suggest they will take months to recover. In consumer electronics, the hard disk drive (HDD) industry also felt the flood's effects. California-based Western Digital is expected to see a 40 percent decline in its exports from Thailand, which is worth $6.5 billion a year, as two of its plants in Bang pa-in have been forced to close. Western Digital produces 33 percent of the world's HDDs and sells to major computer manufacturers like Acer, Dell, and Hewlett-Packard. Apple CEO Tim Cook said that Apple has suffered supply chain snags due to factory closures as well (Times of India on 3rd November, 2011).

From Damage to Losses to Needs Assessment

A subsequent use of the assessment results is to estimate the requirements or needs of financial resources necessary for recovery and reconstruction activities. The value and the spatial, time and by-sector distribution of losses are used to estimate the requirements of economic recovery while the value, geographical and by-sector distribution of damage is used to estimate the requirements of reconstruction. Typical objectives of an overall economic recovery programme include the restoration of personal and family income, and the resumption of essential services and production activities in the affected areas. The main objective of the reconstruction programme is to replace or repair physical damaged asset to restore economic losses and hence the growth path. There is need for moving ahead from making post disaster damage assessment to loss and recovery need and investment priority assessment. And, all the state governments may be encouraged to do so. This tool would act as barometer for measuring development recovery.

Financing Post Disaster Immediate and Long Term Recovery

The responsibility for disaster funding in the aftermath of a natural catastrophe has been shared by the state and central governments. While the affected state manages the relief work and reconstruction efforts, the central government provides financial support. Originally, the central government financed catastrophe relief efforts through margin money allocated to the states from the successive Finance Commissions. However, the general experience under this system was that actual calamity expenditures consistently outpaced underlying budget expectations. Under the Ninth Finance Commission, the government revised the system and created a Calamity Relief Fund (CRF) from which states can draw upon under emergencies. The additional funds will be provided by the centre from National Calamity Contingency Fund (NCCF), after the submission of memorandum (damage assessment report) by the States to the Center. The 13th Finance Commission has merged CRF and NCCF into one fund called National Disaster Response Fund (NDRF). All these funds could be utilized only for the immediate relief given to the affected one and immediate temporary recovery of critical installations. There is no provision or dedicated fund available for long term recovery.

National Disaster Management Act 2005 has made provision for constitution of two funds viz. *National Disaster Response Fund and National Disaster Mitigation Fund*. The National Disaster Response Fund, as specified in the Act, would be used for meeting any threatening disaster situation or disaster. The Response Fund would be available with the National Executive Committee, who would use it towards meeting the expenses for emergency response, relief and rehabilitation according to the guidelines laid down by the Government, in consultation with the National Authority. The National Disaster Mitigation Fund has been provided exclusively for the purpose of mitigation and would be used only for mitigation projects. The corpus of the fund would be provided by the Central Government after due appropriation made by Parliament, by law. This fund would be applied by the National Authority.

The Act has also made provisions for similar funds at the State and district levels. The State Disaster

Response Fund shall be available with the State Executive Committee for emergency response, relief and rehabilitation at the State level, while the State Disaster Mitigation Fund shall be made available to the State Disaster Management Authority for mitigation projects.

For the allocation of CRF to the states the successive finance commissions have taken disasters and expenditure occurred in managing the disasters as one of the important criteria which itself has inherent lacuna. Firstly, many states have very long return period of big disasters leading to huge loss but that doesn't get reflected in the expenditure. On the other hand they keep facing smaller disasters on a regular basis which becomes the basis of funding. Secondly, few states fall in the category of low probability high risk area and many are into high probability and low risk area, this may also be seen and analyzed. Thirdly, many states are willing to spend more money for managing disasters but they are constrained to do that due to financial health of the state. Hence considering the expenditure criteria only is not an appropriate indicator for the allocation of funds to the state. This may be revisited by the finance commission. Vulnerability of the states could also be seen as one of the criteria for allocation.

All these provision of disaster funding is limited to immediate and intermediate disaster recovery. Still, long term recovery funding is an unaddressed issue. In India, long term recovery programmes conducted can be counted on fingers. After so many disasters in the country , India has just gone for a few long term recovery programmes with objective of 'build back better' by incorporating mitigation into reconstruction programmes such as Maharashtra Latur earthquake (1994), AP Cyclone (1997), Orissa Cyclone(1999), Gujarat earthquake (2001), Tsunami (2004), Leh cloud burst (2010) and now Sikkim earthquake (2011). Many recent catastrophic disasters remained unattended for long term recovery (Bihar, Orissa and Assam successive floods, Karnataka and Andhra floods 2008, Bengal Cyclone 2010).

It is important to highlight that direct damages (stock) induce indirect damages (flow). If the long term recovery goes unaddressed, the loss of flow gets added every day and in ultimate analysis it creates huge pressure on economy and the development process. Along with mitigation and response fund, there is also an urgent need to start pondering over Disaster Long Term Recovery Fund, both at the national and state level. In all the disaster situations, the growing problem of funding natural catastrophe losses has been recognized by the Finance Commissions. India's traditional practice of dependence on Central Government funds to finance relief and recovery efforts in the aftermath of natural disasters has contributed to underdeveloped state level risk management and private insurance mechanisms. In the last decade the situation has been exacerbated by the fact that most states and the Central Government have been running deficits on revenue account, and resources for post disaster reconstruction in particular have been increasingly constrained and dependent on donor funding.

Disaster Mitigation Funding

For mitigation (disaster risk reduction) funding, the first and foremost thing which may be done is to do the risk assessment in quantified manner. The identified quantified risk should be on the basis of probabilistic theory which may like to take 50, 100 and 150 years of return period. On the basis of quantified losses risk-zonation may be done accordingly. Once the quantified maximum probable risk is known, after the risk-zonation, different risk management modules can be worked out. Mitigation investment (structural and non structural) can be planned further for risk reduction.

Conclusion

Hence in the light of the above, it is important to first acknowledge that disaster is not the problem of disaster management per se but is a larger development issue for protecting development gains and making development sustainable. Secondly, we have to have a complete picture before us as to how any catastrophic disaster affects country's economy directly and indirectly. And for that mere damage memorandum is not enough instead, we should have a policy shift for making damage, loss and need assessment with micro-macro impact analysis. Thirdly, along with immediate recovery we should also plan long term recovery and make funding provisions accordingly. Fourthly, making assessment of financial tools available for disaster funding and also innovate new funding mechanisms (risk transfer, risk sharing, insurance, bonds, etc.) so that the losses occurring over the years due to disaster can be minimized. And, fifthly, disaster mitigation funds should be designed and planned on the basis of probabilistic risk assessment and risk exposures assessment. It is also important to look into the other new funding options which may further enhance the process for disaster risk reduction and sustainable development in a more integrated format. ❑

DO YOU KNOW?

EARTH SYSTEM SCIENCE ORGANIZATION

What is Earth System Science Organization and what is its vision?

Recognizing the importance of strong coupling among various components of the earth, viz. atmosphere, oceans, cryo-sphere and geo-sphere the Ministry of Earth Sciences was founded in 2006. Soon after in 2007 came in a virtual organisation, an executive arm of the Ministry, the Earth System Science Organisation (ESSO). It has three major branches of earth sciences viz., (i) Ocean Science & Technology (ii) Atmospheric Science & Technology and (iii) Geoscience and Technology. The sole purpose of the endeavor was to address holistically various aspects relating to earth processes for understanding the variability of earth system and for improving forecast of the weather, climate and hazards.

Primarily aimed to develop and improve capability to forecast weather, climate and hazard related phenomena for societal, economic and environmental benefits including addressing aspects relating to climate change science, climate services and integrated Himalayan meteorology, the ESSO is also responsible for development of technology towards the exploration and exploitation of marine resources in a sustainable way for the socio-economic benefit of the society by taking into account the global developments in the field of marine environment.

The Vision

The overall vision of the ESSO is to excel in knowledge and technology enterprise for the earth system science realm towards socio-economic benefit of the Indian sub-continent and in the Indian Ocean region. It has three major components:

- Provide scientific and technical support for both academic and applied research in Earth System sciences as a whole comprising the atmosphere, hydrosphere, cryosphere and the geosphere, with particular reference to the Indian sub-continent and the surrounding oceans as well as the Polar Regions.
- Provide the Nation with the best possible services in forecasting the monsoons and other weather/ climate parameters, ocean state including early warnings to natural disasters like storm surge, earthquakes, tsunamis and other phenomena through well integrated programs.
- Support science and technology development for exploration and exploitation of ocean resources (living and non-living), ensuring their sustainable utilization.

How does ESSO Work?

The ESSO contributes to the areas of Weather (General), Weather advisories specific to agriculture, aviation, shipping, sports, etc. Monsoon, Disasters (cyclone, earthquake, tsunami, sea level rise), Living and non-living resources (fishery advisory, poly-metallic nodules, gas hydrates, freshwater etc), Coastal and Marine Ecosystems and Climate Change, Underwater Technology. One of the major schemes of the ESSO, on defining and deploying satellite based, airborne and in-situ atmospheric, ocean and lithosphere observing systems, acts as backbone for achieving the objectives. These policies/programmes are being pursued through its centres viz., autonomous bodies and subordinate offices. The institutions, viz. India Meteorological Department (IMD), National Centre for Medium Range Weather Forecasting (NCMRWF) and Indian Institute of Tropical Meteorology (IITM), National Centre for Antarctica and Ocean Research (NCAOR), National Institute of Ocean Technology (NIOT), Indian National Centre for Ocean Information Services (INCOIS), Centre for Marine Living Resources (CMLRE) and Integrated Coastal and Marine Area Management (ICMAM) were grouped under the ESSO. These institutions are under Earth System Science Organization (ESSO), managed by the ESSO Council. Each centre has been created with a specific well defined mandate. The ESSO operates through ESSO council, an apex body to formulate policies and plans, and provide programme directions for the Centres/Units and review the implementation of programmers.

How do you explain Desalination Technology and how does it work?

Desalination refers to the process by which pure water is recovered from saline water by the application of energy. The commercially relevant desalination processes are broadly classified as thermal and membrane processes. The Low Temperature Thermal Desalination (LTTD) is a process by which warm surface seawater is flash evaporated under low pressure and condensed with cold deep seawater, for generation of freshwater. The ESSO has set up till

date 4 Low Temperature Thermal Desalination (LTTD) plants successfully in the country, one each at Kavaratti, Minicoy, Agatti, Lakshadweep and at Northern Chenai Thermal Power Station (NCTPS), Chennai. The technology is completely indigenous, robust and environment friendly. Out of this four plants, the Minicoy and Agatti plants were established in April 2011 and July 2011, respectively. The capacity of each of these LTTD plants is 1 lakh litre per day of potable water.

What is South Pole Scientific Expedition?

India had successfully completed a scientific expedition to the South Pole during November-December 2010. It was a very important expedition as it was part of the international celebration of centenary of man's reaching South Pole in 1911.The first expedition to the South Pole started in 1902 and completed in 1911.This expedition was scientific in nature and was carried out with ice trucks, ice vehicles which travel 80 to 90 km/hour against the first expedition which was an adventure expedition where dogs and sledges were used. The 8-member team collected valuable atmospheric aerosol data and several short ice cores in the course of its transect from the Schiramcher Oasis to the South Pole.

What is India's preparedness to monitor Tsunami and is Tsunami Early Warning System in place now?

A state-of-the-art Tsunami Warning System was made operational in September 2007 has been in continuous operation to forewarn of an impending disaster in less than 10 minutes of an occurrence of an earthquake. The National Tsunami Early Warning Centre (NTEWC) is operated 24x7. So this ensures that the warning of a possibility of a Tsunami is given out ahead of it actually hitting the coast, allowing people to evacuate and take necessary precaution.

What is Monsoon Mission?

