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MAINSTREAMING DISASTER RISK REDUCTION IN ENVIRONMENT SECTOR

Guidelines and Tools

nidm

National Institute of Disaster Management
(Ministry of Home Affairs, Govt. of India)

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Guidelines and Tools

Developed with support of the UNDP Disaster Risk Reduction Project

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Acknowledgement

(Dr. Anil K Gupta)

Abbreviations

ADB	Asian Development Bank
BCPR	Bureau of Crisis Prevention and Recovery
BDMSA	Banaskantha DWCRA Mahila SEWA Association
BMTPC	Building Material and Technology Promotion Council
CA	Climate Adaptation
CBDRM	Community-Based Disaster Risk Management
CBOs	Community-Based Organisations
CBSE	Central Board of Secondary Education
CC or DRR	Disaster Risk Reduction
CCA	Climate Change Adaptation
CCA/UNDAF	United Nations Development Assistance Framework
CCF	Climate Change Framework
CMG	Crisis Management Group
CO2	Carbon Dioxide
COBSE	Council of Boards of Secondary Education
COP	Conference of the Parties
CSE	Centre for Science and Environment
CZM	Coastal Zone Management
DADP	Desert-Area Development Programmes
DDP	Desert Development Programme
DFID	Department for International Development
DM	Disaster Management
DMI	Disaster Management Institute
DPAP	Drought Prone Area Development Programme
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EC	European Commission
ECC	Environmental Carrying Capacity
EcE	Economic-cum-Environmental
EIA	Environmental Impact Assessment
ERM	Environmental Resource Management
EU	European Union
EUR-OPA	European Commission
EWS	Early Warning Systems
FP7, FP6,	Framework Programme
GDP	Gross Domestic Product
GIS	Geographical Information System
GLOFs	Glacial Lake Outburst Floods
GOI	Government of India
HFA	Hyogo Framework for Action
HFA	Hyogo Framework for Action
IASC	Inter-Agency Standing Committee

IATF	United Nations Inter-Agency Task Force
IAY	Indira Awas Yojna
ICTs	Information and Communication Technologies
ICZM	Integrated Coastal Zone Management
IDNDR	International Decade for Natural Disaster Reduction
IMD	Indian Meteorological Department
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IRDP	Integrated Rural Development Programmes
ISDR	International Strategy for Disaster Reduction's
IUCN	International Union for Conservation of Nature
KCA	Kutch Craft Association
KEF	Kachchh Ecological Fund
MDGs	Millennium Development Goals
MHA	Ministry of Home Affairs
MoA	Ministry of Agriculture
NCA	National Climate Assessment
NCCP	National Cancer Control Programme
NCMC	National Crisis Management Committee
NDMA	National Disaster Management Authority
NGO	Non-Government Organization
NIDM	National Institute of Disaster Management
NOCs	No Objection Certificates
NPV	Net Present Value
NWDPRA	National Watershed Development Programme for Rainfed Areas
PDNA	Post-Disaster Needs Assessment
PPP	Public-Private Partnership
PPRR	Prevention, Preparedness, Response and Recovery
PRSPs	Poverty Reduction Strategy Papers
REA	Rapid Environmental Assessment
REIA	Regional Environmental Impact Assessment
RTO	Regional Transport Office
SAARC	South Asian Association for Regional Cooperation
SEA	Strategic Environmental Assessment
SEOC	State Emergency Operation Centre
SGRY	Sampooran Grameen Rojgar Yojna
SIDS	Small Island Developing States
SREX	Special Report on Managing Risk of Extreme Events
TDU	Technical Demonstration Unit
ToR	Terms of Reference
TOT	Trainee of Trainers
UK	United Kingdom
UN ISDR	United Nations International Strategy for Disaster Reduction
UNDP	United Nations Development Programme

UNDP/HFA	Hyogo Framework for Action
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children Emergency Fund
UNISDR	United Nations International Strategy for Disaster Reduction
USD	United States Dollar
USEPA	United States Environmental Protection Agency
WSSD	World Summit on Sustainable Development