The ESSO has launched the Monsoon Mission for improving the predictability of the Indian Monsoon. Better monsoon prediction will help the Nation in taking advance action in preparing for the agricultural and other impacts of the monsoon. It consists of two sub-themes-Seasonal and Intra-seasonal Monsoon Forecast and Medium Range Forecast. The mission will support focused research by national and international research groups with definitive objectives and deliverables to improve models in the medium range as well as in the extended and seasonal range scales through setting up of a framework for generating dynamical forecasts and improving skill of forecasts. The Mission will also support observational programme that will result in better understanding of the processes. Under the Mission, Indian Institute of Tropical Meteorology (IITM) will coordinate and lead the effort for improving the forecasts on seasonal and intra seasonal scale. National Centre for Medium Range Weather Forecasting (NCMRWF) will lead and coordinate the efforts for improving the forecasts in the medium range scale. These will be made operational by the India Meteorological Department (IMD). In a bid to improve the skill of the forecasts in various temporal and spatial ranges, proposals will be invited from national as well as international Institutes on very specific projects and deliverables. Provisions for funding the national as well as the international partners will be provided. These partners will be allowed to use the HPC facility at IITM and NCMRWF which will be suitably enhanced for the purpose. A National Steering group is being put in place to steer the programme and review the progress of the mission. ❑

Modified Wood Stove

The stove consists of two chambers, each with a burner for cooking, and a geyser for heating water. Both burners can be used simultaneously, saving time and using the heat effectively

BHARAT AGRAWAT (40) has innovated a multipurpose wood stove with two burners at different elevations that can efficiently run using both, wood and coal as fuel.

He has studied up to class tenth and has been running agricultural equipments' workshop for past 25 years. His family consists of his father (who is an innovator himself and a national awardee of NIF), grandmother, wife and three children.

His father, Amrutbhai was a Pujari in temple, began his life as a farm worker after discontinuing his studies in fifth class. He had set up a small farm machinery workshop. Later he also started making iron doors, boxes for granaries and iron gates.

Bharat started helping his father since he was in sixth standard. He has built many devices. The list includes a lemon cutter, innovative windmill for lifting water from wells, 5 HP power-tiller-cum tractor, which can be rotated at 3600 angles and many more equipments besides the modified stove.

He first made an innovative windmill, which included weight balancing gearbox system, designed to pump water out of the well at a rate of 2000-2200 litres/hour. He is an environmentalist and understands the need of utilizing natural resources to generate energy in an efficient and eco-friendly way to power different applications. This was also tested by GEDA, Vadodara.

This bent of mind has influenced his choice of innovations to be developed. Energy optimization has been a constant focus of all his endeavours such as the present one- the modified wood stove.

Genesis

Traditional wood stoves, by virtue of their design, do not optimally use the heat generated and also emit much smoke and pollutants due to incomplete combustion. Bharatbhai fitted an exhaust chute to a wood stove and noticed that a lot of heat was still coming out, which made him infer that non-utilization of heat was the major fault in existing wood stoves.

He decided to solve the problem by facilitating better heat utilization through sufficient air supply and a correct channel for burning. To improve it further, he developed a mechanism for simultaneous heating of multiple vessels using the same heat source.

Bharatbhai made the first model of this stove in 1999, then after a few modifications, he came up with this multipurpose stove, with two multilevel burners and a single fuel feeding point.

Innovation

Among various innovations of his, only one dealing with cooking stove is taken up for elaboration. Stoves having three chambers connected in parallel are available in art; Astra stove (Jagdish K.S.2004).

The development and dissemination of efficient domestic cook stoves and other devices in Karnataka Current Science 87(7):pp. 926-931. But these chambers are connected horizontally.

In this case, the stove consists of two chambers, each with a burner for cooking, and a geyser for heating water. Both burners can be used simultaneously, saving time and using the heat effectively. The heating chambers are oriented at different levels in order to be able to completely utilise the heat energy produced connected to a chimney, which provides part of the draft

Inside the main chamber, mud has been used as insulating material to retain the heat. There are air vents on the sides of the first chamber to allow cooling of stove so that it is not too hot to touch for those using it.

Bharatbhai is working further on the stove and wants to add another chamber (which can be utilized for steam cooking).

He wants to fine tune its thermal effeciency, reduce assembly's weight and cost by making stove body with GI sheet. He envisages building versions with different burner attachments. While he has sold more than three-dozen units of the current model locally, he is planning to launch commercial versions having two burners with geyser and one burner with geyser.

This product may have considerable social impact and commercial potential. ❑

FORM IV

Statement about ownership and other particulars about YOJANA (English)

1.	Place of publication	:	New Delhi
2.	Periodicity of its publication	:	Monthly
3.	Printer's Name	:	K Ganesan
	Nationality	:	Indian
	Address	:	Publications Division ` Soochana Bhavan, C.G.O Complex Lodhi Road, New Delhi-110003
4.	Publisher's Name	:	K Ganesan
	Nationality	:	Indian
	Address	:	Publications Division, Soochana Bhavan, C.G.O Complex Lodhi Road, New Delhi-110003
5.	Editor's Name	:	Ms. Manogyan Rani Pal
	Nationality	:	Indian
	Address	:	Yojana, Publications Division, Room No.542, Yojana Bhavan,New Delhi-110 001
6.	Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital.	:	Wholly owned by Ministry of Information & Broadcasting, Government of India, New Delhi-110001

I, K Ganesan hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/-
(K Ganesan)
Publisher

MEGA DRILL IN DELHI TO TEST QUAKE READINESS

Delhi witnessed one of the biggest coordinated drills on 15th February 2012, with disaster management agencies checking the alertness and preparedness of various other agencies in the event of an earthquake of 7.2 magnitude rocking the capital.

The drills were conducted in several places including offices, schools, market places and the Metro stations across the national Capital by the National Disaster Management Authority and Delhi Disaster Management Authority at 11.30 a.m.

The drill's motive was to check the preparedness of the agencies in the event of an earthquake with a high intensity of 7.2 on Richter scale. Six metro stations were closed for over half-an-hour and road traffic in many areas in Central, South and North Delhi were also diverted.

They created a number of simulated situations like collapse of flyovers, crack in metro pillars, damage to hospitals and collapse of residential buildings.

Officials from all the important emergency support functionary departments like police, MCD, DMRC, Health department, Delhi Jal Board and Food and Civil Supplies have been coordinating with senior officials of all the nine districts to make the drill a success.

Officials from the emergency support functionary departments like the Delhi Police, MCD, DMRC, Health Department, Delhi Jal Board and Food and Civil Supplies participated.

The DDMA and the NDMA conducted a major earthquake preparedness exercise in Delhi from December 2011 to February 2012, the first such State-wide programme in India. The exercise comprised activities like workshops, awareness programmes, drills, public lectures and media campaigns on various platforms. ❑


63rd Republic Day
Ministry of Informat
Governme


Har Hindustani ki shaan
Tiranga hai hamara swabhimaan
सत्यमेव जयते
formation & Broadcasting
vernment of India
davp 22202/13/0140/1112
YE-257/2012

Natural Disaster Management in India

Vinod K Sharma
D Kaushik Ashutosh

Indeed, concurrent to these occurrences, the government at various levels too, has responded by taking appropriate measures for prevention and mitigation of the effects of disasters

DISASTER IS defined as 'Catastrophic situation in which the normal pattern of life or ecosystem has been disrupted and extra-ordinary emergency interventions are required to save and preserve lives and or the environment' (Ministry of Home Affairs, 2011). The Disaster Management Act has included man-made disasters also and defines disaster as 'a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes or by accident or negligence which result in substantial loss of life or human sufferings or damage to, and destruction of, property or damage to, or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of an affected area'.

The Indian scenario

The Indian subcontinent is highly vulnerable to cyclones, droughts, earthquakes and floods. Avalanches, forest fire and landslides occur frequently in the Himalayan region of northern India. Among the 35 total states/ Union Territories in the country, 25 are disaster prone. On an average, about 50 million people in the country are affected by one or the other disaster every year, besides loss of property worth several million (Table 1).

In the 1970s and the 80s, droughts and famines were the biggest killers in India, the situation stands altered today. It is probably a combination of factors like better resources management and food security measures that has greatly reduced the deaths caused by droughts and famines. Floods, high winds and earthquakes dominate (98 percent) the reported injuries, with ever increasing numbers in the last ten years. The period from 2001 to 2011 has been associated with a large number of earthquakes in Asia that have a relatively high injury to death ratio. Floods, droughts, cyclones, earthquakes, landslides and avalanches are some of the major natural disasters that repeatedly and increasingly affect India (Table-2).

The authors are with Indian Institute of Public Administration & National Institute of Disaster Management, New Delhi respectively.

The natural disasters directly impact economies, agriculture, food security, water, sanitation, the environment and health each year. Therefore it is one of the single largest concerns for most of the developing nations. Different natural hazards because varying levels of physical damage to infrastructure and agriculture with implications for their indirect and secondary impacts. Drought causes heavy Crop and Livestock losses over wide areas of land but typically leave infrastructure and productive capacity largely unaffected. Floods and Cyclones cause extensive whereas damage to both infrastructure and agriculture, depending on their timing relative to the agricultural cycle. While earthquakes have little impact on standing crops excluding localized losses but can cause wide spread devastation of infrastructure and other productive capacity over relatively large areas.

The precise cost of the disaster in terms of loss of lives, property, loss of development opportunities, etc. cannot be clearly assessed, counted or scaled. The costs of disaster are clearly inequitable, falling heavily only on the few. Disasters result not only in loss of shelter but also create hardships, lack of food availability, temporary loss of livelihood and disrupt socio-economic activities. Some of the losses may be redeemable and compensated for through disaster relief and insurance. However, apart from economic dimension, such disturbances have their psychological and social dimensions as well, which need to be studied, and documented besides developing appropriate mitigation strategies.

India's Vulnerability

India is a country highly vulnerable to natural disasters.

Table-1: People affected, lives lost and economic damage due to Disasters in India during 1980 to 2010.

Year	Type of Disasters	People affected	Life lost	Economic damage (USD x 1,000)
1980	Flood	30,000,023		
1982	Drought	100,000,000		
	Flood	33,500,000		
1984	Epidemic		3290	
1987	Drought	300,000,000		
1988	Epidemic		3000	
1990	Storm			2,200,000
1993	Flood	128,000,000		7,000,000
	Earthquake		9,748	
1994	Flood		2001	
1995	Flood	32,704,000		
1996	Storm			1,500,300
1998	Storm		2871	
	Extreme Temp		2541	
	Flood		1811	
1999	Storm		9,843	2,500,000
2000	Drought	50,000,000		
2001	Earthquake		20,005	2,263,000
2002	Drought	300,000,000		
	Flood	42,000,000		
2004	Flood	33,000,000		2,500,000
	Earthquake		16,389	
2005	Flood			3,330,000
	Flood			2,300,000
2006	Flood			3,390,000
2009	Flood			2,150,000

Source: "EM-DAT: The OFDA/CRED International Disaster Database

Table-2: Year-wise damage caused due to floods, cyclonic storms, landslides, etc. during last ten years in India

Year	Live Lost human (in No.)	Cattle Lost (in No.)	Houses damaged (in No.)	Cropped areas affected (in Lakh hectares)
2001-02	834	21,269	3,46,878	18.72
2002-03	898	3,729	4,62,700	21.00
2003-04	1,992	25,393	6,82,209	31.98
2004-05	1,995	12,389	16,03,300	32.53
2005-06	2,698	1,10,997	21,20,012	35.52
2006-07	2,402	4,55,619	19,34,680	70.87
2007-08	3,764	1,19,218	35,27,041	85.13
2008-09	3,405	53,833	16,46,905	35.56
2009-10	1,677	1,28,452	13,59,726	47.13
2010-11	2,310	48,778	13,38,619	46.25

Source: Ministry of Home Affairs (MHA)

Enormous population pressures and urbanization have forced people to live on marginal lands or in cities where they are at greater risk to disasters and the damage they can cause. Whether a flood, a regional drought or a devastating earthquake, millions of Indians are effected each time a disaster occurs. In addition to large-scale displacement and the loss of life, these events result in the loss of property and agricultural crops worth millions of dollars annually. These catastrophes typically result in the substantial loss of hard won development gains.

India is a nation with varied climatologically and hypsographic conditions. Therefore 68 percent of the land is drought prone, 60 percent is prone to earthquake, 12 percent to Floods, 8 percent to Cyclones. This count to almost 85 percent of the land area in India is vulnerable to natural hazards while 22 States have been marked as hazards prone states. The main natural disasters in India includes floods, earthquakes, droughts, and cyclones while the minor natural hazards in India are landslides, avalanches, hailstorms, forest fires and bushfires. In India most of the states experience more than one type of disaster

Types of Disasters

Due to the increasing frequency of natural and man-made disasters and their severe impact on the individuals, society, economy, natural resources and environment, Government of India constituted a High Powered Committee (HPC) on Disaster Management in August 1999 to prepare comprehensive plans for National, State and District levels. The HPC has rightly stressed on the need for a comprehensive and holistic approach towards dealing with all kinds of disasters. From a compartmentalized response oriented approach, a coordinated, holistic and participatory approach has been recommended. HPC identified thirty one disasters in the country. These disasters have been categorized into following five sub-groups depending on generic (origin) considerations and various departments/ ministries dealing with various aspects:

1. **Water and Climate Related Disasters**

Floods and Drainage Management, Cyclones, Tornadoes and Hurricanes, Hailstorm, Cloud Burst, Heat Wave and Cold Wave, Snow Avalanches, Droughts, Sea Erosion and Thunder and Lightning.

2. **Geologically related disasters**

Landslides and Mudflows, Earthquakes, Dam Failures/ Dam Bursts and Mine Fires

3. **Chemical , Industrial & Nuclear related disasters**

Chemical and industrial and nuclear disasters have been included.

4. **Accident related disasters**

Forest Fires, Urban Fires, Mines Flooding Oil Spill, Major Building Collapse, Serial Bomb Blasts, Festival related disasters, Electrical disasters and Fires, Air, Road and Rail Accidents, Boat Capsizing and Village Fire have been included in this sub-group by HPC.

5. **Biologically related disasters**

Epidemics, Pest Attacks, Cattle epidemics and Food poisoning.

Natural disasters are natural phenomenon and occur without any intention while man-made disasters are events which, either intentionally or by accident cause severe threats to public health and well-being. Because their occurrence is unpredictable, man-made disasters pose an especially challenging threat that must be dealt with through vigilance, and proper preparedness and response.

Natural disasters

Floods

Floods in the Indo-Gangatic Brahmaputra plains are an annual feature. Seventy five percent of rainfall is concentrated over four months of monsoon (June - September) and as a result almost all the rivers carry heavy discharge during this period. Brahmaputra and the Gangetic Basin are the most flood prone areas. The other flood prone areas are the north-west region of west due to over flowing rivers such as the Narmada and Tapti, Central India and the Deccan region with major eastward flowing rivers like Mahanadi, Krishna and Cavery. The average area affected by floods annually is about 8 million hectares while the total area in India liable to floods is 40 million hectares in which Uttar Pradesh has 21.9 percent, Bihar (12.71 percent), Assam (9.4 percent), West Bengal (7.91 percent), Orissa (4.18 percent) and other states have 43.9 percent flood prone area.

An analysis of data of different states for the period of 1953-2009 reveals that average annual damage to crops, houses and public utilities in the country was around Rs. 1649.77 crore and maximum reported 8864.54 crore was in the year of 2000. On an average, an area of about 7 million hectares (17.50 mha maximum in 1978) was flooded, of which, on average crop area affected was of the order of 3.302 million hectares (10.15 mha in 1988). The floods claimed on an average 1464 human life and 86288 heads of cattle dead every year.

Droughts

We have a largely monsoon dependant irrigation network. An erratic pattern, both low (less than 750 mm) and medium (750 - 1125 mm) makes 68 percent of the total sown area vulnerable to periodic droughts. Severe and rare droughts occur in arid and semi-arid zones once in almost every 8-9 years. Drought is a perennial feature in some states of India. 16 percent of the country's total area is drought prone and approximately 50 million people are annually affected by droughts. In fact, persistent drought with less than average rainfall over a long period of time gives rise to serious environmental problems.

Cyclones

India has a long coastline of approximately 8,000 km. There are two distinct cyclone seasons: pre-monsoon (May-June) and post-monsoon (October-November). The impact of these cyclones is confined to the coastal districts, the maximum destruction being within 100 km from the centre of the cyclones and on either side of the storm track. Most casualties are caused due to coastal inundation by tidal waves, storm surges and torrential rains. The occurrence of tropical cyclone is almost a common natural phenomenon. The Indian Ocean is one of the six major cyclones–prone regions of the world. In India, cyclones from Indian Ocean usually occur between April and May, and also between October and December. The eastern coastline is more prone to cyclones than the western coast. About 80 percent of total cyclones generated in the region hit the eastern coast. Out of approximately six cyclones formed every year, two to three may be severe.

Earthquakes

The Himalayan mountain ranges are considered to be the world's youngest fold mountain ranges. The subterranean Himalayas are geologically very active. In a span of 53 years four earthquakes exceeding magnitude 8 have occurred in this region. The peninsular part of India comprises stable continental crust. Although these regions were considered seismically least active, earthquakes, which occurred in Latur in Maharashtra on September 30, 1993 of magnitude 6.4 on the Richter scale and Gujarat 2001 of magnitude 6.9 on the Richter scale caused substantial loss of lives and damage to infrastructure. India has a large part of its land area liable to wide range of probable maximum seismic intensities where shallow earthquake of magnitudes of 5.0 or more on Richter Scale have been known to occur in the historical past or recorded in the last about 100 years. The Himalayas frontal that are flanked by the Arakan Yoma fold belt in the east and the Chaman fault in the west constitute one of the most seismically active regions in the world.

Landslides

The Himalayas, the Northeast hill ranges and the Western Ghats experience considerable landslide activity of varying intensities. River erosions, seismic movements and heavy rainfalls cause considerable landslide activity. Heavy monsoon rainfall often in association with cyclonic disturbances results in considerable landslide activity on the slopes of the Western Ghats. The Himalayan, the north-east hill and the Western Ghats experience considerable land-slides activities of varying intensities. The rock and debris carried by the rivers like Kosi originating in the Himalayas cause enormous landslide in the valleys. The seismic activity in the Himalayan region also results in considerable landslide movement. The Government of India is collaborating with a wide range of Indian academic institutions on hill research.

Landslides Zonation Mapping is a modern method to identify landslide prone areas and has been in use in India since 1980s.

Avalanches

Avalanches constitute a major hazard in the higher elevations of Himalayas. Parts of the Himalayas receive snowfall round the year and adventure sports are in abundance in such locations. Severe snow avalanches occur in States like Jammu & Kashmir, Himachal Pradesh and Uttrakhand. Losses of life and property have been reported due to avalanches.

Manmade Disasters

The fast pace of growth and expansion in the name of development without comprehensive understanding or preparedness has brought forth a range of issues that seek urgent attention at all levels. In the absence of such measures growing numbers in our population are at a risk of prospective hazards such as air accidents, boat capsizing, building collapse, electric fires, festival related disasters, forest fires, mine flooding, oil spills, rail accidents, road accidents, serial bomb blasts, and fires. The safeguards within existing systems are limited and the risks involved high. Nuclear, Chemical and Biological threats are apparent in the present scenario. Deliberate international terrorism or accidental secondary fallout can be fatal. Creation of specific infrastructure is imperative to avoid a catastrophe in the future. However, rapid and effective response needs intensive research and laboratory support.

Forest Fires

Forests face many hazards but the most common hazard is fire. Forests fires are as old as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime of fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. Forest fires are usually seasonal. They usually start in the dry season and can be prevented by adequate precautions. State Governments are aware of the severe damage caused by fires not only trees but also to forests and ecology of the area. Successive Five Year Plans have provided funds for forest fire fighting.

National Disaster Management System in India

Indeed, concurrent to these occurrences, the government at various levels too, has responded by taking appropriate measures for prevention and mitigation of the effects of disasters. While long term preventive and preparedness measures have been taken up, the unprecedented nature of the disasters has called in for a nationwide response mechanism wherein there is a pre-set assignment of roles and functions to various institutions at central, state and the district level.

The Administrative Response

In the federal set-up of India, the responsibility to formulate the Governments response to a natural calamity is essentially that of the concerned State government. However, the Central Government, with its resources, physical and financial does provide the needed help and assistance to buttress relief efforts in the wake of major natural disasters. The dimensions of the response at the level of Central Government are determined in accordance with the existing policy of financing the relief expenditure and keeping in view the factors like:

(i) the gravity of a natural calamity,

(ii) the scale of the relief operation necessary, and

(iii) the requirements of Central assistance for augmenting the financial resources at the disposal of the State Government.

The Division of Disaster Management of Ministry of Home Affairs, Government of India is the nodal ministry for all matters concerning disasters at the Centre except the drought. The Drought Management is looked after by the Ministry of Agriculture, Government of India. The National Contingency Action Plan (NCAP) facilitates launching of relief and rescue operations without delay. The CAP identifies initiatives required to be taken by various Central Ministries, and Public Departments like in the wake of natural calamities, sets down the procedures and determines the focal points in the administrative machinery.

As pointed out earlier, the central government only supplements the efforts of the State Government. State Governments are autonomous in organizing relief operations in the event of natural disaster and in the long-term preparedness/ rehabilitation measures. The States have Relief Commissioners who are in charge of the relief measures in the wake of natural disasters in their respective states. In the absence of the Relief Commissioner, the Chief Secretary or an Officer nominated by him is overall in-charge of the Relief operations in the concerned State.

The Chief Secretary is the head of the State Administration. The State Headquarters has, in addition, a number of Secretaries who head the various Departments handling specific subjects under the overall supervision and co-ordination of the chief Secretary. At the level of the State Government natural disasters are usually the responsibility of the Revenue Department or the Relief Department.

States are further divided into districts, each headed by a District Collector (also known as District Magistrate or Deputy Commissioner). It is the District Collector who is the focal point at the district level for directing, supervising and monitoring relief measures for disaster and for preparation of district level plans.

Non Governmental Organizations

Emerging trends in managing natural disasters have highlighted the role of Non Governmental Organizations (NGOs) as one of the most effective alternative means of achieving an efficient communication link between the Disaster Management agencies and the affected community. Many different types of NGOs are already working at advocacy level as well as grassroots level; in typical disaster situations they can be of help in preparedness, relief and rescue, rehabilitation and reconstruction and also in monitoring and feedback.

The Community

It has now been revealed that the community as an institution in itself is emerging as an effective player in the entire mechanism of disaster administration. In the event of actual disasters, the community, if well aware of the preventive actions it is required to take can substantially reduce the damage caused by the disaster. Awareness and training of the community is particularly useful in areas that are prone to frequent disasters.

New Strategies for A Safer Future

Preparedness, Mitigation And Prevention

In disaster situations, a quick rescue and relief mission is inevitable; however damage can be considerable minimized if adequate preparedness levels are achieved. Indeed, it has been noticed in the past that as and when attention has been given to adequate preparedness measures, the loss to life and property has considerably reduced. Going along this trend, the disaster management setup in India has, in the recent years, oriented itself towards a strong focus on preventive approaches, mainly through administrative reforms and participatory methods.

Preparedness measures such as training of role players including the community, development of advanced forecasting systems, effective communications, and above all a sound and well networked institutional structure involving the government organizations, academic and research institutions, the armed forces and the non-governmental organizations have greatly contributed to the overall disaster management in the country. This can clearly be seen from the various instances of reduced damages from disasters due to better preparedness and coordinated inter-agency response. Preparedness is the key to breaking the disaster cycle.

The good practices are a result of the heightened awareness and sensitivity towards communities at risk. The approach of reducing community vulnerability for reducing disasters has paid rich dividends. The first step in this direction has been of identification of vulnerable communities. Those communities periodically exposed to natural hazards, and within them those with low levels of coping powers, such as economically weaker sections, are the first focus of preparedness efforts. Marginal sections of rural communities and dwellers of informal settlements and slums in urban areas fall within this class.

Efforts in the direction of integrating disaster prevention into habitat planning processes are one of the most viable disaster prevention means. The National Centre for Disaster Management's work on developing and testing methods for integrating risk reduction using community participation into urban planning is one such initiative. The general direction of current efforts is one of multi-pronged approach of mobilization of community perceptions towards a culture of prevention of natural disasters.

Role of Local Bodies

The Constitution 73rd and 74th Amendments paved the way for a constitutional status for local governments - Urban Local Bodies and Panchayati Raj institutions, to play a greater role in matters of immediate concern. While they have started taking active interest and initiatives in most of the subjects under their jurisdiction, disaster management is a topic that has not captured their attention so far.

Local governance institutions, with their grass-root level contacts with the common people, can make a substantial contribution to the process of spreading awareness and ensuring an active people's participation in disaster mitigation activities. They are the ideal channels for NGOs and other agencies that conduct any disaster management programme, right from relief, recovery and rehabilitation to planning for mitigation and prevention.

Institutional and Policy Framework

1. The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well-established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned.

2. At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/ warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis.

Each Ministry/Department/ Organization nominates their nodal officer to the Crisis Management Group chaired by Central Relief Commissioner. The nodal officer is responsible for preparing sectoral Action Plan/Emergency Support Function Plan for managing disasters.

3. National Crisis Management Committee (NCMC): Cabinet Secretary, who is the highest executive officer, heads the NCMC. Secretaries of all the concerned Ministries /Departments as well as organizations are the members of the Committee. The NCMC gives direction to the Crisis Management Group as deemed necessary.

4. Crisis Management Group: The Central Relief Commissioner in the Ministry of Home Affairs is the Chairman of the CMG, consisting of senior officers (called nodal officers) from various concerned Ministries. The CMG's functions are to review

every year contingency plans formulated by various Ministries/ Departments/Organizations in their respective sectors, measures required for dealing with natural disasters coordinate the activities of the Central Ministries and the State Governments in relation to disaster preparedness and relief and to obtain information from the nodal officers on measures relating to above.

5. Control Room (Emergency Operation Room): An Emergency Operations Center (Control Room) exists in the nodal Ministry of Home Affairs, which functions round the clock, to assist the Central Relief Commissioner in the discharge of his duties. The activities of the Control Room include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected States, interaction with other Central Ministries/ Departments/Organizations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries etc., keeping up-to-date details of all concerned officers at the Central and State levels.

6. Contingency Action Plan: A National Contingency Action Plan (CAP) for dealing with contingencies arising in the wake of natural disasters has been formulated by the Government of India and it had been periodically updated. It facilitates the launching of relief operations without delay. The CAP identifies the initiatives required to be taken by various Central Ministries/Departments in the wake of natural calamities, sets down the procedure and determines the focal points in the administrative machinery.

7. State Relief Manuals: Each State Government has relief manuals/codes which identify that role of each officer in the State for managing the natural disasters. These are reviewed and updated periodically based on the experience of managing the disasters and the need of the State.

8. Funding mechanisms: The policy and the funding mechanism for provision of relief assistance to those affected by natural calamities are clearly laid down. These are reviewed by the Finance Commission appointed by the Government of India every five years. The Finance Commission makes recommendation regarding the division of tax and non-tax revenues between the Central and the State Governments and also regarding policy for provision of relief assistance and their share of expenditure thereon. A Calamity Relief Fund (CRF) has been set up in the State as per the recommendations of the Eleventh Finance Commission (Centre contribute 75 percent where as State 25 percent). State can get assistance through National Calamity Contingency Fund (NCCF).Also through Prime Minister Fund.

9. At the State level, response, relief and rehabilitation are handled by Departments of Relief & Rehabilitation. The State Crisis Management Committee is set up under the Chairmanship of Chief Secretary in the State. All the concerned Departments and organizations of the State and Central Government Departments located in the State are represented in this Committee. This Committee reviews the action taken for response and relief and gives guidelines/ directions as necessary. A control room is established under the Relief Commissioner. The control room is in constant touch with the climate monitoring/forecasting agencies and monitors the action being taken by various agencies in performing their responsibilities.

The district level is the key level for disaster management and relief activities. The Collector/ Dy. Commissioner is the chief administrator in the district. He is the focal point in the preparation of district plans and in directing, supervising and monitoring calamities for relief. A District Level Coordination and Relief Committee is constituted and is headed by the Collector as Chairman with participation of all other related government and non governmental agencies and departments in addition to the elected representatives.

National Disaster Management Act 2005

The Parliament of India has enacted the National Disaster Management Act in November 2005, which brings about a paradigm shift in India's approach to disaster management. The centre of gravity stands visibly shifted to preparedness, prevention and planning from earlier response and relief centric approach. The Act provides for establishment of:

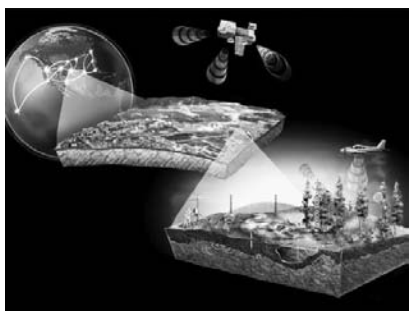
- National Disaster Management Authority (NDMA)
- State Disaster Management Authority (SDMA)
- District Disaster Management Authority (DDMA)

The Act also provides for -

- Constitution of *Disaster Response* Fund and *Disaster Mitigation* Fund at National, State and District levels.
- Establishment of NIDM and NDRF.
- Provides penalties for obstruction, false claims, misappropriation etc.
- It states that there shall be no discrimination on the ground of sex, caste, community, descent or religion in providing compensation and relief. ❑

Geospatial Techniques and Methods

S Sreekesh



The development of telecommunication technology using satellites allow transmission of disaster warning even to remote and inaccessible areas

THERE HAS been many fold increase in the occurrence of natural disasters and extreme events and related threat to life and property in India. These disasters are caused either by climatological events such as cyclone, flood and drought or by geological phenomena such as earthquakes, volcanoes, and landslides. The intensity and duration of disasters vary over space and time. The occurrences and magnitudes of many natural disasters are often unpredictable and vary over time-space domains.

It is imperative to have a disaster management plan prepared for such events at any time. In order to be prepared for any kind of the natural disasters in an area it is essential to understand the vulnerability of the area to different kinds of disasters and their possible magnitude. This article discusses the ways in which GIS and remote sensing techniques can be employed for disaster management.

Wide spread apathy exits towards the natural hazards and disasters till that time it occurs. The national development is often retarded or even brought to a stand still as and when an extensive or intensive natural disaster occurs. All these have led to a resolution (44/236 of December 22, 1989) in the General Assembly of United Nations to focus on issues related to natural disaster reduction. The disasters included under this are earthquakes, volcanoes, tsunamis, landslides, floods, storms, wildfires and drought.

The geospatial technologies have an important role in developing strategies for disaster reduction as well managing the disasters. It can be broadly classified into remote sensing based technologies and Geographical Information System (GIS). The remote sensing can be either space or aerial based.

The author is Associate Professor, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi.

The space born remote sensing technology, that is satellite remote sensing, is more apt for disaster management owing to its temporal repetitively.

Role of Satellite remote sensing

The Earth observation satellites provide synoptic and temporal coverage of large areas in near real time. The repetitive images enable the continuous monitoring of Earth surface features and phenomena. It facilitates the detection and early warning of disasters, especially those of meteorological origin. Besides, the different spatial resolutions of the satellite images enable us to choose images according to the area coverage of disaster prone areas. The forest fires can be detected early and their spread can be monitored. The images enable the mapping of flood affected areas and also track the direction of movement of tropical cyclones.

The satellite images also assist in mapping the drought and flood stricken areas and forest fire affected areas. The magnitude of the drought and flood can be assessed using the temporal images of the affected area.

Socio-economic assessment

The success of disaster management depends upon the development of demographic (no of people, age-sex groups etc.) and economic conditions of the vulnerable groups of the affected area in the geospatial domain.

Satellite communication

The development of telecommunication technology using satellites allow transmission of disaster warning even to remote and inaccessible areas. Further the availability of mobiles enhances the capability to locate isolated people by disaster.

Geographic Information System

An effective and real time disaster management programmes requires the spatial data from various sources which should be collected, manipulated, analyzed, and displayed in an organized manner. GIS provides a set of tools and techniques to accomplish these tasks.

A successful, practical and real time disaster preparedness and management needs an up-to-date geographically tagged database. Disaster preparedness to a large extent are spatial in nature. A sound GIS provides the tools to collect, collate, overlay, analyze, and display these geospatial information and help in taking informed decisions.

Institutional Dimension

The Millennium Development Goals (MDG) recognized the link between environmental degradation and disaster susceptibility and called for environmental sustainability to reduce the vulnerability.

Subsequent to this in 2005 the United Nations promulgated strategic directions for preparedness and reduction of disaster risk under the International Strategy for Disaster Reduction (ISDR). The World Conference on Disaster reduction adopted the *"Hyogo Framework for Action 2005-2015"* and emphasized the need to promote strategic and systematic approaches to reducing vulnerability and risks to hazards.

Vulnerability is the predisposition to damage, in the event of a disaster, beyond a certain threshold of intensity which impact the society, assets (natural and manmade) and ecosystems.

It is high time that governed and government realize the importance of building resilience to disasters by taking proactive measures to reduce risk and vulnerability.

The disaster management entails pre-disaster planning, response during disaster and post-disaster management.

The pre-disaster planning consists of three activities disaster prevention, disaster mitigation and disaster preparedness.

The geospatial techniques can be used for identifying disaster prone areas. The geospatial analysis of frequency and magnitude of meteorological and geological extreme events enable us to determine the most frequent disaster prone areas. It is also possible to identify the area more frequented by each of the disaster and also the combined vulnerability in a geospatial environment.

Identification of safer locations in case of evacuation of people from affected area.

Relief and rehabilitation

Route Planning

In the event of a disaster it is handy to know different routes through which affected people can be evacuated and relief material and medical aids can be dispatched.

Assessing vulnerabilities

It is therefore desirable to have the right data in the right place at the right time. The data should be organized in a usable format for stakeholders to respond and take action in case of an emergency.

Most of the emergency data requirements are of spatial nature hence the need for a Geographic Information System (GIS). ❑

CORRIGENDUM

In Page No. 3 of the November 2011 Issue on Non-Governmental Organizations, the sentence in the third paragraph should be read as "Recognizing the important contributions made by this sector, in 2000 Planning Commission was declared the nodal agency for Government Organization – Voluntary Organization interface".

Editor

Hazard Profile of India

G Padmanabhan

The approach to disaster management has been undergoing a change from a relief centric to more proactive approach encompassing all phases of disaster management without limiting it to relief

ACCORDING TO UNISDR, in the year 2010, India ranked second in the world for natural disasters after China. India's hazard profile is mainly determined by the geo-climatic settings and topographic features, and the underlying vulnerabilities result in annual disasters of varying degree. Climate induced hazards rank high in terms of frequency, impact and uncertainties of occurrence. This article tries to capture some of the challenges that India is facing in dealing with Climate induced Disaster Risk Reduction.

Hazard profile of India

About 59 percent of the land area is prone to earthquakes (MHA, 2011). The Himalayas and adjoining areas, north east, parts of Gujarat and Andaman Nicobar Islands are seismically the most active regions. Around 68 percent of the country is prone to drought of varying degress -38 percent receiving 750-1125 mm of rainfall, and 33 percent receiving less than 750 mm of rainfall. The drought prone areas are confined to peninsular and western India primarily arid, semi-arid, and sub humid regions (NIDM/DAC 2009). Out of 40 million hectares of flood prone area in the county, around 7.5 million hectares get affected every year by recurring floods. While flood occurs in almost all river basins in India, large parts of states such as Assam, Bihar, Gujarat, Uttar Pradesh and West Bengal gets affected almost every year. Approximately 71 percent (5300 kms) of the 7500 kms long coast of India are susceptible to cyclones. Andaman and Nicobar Islands, Andhra Pradesh, Orissa, Tamil Nadu, and Puducherry get affected periodically due to cyclones.

The following table shows the number of events recorded and the damage due to disasters during 1980-2010.

The author is Emergency Analyst, UNDP India, New Delhi. The views expressed are the author's personal.

Natural Disasters in India from 1980 – 2010	
No of events:	431
No of people killed:	143,039
Average killed per year:	4,614
No of people affected:	1,521,726,127
Average affected per year:	49,087,940
Economic Damage (US$ X 1,000):	48,063,830
Economic Damage per year (US$ X 1,000):	1,550,446

Source: Preventionweb

The above table shows the susceptibility of India in the context of natural hazard induced disasters and the high economic impact compared to other developing nations of the world. The direct losses from natural disasters have been estimated to amount to up to 2 percent of India's GDP and up to 12 percent of central government revenues (World Bank 2003 and 2009).

It also means that the developmental gains (economic, physical, social and environment) attained over several years are wiped out during the recurrent events. Disaster exposes the cumulative implications of many decisions some taken individually, others collectively and a few by default (World Bank and UN 2011). The impact on human beings disaggregated hazard wise reveal more about the damages being caused.

During 1967-2006, more than 52 percent of the disasters that occurred in India were due to floods, followed by cyclones (23 percent), and earthquakes and landslides accounting for 11 percent each. However, maximum number of casualties occurred due to earthquakes, followed by floods and cyclones. The data on people affected shows that maximum number of people is affected by droughts. The very nature of drought has long lasting effects.

Vulnerability of states

The only document that reflects the detailed hazard profile of the states in India is the Vulnerability Atlas prepared by the Building Materials and Technology Promotion Centre (BMTPC). The Atlas produced by BMTPC in 1997 was revised in 2006 with latest information available on various hazards. This Atlas also captures the physical vulnerability. States such as Uttar Pradesh may be highly flood prone, but not high on Cyclones. Given the complications in comparing states, the Working Group on Disaster Management for the 12th Five Year Plan has compared the data on various losses incurred due to disasters and rated the states.

"The states of Gujarat, Maharashtra, Andhra Pradesh, West Bengal, Karnataka and Bihar come under the top 10 states in case of human lives lost, cattle lost, houses damaged and crop area damaged. Andhra Pradesh, Rajasthan and West Bengal record the highest cattle loss due to disasters. Uttar Pradesh, Bihar, Karnataka and West Bengal account for maximum human lives lost, damage to houses and crop area as compared to other states. While the reasons for the vulnerability can be established only on the basis of further analysis these states fall in the high vulnerability category and need special attention" (12th Plan Working Group on DM).

Rapid growth of population along the hazard prone areas (especially in the coasts) and other developments have increased the level of exposure to hazards. These coupled with the physical, economic, social and environmental vulnerabilities have resulted in much of these hazards getting converted into disasters that end up in massive loss if lives and properties. Accordingly, the cost due to direct impact of the disasters is very high. In addition, the Governments and other development partners have been spending enormous amount

Disaster Risk Statistics (1967 -2006)				
Disaster Type	**No. /Year**	**Distribution %**	**Casualties/ Year**	**Avg, affected Population/ Yr in Million**
Earthquake	0.88	11	2,672	0
Flood	4.05	52	1,308	18
Drought	0.20	3	8	24
Landslide	0.88	11	104	0
Cyclone	1.83	23	1,219	2

Source: Financing disaster management, NIDM 2009

Losses during 2005-2006 to 2009-2010								
Human Lives			Cattle		Houses		Crop Area	
Sl No.	Top 10 states	No.	Top 10 states	No.	Top 10 states	No.	Top 10 states	Lakh Ha
1	Himachal	379	Assam	11659	Gujarat	221664	Orissa	12.36
2	Uttarakhand	488	Himachal	13551	Rajasthan	269252	Gujarat	12.85
3	Maharashtra	749	Gujarat	19365	Orissa	475618	Rajasthan	17.36
4	Kerala	763	Bihar	20474	Assam	493228	Bihar	21.37
5	Andhra	770	Karnataka	23020	UttarPradesh	517198	Maharashtra	21.52
6	West Bengal	921	Arunachal	28409	Maharashtra	723325	UttarPradesh	22.87
7	Karnataka	990	Maharashtra	46586	Andhra	857027	Tamil nadu	23.34
8	Gujarat	1199	West Bengal	47526	Bihar	1089676	Andhra	29.21
9	Bihar	1684	Rajasthan	50894	Karnataka	1134080	West Bengal	31.38
10	Uttar Pradesh	2763	Andhra	481960	West Bengal	2096665	Karnataka	32.46
	Others	2340	Others	42668	Others	921314	Others	34.43
	Total	13046	Total	786112	Total	8799047	Total	259.15

on relief and rescue operations as well as in paying compensation for the loss of lives and property.

Data on the expenditure incurred for relief and rescue operations is limited to Government sources; sometimes for specific events. Government has two sources to support the households that have lost people. These are the Prime Minister's and Chief Minister's Relief Fund. In addition, the Calamity Relief Fund (CRF), now called the State Disaster Response Fund (SDRF) is used to meet the expenses related to relief and rescue operations. Some of the repair costs are also met out this source, which is basically an agreed allocation where the state has to contribute 25 percent and the remaining would be given by the Central; Government Some states such as J&K and NE states have a different break-up. Data on the utilisation of SDRF is not a good measure to capture the nature of problems in the states.

When the disaster affected state Governments are not in a position to meet the expenditure with the SDRF allocation, they submit a memorandum outlining the damages incurred and seek central government assistance through the National Calamity Contingency Fund (NCCF), now called the National Disaster Response Fund (NDRF). The central Government would release the funds based on the recommendations of the Central Team that would visit the affected areas in the states. The release of funds would reflect the extent of dependence on external funds to cope with the event. While this need not reflect the reconstruction requirements fully, in the absence of any scientific assessment of the damages and requirements for reconstruction, the NDRF funds released to various states reflect the vulnerability of the states. NDRF data over the last six years has been taken to rank the top 10 states that have received support after disasters of different magnitude.

NDRF release over the last six years shows that states such as Karnataka, Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh, Bihar, Rajasthan, West Bengal, Uttar Pradesh and Assam accounted for 85.7 percent of the funds released.

Institutional and legal mechanisms

The National Disaster Management Act (2005) was passed in 2005. Apart from stipulating an institutional mechanism to carry out various disaster management functions at the national, state, districts and local levels, it mentions the measures to be taken up by various Government departments/ agencies/Ministries for disaster

mitigation and prevention.

In line with the Act the Government constituted a National Disaster Management Authority (NDMA) in 2005 at the national level and State and District Disasters Management Authorities (SDMAs and DDMAs) have been set up by the respective state Governments. In addition to these, the Government has established specialized forces to respond the disasters, set up a National Institute of Disaster Management to undertake training and research and has established mechanisms to provide funds for response/relief. It has also outlined the need for establishing funds for undertaking various mitigation measures. The approach to disaster management has been undergoing a change from a relief centric to more proactive approach encompassing all phases of disaster management without limiting it to relief. The Finance Ministry has issued orders to ensure that all new development project seeking clearances should be screened from disaster management point of view and a certification that the project doesn't increase vulnerability has to be issued.

Notwithstanding the above, the country has several challenges in dealing with disasters across the states. Most recurring disasters are caused due to hydro-meteorological hazards, which incidentally have been increasing in number and intensity (extreme in nature). The current level of preparedness in the most hazard prone areas is not adequate to deal with such extreme events which deviate from the earlier pattern. Such deviations in pattern are not just limited to intensity or distribution over time, but the occurrence itself is happening in new areas. Example: Barmer, which is acknowledged as a perennial drought affected area has been witnessing floods.

The climate variability and manifestations of it in the changing hazard scenario across the country is adding whole lot of new dimensions to the existing stock of challenges. If the climate induced hazards continue the exhibit uncertainties in the form of extreme events and occurrence at unexpected timings, it would definitely alter the hazard profile but its impact on various sectors would have manifold manifestations. An illustration is given below:

- Infectious, respiratory and water-borne diseases as well as impact of extreme heat and cold wave conditions would affect the public health in a major way. Even in cities that have reportedly controlled vehicular emissions, the incidence of respiratory diseases is on the rise.
- Uncertainties regarding availability of water would affect the agricultural productivity, yields, demand for irrigation, and pest infestations will be an added challenge.
- Fluctuations in the quantity of water available would affect extraction of ground water to offset the demand supply gap. This would affect the quality and increase the problems associated with water table depletion. Quality of water would also get affected as sources of drinking water are prone to contamination during floods.
- Extreme events would put lot of stress on the existing drainage system in the cities. The Mumbai flood in 2005 and floods in Hyderabad, Bangalore and Chennai are all examples of how the existing infrastructure could not handle the runoff.

Given the above scenario and given the trajectory of growth which would witness rapid development of urban areas, the approach to Disaster Risk Reduction need to have specific focus on climate induced hazards.

The impact of climate variability is redefining the hazard profile of many states in India. The Government of India is trying to address the Climate Changes challenges through the National and State Climate Change Action Plans, and systems are being

NDRF Funds Release (in Rs Crores)

Average per year during 1995-1996 to 2009-2010

Sl No	States	Rs Crores	Sl No	States	Rs Crores
1	Assam	98.74	7	Maharashtra	332.65
2	Uttar Pradesh	140.14	8	Gujarat	456.15
3	West Bengal	181.97	9	Tamilnadu	494.67
4	Rajasthan	281.49	10	Karnataka	517.04
5	Bihar	314.04		Others	523.66
6	Andhra Pradesh	332.44		**Total**	**3672.66**

strengthened to deal with these changes. However, the linkages with Disaster Risk Reduction which by itself needs major changes would be required.

Challenges

- While the Government has systems to deal with response, and capacities for it are being strengthened, the country needs many more Disaster Management professionals to address mitigation and prevention. The capacity to develop this human skill is grossly inadequate in the Government sector and outside, including academic institutions.
- We have an enabling environment in the country in terms of Institutional structure (of course it needs improvement), policies, Acts and guidelines. The Disaster Management Authorities in many states are still not operational. The State Action Plan fort Climate Change is still being prepared by most of the states.
- While the Finance Ministry (Government of India) has issued orders to screen all new projects from a disaster risk reduction angle, as a pre-condition for approval, most of the functionaries responsible for certifying do not have adequate skills to do that.
- One of the major requirements to reduce risk is a good understanding of risk. All State Governments are not familiar with the methodology to undertake detailed risk assessment and there is very little capacity in the Government to undertake these.
- Disaster Risk Reduction (DRR)has to be seen as development issue. Though the Five Year Plans (10th and 11th) have clearly articulated the need to look at disaster management as a development issue, in practice it is not happening.
- The approach to conceptualize Climate Risk Management as a development problems needs to be underscored and capacities for it built. Specific focus is required on sectors such as agriculture, food security, water resources, infrastructure and health. The concerned departments dealing with these sectors will have mainstream disaster risk reduction in their sectoral development initiatives. Efforts are also required to integrate DRR in the on-going programmes.
- The Human Resources Development will have to be made systematic. Mere training alone is not enough to develop the capacities. The trainers and trainees will have to be selected systematically and there should be provisions for refresher training and utilization of the trained personal. In addition there should be a enabling environment to facilitate the mainstreaming of DRR and tools and methodologies developed.
- Many of the traditional knowledge in dealing with extreme events have either forgotten or not practiced. Many of these can be revived and with scientific inputs the effectiveness can be strengthened.
- The system for early warning in the country works fairly well upto to the district level. Alerting the communities about imminent hazards is not poor. This will have to be strengthened further.
- The communities at risk will have to be empowered to deal with risk reduction. Community DM plans articulating clearly the roles and responsibilities as well as systematic manner in which various response, preparedness and mitigation functions have to be carried out will have to be put in place. Mockdrills to test the efficacy of these plans are also required.
- Disaster risk management cannot be seen as a function of one department in the Government. It has to be the responsibility of all departments and development partners. It is important to understand the existing vulnerabilities and possible risk that could happen due to extreme events and enhance the preparedness to meet the requirements. In addition to state and district plans every building and household should have DM plans and be prepared. The culture of prevention will have to be in the way of life, not out of compulsion or obligation. ❑

Saving the Girl Child

Santosh Kumar Mohapatra

The paramount need of hour is sensitizing society to look at a girl child as a `boon'. This is possible by ensuring women empowerment and also making women economically independent

INDIA MAY be second fastest growing economy of the world, but India`s exponential growth and rising importance in the world act as a smokescreen to the careworn status of women in the country. Millions of girls have to struggle with acute gender discrimination and distress as part of their every day experience. The existing patriarchal system leads to unequal status of women which render the latter vulnerable to exploitation, oppression, deprivation and destitution. The disparity and discrimination is also reflected in literacy, health, and development and working environment. The Census 2011 data reaffirms that girls have no place in India`s growth story. Atrocities are perpetrated and rights are trampled, but the highest form of violence against women is to deny life in womb because of gender, what is tragically known as massacre in womb.

Recently, a global perception survey has named India as the fourth most dangerous country in the world for women with high level female infanticide and sex trafficking being cited as the major reasons. Afghanistan tops the list of the five worst States followed by Democratic Republic of Congo and Pakistan. This is corroborated by UN Population Fund Report which says that up to 50 million girls are thought to be missing over the past century due to female infanticide and foeticide. The tragedy is that the Census 2011 data also portend the same bleak scenario. After falling continuously from 972 females per 1000 males in 1901 to 927 females per 1000 males in 1991, the overall sex ratio (number of females per 1000 males in the population) in India picked up marginally to 933 in 2001 and 940 in 2011 due to improved medical technology and education. But, what is most distressing is that the census data of 2011 showed a colossal drop in sex ratio among children in the age group of 0-6 years from 945 in 1991 to 927 in 2001 and further decline to 914 in 2011.This decline in juvenile sex ratio has been unabated since

The author is an Odisha based financial columnist.

1961 census and has touched nadir now.

The state-wise analysis shows a large discrepancy in trends. According to the Census 2011, child sex ratios in eight states and one Union Territory are less than 900. These are Delhi, Haryana, Punjab, Jammu and Kashmir, Chandigarh, Maharashtra, Rajasthan, Lakshadweep and Uttarakhand. And ratios in two states and one Union Territory- Meghalaya, Chhattisgarh and Andaman and Nicobar Islands- are above 970. In case of urban areas, the ratio is less than 900 in 13 states- Haryana, Punjab, Gujarat, Jammu and Kashmir, Uttarakhand, Chandigarh, Delhi, Rajasthan, Himachal Pradesh, Dadra and Nagar Haveli, Uttar Pradesh, Maharashtra and Madhya Pradesh. And it is above 970 in only Mizoram and Nagaland. However, in most states both rural and urban areas have seen lower child sex ratios in 2011. Though, overall, the urban child sex ratio at 902 is worse than the rural ratio of 919, the latter has witnessed the ratio decline by 15 points over the last decade compared to the fall of four points in urban areas. While only Punjab, Haryana, Himachal Pradesh, Gujarat, Tamil Nadu, Mizoram and Andaman and Nicobar Islands have recorded an increasing trend in juvenile sex ratio, the remaining 27 states and Union territories showed declining trend.

However, among these 27 states and Union territories, Lakshadweep, Pondicherry, Assam, Karnataka, Kerala and Nagaland present a mixed picture with only urban areas showing an improvement. On the other hand, in Daman and Diu and Arunachal Pradesh, only rural areas have seen a rise in the child sex ratios. The precipitous decline in the rural child sex ratio over the last decade was recorded in Lakshadweep-a fall of 111 points. This followed by Jammu and Kashmir where the ratio fell by 97 points. Dadra and Nagar Haveli, Delhi, Nagaland and Maharashtra registered a fall in the rural child sex ratio by more than 35 points. A positive glint came from Punjab, which has seen the highest rise in the rural child sex ratio by 44 points. However, despite this jump, Punjab has the third lowest rural child sex ratio. In a normal society where discrimination against women does not exist, the juvenile sex ratio is expected to be higher than the sex ratio at birth as female babies have better chances of survival than male babies.

Our constitution guarantees women equality of opportunity and wage and disallows gender bias, but our society intractably continues to be slave to son preference with the wrong notion that male child is a source of bread earing and security in twilight year and female child is an economic liability. The prevalence of dowry system exacerbates the situation. As a result, the birth of male child is greeted with jubilation and that of daughter with derision. This concept leads to gender discrimination, less care for girl child in the neo-natal and infancy stage which results in to female foeticide and infanticide. Despite laws and Pre-Natal Diagnostic Techniques (PNDT) Act, 1994, female foeticide continues to thrive in aid of unscrupulous elements.

This declining child sex ratio is a harsh reminder of India`s enduring hatred for the girl child. While addressing an international symposium on women and child empowerment, President Pratibha Patil expressed 'shock' over the sex ratio figures in the 2011 Census which she said were the lowest after independence. There exists a diabolical link between urban prosperity and gender prejudice. More the people prosperous, educated more the extermination of female fetuses in womb as they are better equipped to indulge in such abominable crime. The macabre fact is that in India around one crore girls vanish every year through foeticide or other form of killing. Out of which more than five lakhs female fetuses are killed, aborted every year. It is a matter of compunction that about 12 million girls are born in India every year, a third of them die in the first year of their life and about three million don't survive past their fifteenth birthday. Hence, the gender bias yet again draws attention to lingering societal flaws and fetters that economic growth is not being able to correct and requires efforts by government and Civil Society for its women to ensure an equitable society.

With its sex ratio dismally skewed towards males, changing India`s ingrained gender bias against the girl child requires determined effort within communities. Female foeticide–a heinous crime with concomitant neglect of girls should be tamed; otherwise it will trigger catastrophic demographic consequences. Deterrent punishment should be inflicted on those who indulge in all kinds of culpable acts of foeticide and infanticide etc. Every person should come forward to eradicate this social evil and ensure equal status for women in all spheres of life. The paramount need of hour is sensitizing society to look at a girl child as a `boon'. This is possible by ensuring women empowerment and also making women economically independent. Better education, health services, nutritious food for mother and infant and self-employment of women will go long way to ensure empowerment of women. We need to change our mind-set to help create a safer and better tomorrow for the girl child. ❑

Disaster Risk Reduction Techniques for Effective Poverty Eradication

L Mohamed Mansoor

The World Bank in its report on "Managing Disaster Risk in Emerging Economies" stated that the major development imperative was to reduce disasters in order to reduce poverty

UNTIL RECENTLY, poverty reduction initiatives and disaster risk reduction initiatives were undertaken independently and mutually exclusive of each other. However, due to growing realization of the observed linkages between poverty eradication and disaster risk reduction there is a growing need to study the effects of disaster risk reduction techniques and strategies on poverty alleviation. The World Bank in its report on "Managing Disaster Risk in Emerging Economies" stated that the major development imperative was to reduce disasters in order to reduce poverty. It reaffirmed in categorical terms that "Development and vulnerability to disasters are closely linked" (Edited by Arnold M and Kriemer A: 2000). Further, in the year 2004, United Kingdom's Department for International Development (DFID) made explicit links between disasters, development and poverty. It concluded that "sustainable poverty reduction is proving to be an elusive goal and this is particularly because disasters are not being properly factored into development, DFID 2004-06).

Initially reducing poverty was seen more as supplementing growth with social spending and was based on monetary measures alone. Whereas, disasters were treated as one-off events responded by Government and Relief Agencies. However, now poverty is measured in terms of human poverty indicators such as lack of access to resources necessary to sustain the basic human capabilities and disaster management is now expressed in terms of hazard assessment, vulnerability analysis and disaster risk reduction.

The author is Joint Secretary, Higher Education, Govt. of Puducherry.

Therefore, we see a paradigm shift in both poverty alleviation concepts and disaster management concepts.

Natural disasters cause immense loss of life and damage to property wherever it occurs. Be it earthquake, cyclone, flood flash, drought, storm surge or Tsunami the hazard level is equal to all sections of humanity. However, the vulnerability or the extent of exposure for communities or sections of society differs. The poor and the marginalized sections of the society, by virtue of their poverty are much more affected by the vagaries of nature's fury than the normal populace. There are various concerted efforts taken by the Government for eradicating / alleviating poverty. Every year, the Government of India, through the Ministry of Rural Development spends enormous amount of money for eradicating poverty.

Year after year, the programmes continue and yet eradicating or alleviating poverty seems to be a distant reality. The reasons for this is the fact that natural disasters have also become more common than ever before and climate change becoming near constant. Unpredictable hydro-metrological disasters are striking with impunity at regular intervals of time. The victims of all these disasters are pre-dominantly poor and the marginalized sections of the society. Because of the impact of the disasters, they lose their houses, lose their standing crops (livelihood), lose their cattle and become indebted, thereby pushing them back into the vicious circle of poverty. Therefore, it is quite clear that the poor and the marginalized sections of the society are the worst sufferers due to any kind of disasters.

This paper proposes to advocate the adoption of Disaster Risk Reduction (DRR) Strategies in the Programmes and Schemes aimed at poverty alleviation by the Ministry of Rural Development.

Incorporating Disaster Risk Reduction measures in Rural Poverty Alleviation Programmes can effectively help in reduction/ eradication of poverty in rural India. The Disaster Risk Reduction measures to be incorporated into the programmes and schemes of the Government include Structural and Non-Structural measures. Non-Structural measures can be further categorized as Risk Avoidance Measure and Risk Spreading Measure.

Risk Avoidance Measure: Discourage location of settlements, infrastructure and economic activities in known hazardous areas by the (i) Land use Regulation/ Ordinance (ii) Financial Incentives or Penalties (iii) Disclosure of Risk Information, (iv) Public Infrastructure Policy (v) Natural Resource Management Policy.

Risk Spreading Measures: The Risk Spreading Measures are (i) Property damage and revenue loss insurance (ii) Crop diversification (iii) Redundancy in lifeline systems

Vulnerability Reduction Measures (Structural Measures): Physical measures designed to enhance Natural Hazard impacts by retrofitting of existing structures, use of appropriate building standards, reducing hazard proneness of the site (dams, retaining walls, wind breaks). Particularly, the schemes operated by the Ministry of Rural Development can be classified into Self Employment Programme (SGSY, NRLM), Wage Employment Programme (MNREGA), Housing Programme (IAY, PMGY), Rural Roads and Connectivity (PMGSY), and Area Development Programme (DPAP, DAP) and Rural Sanitation Campaign.

In India, Poverty reduction/ Poverty Alleviation Programmes in rural areas have been operated through the Ministry of Rural Development. The Self Employment Programme of SGSY is modeled on Self Help Group (SHG) concept, whereby 10-15 poor women form a Group and are exposed to thrift and credit activity from among the savings generated by each member. Later, based on the performances of the thrift and credit operations and discipline of the Group, they are extended back-ended subsidy for starting of Small and Medium Enterprises (SME) in which ideally the whole Group undertakes a common activity like milch cattle rearing, goat/sheep rearing, poultry farming, crop cultivation, fishery, tailoring, petty shop and other Self Employment initiatives. Basically, the Self Employment Programme of SGSY is a micro- credit programme with avenues for large scale replication

and convergence of backward and forward linkages among various activities of different Groups. Every group is linked to the Bank thereby ensuring financial inclusion for the poor and marginalized. Most of the SHGs have milch/cattle rearing, mixed farming, tailoring, petty shop business etc. where asset creation is implied in the enterprises. The key activities is so chosen that net monthly income is more than Rs. 2,000 per month per individual beneficiary. Apart from this, the Groups have access to their own savings as well as matching revolving fund given by the Bank/Government. Therefore, linkage with the bank for much needed capital and liquidity in the form of assets are provided for in this program. Therefore, in the event of any calamity, if there is damage to the assets for eg. Milch/ cattle death due to flood or cyclone, micro-insurance is provided for within the project before approval by the bank / BDO for release of loan/subsidy for micro enterprise. If the asset is of other category, provision for micro insurance is not normally made thereby exposing the assets to the risks of hazards. For assets like petty shop, tailoring, pickle and puppad making, insuring of assets is not being carried out which exposes the assets to the vagaries of nature. During flood or cyclone, the activity part of the micro enterprises may be affected/ disrupted like the death of the cow or sheep or goat or poultry or in case of farming or cultivation, crops may be submerged since the crop is normally not insured, the damage caused on account of the flood or heavy rain is a set back for the whole Group. But however, the micro credit available in the form of Group Corpus comes in handy during such periods of distress. The members of the Group use Group Corpus or if required revolving fund credit to tide over the uncertainties arising out of loss of assets or damage to assets which hinder flow of monthly income from the small and medium enterprises.

Therefore, the presence of micro financing/micro credit in the Self Employment Programme is a great tool of mitigation already available under the Scheme but not yet put to maximum use. If all the assets of key activities/SMEs undertaken by the SHGs are insured like crop insurance, cattle insurance or some risk transfer mechanism is evolved using the Group Corpus which is already operated out of a Bank account, then post-disaster reconstruction of the asset will be made easier and the poor and marginalized women can get back to business and earn their livelihood without losing much time.

The major scheme operated under Wage Employment Scheme is Mahatma Gandhi National Rural Employment Generation Act (MNREGA). The objective of the Act is to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. Unlike other Poverty Alleviation Programmes, MNREGA is an Act of Parliament which guarantees 100 days wage employment to every house-hold. All adult members of the rural household willing to do unskilled manual work may apply to the Gram Panchayat which will issue a job card. Employment will be given within 15 day of application for work. If work is not provided within 15 days of application, then daily unemployment allowance has to be paid by the concerned State. Wages are to be paid according to the Minimum Wages Act for agricultural labourers in the State. Work should ordinarily be provided within five kilometre radius of the village of the beneficiary.

The Wage Employment Programme is the single most important daily wage programme which guarantees wages for meting out day to day essential expenses of the family. As seen from the list of works permissible under MNREGA, most of the works pertain to soil and water shed management, minor irrigation works and flood control initiatives. Therefore, the list of eligible works clearly shows that MNREGA attempts to create assets which are helpful in mitigating natural disasters like drought, flood, cyclone etc. However, the emphasis of the programme is more on 'asset creation' rather than on processes of 'mitigation'. Works like de-silting of ponds, tanks and irrigation channels are being routinely done annually under this programme. Though, there may be many such ponds, tanks and channels which require to be de-silted, the identification of ponds/tanks/channels is mostly

driven by convenience rather than by water shed approach. If these works are selected / identified on the basis of water shed approach, then for flood management, the very same works could become mitigation efforts like the de-silted sand from a channel should be used to create contour on the banks of the channel thereby strengthening and consolidating bunds against overtopping.

Mitigation works for drought management should also be included in the list of works taken by the Gram Panchayat annually. Works like rejuvenation of water sheds, creation of rain water harvesting structures, creation of earthen check dams to prevent run off of excess rain water, creation of percolation ponds.

Most of the Below Poverty Line families are marginal farmers, agricultural labourers or tenants cultivating the land of the land lord for one third of the produce. In the event of heavy rain/flood/ drought and cyclone, crop loss is a major factor which affects the income generating potential of the poor farmers. An agricultural labour who does manual work in the field of other farmers do not have work when heavy rain or floods occur. Similarly, the marginal farmers who has small piece of land is unable to cultivate owing to flooding and unsuitable conditions for cultivation. The plight of the tenant farmer is even more pathetic. He spends out of his pocket to develop the land of the land owner by ploughing and manuring the field and due to the onslaught of the rains and flood, he loses his crop. The same is the case where due to inadequate rain and failed irrigation initiatives drought like situation emerges, where again he encounters crop loss.

Therefore, as seen from the impact of the natural calamities like flood, cyclone, heavy rain and drought, agricultural sector of the rural economy is seriously disrupted, thus making the constituent members viz. marginal farmers, agricultural laborers and tenant cultivators lose their livelihood and thereby putting their food security at risk. Under the MNREGA 'Land Development' is a category in the permitted list of works, but rarely is it being taken up. Under 'Land Development' works like tilling, ploughing, field bunding, contouring of individual fields with better gradient for drainage facilities should be allowed to be taken up by the concerned marginal farmers himself in his own field to ensure that water stagnation or flooding does not occur in his paddy field. If this activity is carried out by the respective farmers in their own fields during the summer months, there can be no better mitigation measure carried out by the beneficiary themselves fully aware of the benefits of their work and the consequences of not having carried it out before the on set of rain/cyclone/drought.

Under the housing category, Indira Awas Yojana, PMGY Credit Linked Subsidy Scheme are some of the Housing Schemes available for Below Poverty Line families. The financial assistance is given to the beneficiaries in the form of installments according to the progress of the work. This scheme is a beneficiary oriented scheme in which the beneficiary himself would be required to engage in the construction of his house. An amount of Rs. 45,000/- is provided to the beneficiary in four installments to ensure the completion of the house. This amount is inadequate for the construction. Therefore, the beneficiary normally either raise loan from other sources or mortgages movable/immovable assets for raising additional amount. As it is seen, there is no type design or standard plan for building a house under this scheme and is mostly left to the wisdom of the individual beneficiaries. Though the amount of Rs.45,000/- provided is not adequate to cover the cost of construction, it is expected that the beneficiary has to factor in his skilled and unskilled labour of his family and also spend out of his other earnings /assets to complete the house. As it is seen from the guidelines of the Scheme, effort is made to get a decent shelter for the poor without much restrictions/ requirements regarding the type or nature of construction.

Now, let us discuss the various DRR initiatives which can be incorporated in the Poverty Alleviation Programmes which can make them disaster proof.

It is an established fact that during most disasters, the houses are damaged either partially or fully and the poor families are forced to live in relief shelters. Depending upon the type of the natural calamity/

disasters, severity of the damage to the houses is also related to the type of the dwelling unit/houses. According to the Census details available, rural houses can be categorized into (1) Kucha super structure-kucha roof (2) Pucca super structure-kucha roof (3) Pucca super structure- pucca roof, which can be broadly identified as thatched house, earthen wall-thatched roof house, earthen wall-tiled roof house, masonry wall-thatched roof, masonry wall-tiled roof, masonry wall-sheeted roof and masonry wall RCC roof.

If an earthquake occurs, all these categories of houses may be subjected to destruction/damage, whereas, during cyclone, the roofing in hut, tiled and sheeted houses will be damaged. In flash floods, the earthen walls and thatched super structured houses will be affected.

Therefore, the DRR initiatives in the form of simple framed structure when, earth quake resistant design is incorporated in the type design of the IAY/ PMGY housing schemes, the threat posed by earthquake, cyclone, flash flood, storm surges can be successfully over come. Also, the concept /practice of insuring the houses could be made mandatory to ensure replacement in case of destruction/damage.

Incorporating earthquake proof or earthquake resistant design into the plan and execution of a residential house by the poor and marginalized sections of the society is a tall order. However, there can be found simpler methods and processes for adopting the disaster proof design in constructing a typical cost effective shelter for the poor which can withstand the fury of annual calamities. As we are aware, severe cyclonic storms and flash floods are more or less becoming annual features which cause minimal to severe damages to households. Disasters of lesser intensity like gale winds and heavy rain may cause partial damages to the house like roof being torn away or earthen walls collapsing, etc. may require the poor to spend out of his hard earned wages to repair and restore the partial damage. As this continues to be a recurring phenomena, much earned savings are annually channeled toward restoration of the damage to his shelter. ❑

Climate Change and Disaster Management in Coastal Areas

V Selvam

However, in order to develop and sustain effective coastal bioshields active participation of the local community and local self government is necessary

THE LIVELIHOOD security of the coastal communities and ecological security of the coastal zones of India is already under stress due to high population density, rapid urbanization and industrial development, high rate of coastal environmental degradation and frequent occurrence of natural disasters such as cyclones and storms. This made more than 100 million people, who directly or indirectly depend on coastal natural resources for their livelihood, vulnerable. The problem is going to be further aggravated by increase in sea level rise due to climate change. It has been projected that along the Indian coast sea level would rise by 39 to 57 cm by 2050 and 78 to 114 cm by 2100 due to climate change (Unnikrishnan *et al*, 2006). The coastal zone in India, particularly the east coast is vulnerable to hydrometeorological hazards such as cyclones, floods and geophysical hazards like tsunami. Meteorological data show that more than 1000 cyclonic disturbances occurred in the Bay of Bengal during the last century; out of which over 500 were either depressions and over 400 were either cyclonic storms or severe cyclonic storms. Out of 205 severe cyclones for which records are well documented, 55 affected the coastal zone of Tamil Nadu, 59 crossed the coastal areas of Andhra Pradesh, 58 hit Orissa coast and 33 struck West Bengal. Depending on the location, the risk of hydrometeorological hazards ranges from moderate to high and that of geophysical hazards from low to moderate. A recent simulation study showed an increase in occurrence of cyclones in the Bay of Bengal in the increased Green House Gas scenario, particularly in the post-monsoon period. The same study also indicated that wind speeds associated with cyclones will also reach maximum increased due to climate change (Unnikrishnan *et al*, 2006).

The author is Director, Coastal Systems Research, M.S. Swaminathan Research Foundation, Chennai.

Combined with growing population, a large section of which remains dependent on agriculture and fishing, the east coast of India is categorized as moderate to high disaster risk region. These natural hazards cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption and severe environmental damage. However, it has been reported that in areas where coastal zone is characterized by the presence of coastal tree vegetation such as mangrove and non-mangrove forest and sand dunes with vegetation, loss of life and damage to property and environment due to cyclonic disturbances and tsunami is relatively less. These coastal tree vegetations along with sand dunes are called as coastal bioshields. Considering the effectiveness of bioshield the National Disaster Management Authority of Indian recommended raising mangrove and non-mangrove bioshield as an important measure in cyclone and tsunami management (NDMA, 2008)

Effectiveness of coastal bioshields in reducing the impact of natural disasters

For a long time, local communities living around mangroves and other coastal vegetation have been aware of the effectiveness of this vegetation as shields against cyclones, storm surges and tsunami. For example, the people of Tamil Nadu state, have been calling mangrove forest as "*aalayaathi kaadu*" for thousands of years ("A*alai"* means waves and "*aathi"* means mitigate and "*kaadu"* means forest). This traditional wisdom is supported by experimental studies in the field and laboratory. Theoretical studies on wave forces and modelling of fluid dynamics suggest that tree vegetation may shield coastlines form tsunami damage by reducing wave amplitude and energy. Analytical models show that 30 trees - either mangrove or non-mangrove - per 100 m^2 in a 100 m wide may reduce the tsunami flow pressure by more than 90% (Hiraishi *et al*, 2003). Effectiveness of a coastal forest in mitigating the impact of natural hazards depends on the width, density and structure of the forest and the tree characteristics (height and diameter at breast height). A study indicates that for a tsunami wave height of 3 m, the effective forest width – mangrove or non-mangrove - is about 20 m and for 6 m high tsunami wave the effective width of forest is about 100 m. It has also been estimated that trees with 10 cm diameter at breast height is effective against 4.6 m tsunami waves and 35 cm diameter for 7 m **(** FAO, 2006). However, empirical and field based evidences were not available for long time. The super cyclone of Orissa in October 1999 and tsunami in December 2004 provided opportunities to collect field based evidences on the role of coastal vegetation in reducing the impact of such natural disasters.

Mangroves and Super Cyclone

A super cyclone with wind speed of about 258 km per hour struck the coastal areas of Orissa on 29th October 1999 causing extensive damage to life and properties. Immediately after the super cyclone, a study was conducted to evaluate the extent of damage caused in areas that were under the umbrella of Bhitarkanika mangrove forest and areas that were not sheltered by mangroves (Badola. and Hussain, 2005). Three villages with three different physical settings, i) a village within the shadow of mangrove forest, ii) a village which is not in the shadow of mangroves and also not protected by embankment that is constructed to avoid seawater intrusion and iii) a village not protected by mangroves but protected by embankment was selected for the study. All these three villages were located at equidistance from the sea and the socio-economic conditions were also same. Eleven variables such as the cyclone damage to houses, livestock, fisheries, trees and other assets owned by the people and the level and duration of flooding etc were used to compare the damage in these three villages. In the mangrove protected villages, variables had the lowest values for adverse factors such as damage to houses. The economic loss incurred per household was higher in the village that was not protected by mangroves but had an embankment. Attitude survey conducted among the people of the villages nearby the Bhitarkanika areas showed that they were aware of the role played by the mangroves in protecting their lives and properties during the super cyclone and also appreciated the protective functions performed by the mangroves.

Mangrove and Non-mangrove Bioshield and Tsunami

Similarly, after 26th December 2004 tsunami the role of mangroves and other coastal vegetation in mitigating the impact of tsunami was evaluated scientifically following two kinds of approach.

Approach 1: In the first approach tsunami mitigating role of coastal vegetation was studied at macro level using pre and post tsunami high resolution remote sensing imageries. This study was carried

out in the southern part of Cuddalore district and northern portion of Nagapattinam district, which were the worst affected areas of 2004 tsunami. The coastal vegetation of southern Cuddalore district consists mainly of mangroves (Pichavaram) whereas Nagapattinam study area is characterized by the presence of large casuarina shelterbelt (non-mangrove bioshield) plantations raised by the Tamil Nadu Forest Department since 1970s. The total length of the coast covered in this study was about 20 km and the land up to 1 km from the shoreline was taken up for the assessment. The height of the tsunami that hit these coastal areas was about 4.5m. Using Quick Bird satellite imagery of May 2003 (pre-tsunami), the study area was divided into three categories namely, i) dense tree vegetation, ii) open tree vegetation and iii) no tree vegetation. Mangrove forest with dense trees and thick casuarina shelterbelt areas were included in the dense tree vegetation category. All other woody vegetation, including degraded mangroves and gaps in plantations, were considered open vegetation. For post-tsunami damage assessment, IKONOS satellite imageries of December 29, 2004 (3 days after the tsunami) were used. Damages due to tsunami were divided into three categories namely, i) damaged (areas where all or most of the physical structures had been destroyed, removed or damaged), ii) partially damaged (some damage but most of the physical structures remain intact) and iii) undamaged (no damage visible on the ground or in the satellite imageries). A comparison was then made between the tree vegetation categories and the tsunami damage using chi-square tests. The results showed that within 1 km from the shore, there was statistically significant correlation between tsunami-caused damage categories and different tree vegetation densities: ($\chi_4^2 = 5.15 \times 10^2$, $P<0.01$), in particular, dense trees vegetation associated with undamaged areas and dissociated with damaged areas (Danielsen *et al*, 2005).

Approach 2: In this approach, two pairs of villages, one pair in mangrove situation and another pair in shelterbelt (non-mangrove vegetation) plantation area, were selected for the study. These villages were located more or less equidistance from the sea and at similar elevation. However, one village is protected by vegetation - either mangrove or shelterbelt - and another village is unprotected by such vegetation. Impact of tsunami on the villages is related to loss of lives, damages to houses and household properties, loss of boats and nets, etc. Some of the damages, for example, loss of boats and nets mostly happened in the boatyards and neither mangroves nor any other coastal vegetation cover these boatyards. Hence, loss of boats and nets was common to both protected and unprotected villages and thus, could not be taken as an indicator to assess if mangroves and shelterbelts lessened the impact of tsunami. Such a kind of misunderstanding was also encountered when total loss of human lives was taken as one of the indicators. Total loss of human lives in a village could not be considered as an indicator because some of them died while in the boatyards. Others lost their lives due to forceful entry of water into the villages. In order to solve these confusions and also to find out suitable indicators a series of discussions was held in the selected villages. On the basis of the inputs obtained the following indicators were selected: i) loss of lives within the village due to forceful entry of the tsunami waves, ii) number of houses damaged, either fully or partially and type of houses, iii) height of the water inundating the villages (identified as lines in the walls of the houses).

The results indicates that in the mangrove protected village of T.S.Pettai the loss of life and damage to houses was nil whereas in the mangrove-unprotected village namely, Muzhukkuthurai, 11 (2 percent) people died and 89 percent of the houses damaged due to forceful entry of tsunami water. In the case of casuarina shelterbelt plantation, 58 people died in the unprotected village and more than 50 percent of the houses were also damaged. In the shelterbelt protected village of Madavamedu, 13 people died and only 21 percent of the houses damaged (MSSRF, 2006).

Table 1 Distribution of tsunami damaged area with reference to tree vegetation cover (numbers in parenthesis indicate %)

Damage category/ tree cover	Damaged area (ha)	Partially damaged area (ha)	Undamaged area (ha)	Total (ha)
Dense tree vegetation	2.2 (0.5)	15.7 (3.5)	437.1 (96.1)	455.0
Open tree vegetation	30.9 (15.4)	84.4 (41.9)	86 (42.7)	201.3
No tree vegetation	502.9 (35.1)	384.2 (26.8)	547.0 (38.1)	1434.1

Issues relating to bioshield management

The experiences of the community during the tsunami and anecdotal evidences published in the media about the role of mangroves and non-mangrove coastal vegetation in reducing the impact of tsunami brought changes in the mindset of coastal communities and the attitude of government agencies towards raising mangrove and non-mangrove vegetation as bioshields along coastal areas. The fishing community, which is normally reluctant to participate in restoring, conserving, raising mangrove and other coastal vegetation programmes, now shows lot of interest in restoring degraded coastal vegetation as well as raising plantations in new areas. This is indicated by the demands of the fishing community to government agencies and non-governmental organizations for raising mangrove or other tree vegetation in suitable places around their villages. Similarly, administrators and planners are willing to allot large parcels of wasted lands including saline affected areas to the coastal community to raise tree plantations, either mangroves or non-mangroves trees, as a protective cover along the coastal areas as a part of disaster mitigation initiatives. Considering all these, the coastal bioshield movement was initiated in 2005 by M.S.Swaminathan Research Foundation, which was subsequently followed by other non-governmental agencies.

Before taking up large scale coastal bioshield activities a study was conducted by M.S.Swaminathan Research Foundation during 2005 to understand the various practices followed to raise and manage these plantations. The study was conducted in randomly selected areas covering the entire coast of Tamil Nadu. The study covered a) the species used to raise coastal shelterbelts, b) the techniques followed, c) the level of community participation in raising shelterbelts, d) the community initiatives in conserving sand dunes and associated coastal vegetations. The following are the major findings of this study.

Lack of ownership of biosheild

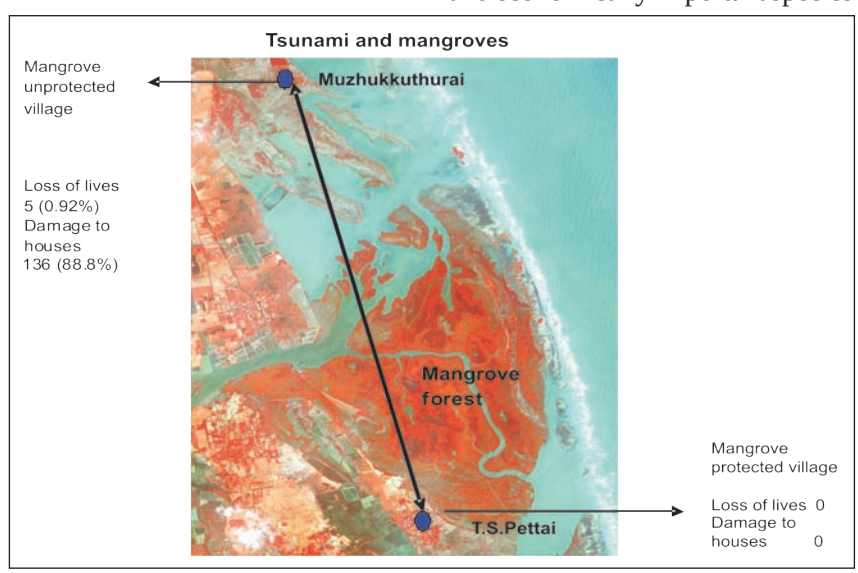
The state Forest Department is normally responsible to raise coastal vegetation including mangroves and non-mangroves (shelterbelts) and it used to raise these vegetations mostly in the lands owned by the Forest Department. After tsunami, mangrove and non-mangrove vegetations are being raised in non-forest lands, mostly in the lands owned by the Revenue Department. Since the plantation is being taken up in non-forest area ownership of these plantations is a big issue and because of this long-term sustainability of these plantations is not guaranteed. In order to solve this problem, local community and Panchayat Raj Institution (elected local government), which has a constitutional mandate of disaster management at village level, should be taken as lead partners in planning, implementing and monitoring bioshield programmes.

Tokenistic participation of community

In some areas though government agencies try to raise bioshield with the participation of the community but due to target-approach followed, participation of local community in these areas is only tokenistic. Secondly, in most of the areas Panachayat Raj Institutions are not at all taken into consideration in these programmes.

Single species non-mangrove shelterbelt

Almost all the shelterbelts raised by the government agencies consist of single or mono species namely *Casuarina equisetifolia*. The ecological impact of such shelterbelts is not known, but such single species shelterbelts do not address the issue of linking livelihood security of the coastal communities with ecological security of the coastal areas. Multispecies non-mangrove bioshield with a mixture of species which are native to the region and part of local landscape and economically important species



should be raised along the coastal areas.

Neglected sand dunes and associated vegetation

Small sand dunes with various kinds of vegetation are present all along the coast. A few of them are owned by individuals but a majority of them are common property, belonging to either the Panchayat or other government agencies. However, there is no system in place for the management of these coastal sand dunes. Conservation of these sand dunes with suitable sand binding and tree vegetation with the participation of the local community should be taken up as a priority issue because these dunes act as barriers against cyclones and tsunami and play a dominant role in water conservation in coastal areas where water scarcity is a recurrent feature during the summer season.

Casuarina shelterbelt and coastal ecology

Starting of casuarina plantation right from the high tide line is one of the serious concerns relating to shelterbelt plantation along the coastal areas. This may have serious implications on the ecology of the coastal areas and on wildlife.

a) Many of the sandy beaches are utilized by sea turtles as nesting grounds and it has been reported in many places that raising of casuarina very close to the sea prevented nesting by sea turtles.

b) Different species of crabs lives in different vertical zones near the high tide line and planting of casuarina close to high tide line would affect the niches of these crabs

c) Most importantly, sandy beach supplies sand to littoral current, which run parallel to the shoreline. This current system, in combination with wind-induced waves, takes away sand from one place and deposits it in another area. Since this process takes place simultaneously all along the coast, a balance is achieved between removal and supply of sand in a given place and this balance avoids sea erosion. If shelterbelt plantations are raised starting from the high tide line, than the supply of sand to the littoral current would be reduced or stopped (due to sand binding property of the plantation) and to compensate this, current and waves would remove large chunk of sand in other areas, leading to sea erosion in those areas. In order to avoid such problem a part of the beach from high tide line to landward portion should be left free.

Conclusion

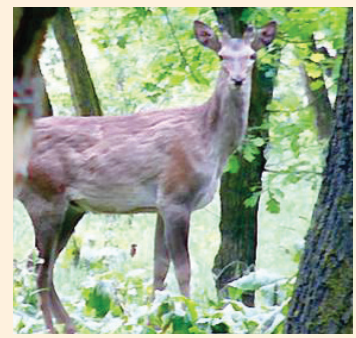
The role of coastal forests and man-made plantations in protecting coastal areas from tsunami and other natural hazards such as cyclones, storm surges was deliberated comprehensively in a technical workshop by Food and Agriculture Organization (FAO) in Bangkok in 2006. The workshop brought together the best available knowledge and experience to give a clear picture of the roles that forests and trees play in protection against hydrometeorological and geophysical hazards in the wider context of coastal planning and social, economic and environmental considerations. It also assessed the value of coastal vegetation compared to other commonly used hard (engineered) structures for coastal protection. The major findings in the workshop are:

- Forests and trees can act as bioshields that protect people and other assets against tsunamis and other coastal hazards but whether they are effective and the degree of their effectiveness depend on many variables. These variables include characteristics of the hazards itself, the features of the site such as bathymetry, geomorphology and the characteristic of the bioshield such as type of forest/tree, width, height, density etc.
- Care must be taken to avoid making generalizations and creating a false sense of security that bioshields will alone protect against all hazards;
- The use of bioshields should be considered within the framework of disaster management strategies, which also include effective early warning systems and evacuation plans.

Thus, both mangrove and non-mangrove vegetations can be part of any programme that tries to enhance resilience of the coastal community to natural disasters. However, in order to develop and sustain effective coastal bioshields active participation of the local community and local self government is necessary. Secondly, sustainability of the bioshield can be achieved only if the ecological security of the coastal zone and livelihood security of the coastal community is given concurrent attention. There is a need to develop and demonstrate models of mangrove bioshield integrated with fisheries and multispecies non-mangrove bioshield that has a mixture of ecologically and economically important species. ❑

J&K WINDOW

INITIATIVES TO PROTECT ENDANGERED SPECIES



According to survey conducted by wildlife department in Dachigam National Park to find out the total number of wild animals and the population of Hangul was registered 218, compared to 175 in previous survey of 2009.

The population of Hangul in Jammu and Kashmir has increased to 218. The Hangul or the Kashmir stag are a critically endangered species. The latest census carried out in the Dachigam National Park, have shown an encouraging trend in Hangul population.

Range Officer, Dachigam National Park said that increase in the population of Hangul is encouraging for his department. "We have a total of 218 Hangul species in the park. The number has increased this time compared to our earlier surveys. In 2009, the Hangul species were restricted to 175 only.

But the number has increased due to various measures taken by the department to protect the animal. Fortunately, the Hangul has been managing to survive in this critically endangered state for more than five decades. But, it is high time to save the species with some strict measurement.

The range officer admitted that the population of Hangul was significantly declining till couple of years ago. Till 2004, the population of Hangul was declining due to a number of reasons.

Their number was restricted to 145 only. But the department took a number of initiatives to increase the population of Hangul and save the precious species from human interference and also from wild animals, which helped the department to increase the number of Hangul in the national park.

Dachigam is the home of 20 mammal species including the Kashmir Hangul, snow leopared, and black bear and over 15 other species. The park coves an area of around 141 square kilometers and it ranges from south Kashmir Tral area to Dachigam in Srinagar. It is spread over Braine, Khanmoh, Chesmashahi, Wangath, Khrew, Dare Conservation Reserves. Surfrao, Akhal, Mammar, and Najwan which are adjoining the forest areas. ❑

RAIL LINK IN JAMMU AND KASHMIR

The Jammu and Kashmir government has said that Qazigund-Banihal and Udhampur-Katra railway tracks, connecting Kashmir with rest of the country through rail-line are likely to be completed by December. The Qazigund-Banihal and Udhampur-Katra railway tracks, being laid at an estimated cost of Rs 1,722 crore and Rs 928 crore respectively, are likely to be completed by December 2012.

About Rs 1.26 crore have been distributed among the affected people as compensation for land acquired while a compensation of Rs 42.24 crore has been distributed for land acquired under Udhampur-Katra railway track and Rs 10.7 crore distributed for land acquired under Jammu-Udhampur railway track. In Jammu district, a compensation of Rs 12 crore has been disbursed among the affected 9 villages under NHAI road projects while remaining 3 villages would be given the compensation soon. ❑