Summary

The present global concerns and ongoing discourse on climate and disaster threats directly point towards the word "environment". Humanity and its rapid development processes are in direct conflict with the environment, often leading to disastrous consequences. Environment in itself is a very big sector that covers directly or indirectly all spheres of development and its related ecosystems, making it complex to relate development, environment and disasters. Environment is impacted mainly by two factors, natural activities and anthropogenic activities. Natural hazards are often uncontrollable, but their consequences on lives and property are usually avoidable through appropriate developmental and mitigating action. To be able to do this, a deep understanding of the cross-sector linkages is required, and the mainstreaming of disaster risk reduction in the development and environment fields is necessary. The present document is based on this approach and is an initial step towards building in resilience in the environment sector through the identification and development of appropriate tools.

The document, titled "Development of Tools for Mainstreaming DRR in Environment Sector", has been written with a build-up towards the need, identification and way forward for implementation of mainstreaming tools. The first chapter, "Background or Mainstreaming DRR", illustrates the term mainstreaming and uses it to describe the process of incorporating disaster risk reduction into humanitarian and development practice, and it also refers to the end result: where the fundamental elements of risk reduction are imbedded into normal development practice and fully institutionalised within a government's development agenda. The institutionalisation of DRR is meant to internalise and mainstream the concept in the government policy and programming; and all tiers of the government should recognise the need for involving other stakeholders, including communities, in disaster risk management work in their policies and plans, allocate funds for DRR activities, assign responsibilities to operational-level staff members to provide support to community groups, develop appropriate strategies and programmes to support community action and establish technical resource centres in the country. The DRR mainstreaming process in development sectors is new to all South Asian countries. India and Bangladesh are pioneers in this regard, where national development plans have clearly mentioned the mainstreaming of disaster management in sectoral policies and plans. India has established national bodies for coordinating disaster management activities in ministries and departments and has thus paved the way for such mainstreaming to happen.

This report is of global concern. It accommodates a number of reported case studies of different countries. Chapter 2, "Description of Environment Sector in India", describes how India has taken some measures to protect its environmental domain. India had taken proactive measures in the 1980s and 90s for bringing about legislation and establishing protocols on environmental protection, including pollution control

measures and Environmental Impact Assessment procedures. The Prime Minister's Office has taken the lead by setting up a mission and bringing out a National Action Plan on Climate Change. The plan, however, still does not address disaster risk issues in an adequate measure. It is expected, though, that the pressure to respond to the Climate Change threat through mitigation and adaptation measures will bring about further action on this front in the near future. In India, this study brings out the needs and also the various dimensions of appropriate tools that can be deployed towards mainstreaming of DRR in the environment sector. The broad categorisations are: assessment and planning tools (like EIA), institutional support framework (national, state, district and local), legislative support framework and financial instruments. This chapter also focuses on main sub-sectors on environment like agriculture, water and sanitation, health, education, transport and energy, land and land-use, forest and ocean and also explains what main disaster risks in these sectors are and what India has done to reduce the particular risks.

A very important issue that needs to be addressed is the levels and cross-sectoral nature of the relationship between environment and disasters. Chapter 3, "Environment and Disasters", deals with this and includes important points like environmental degradation leading to disaster risk and vulnerability, disaster causing environmental degradation, environmental impact of humanitarian relief action and environmental concerns in relief and recovery. The chapter also describes our present approach to disaster risk reduction and the relevance of instruments like HFA, NDMA guidelines, SAARC Framework for DRR, Delhi declaration and mainstreaming of DRR, environmental management and DRR with some case studies related to them.

The backbone for implementing any measures for mainstream DRR is the framework of laws and policies. Chapter 4, "Legal and Institutional Provisions", describes the steps taken by the Government of India to protect the environment comprehensively, and in some dimensions also in relation with risks. Certain policies like those for the sectors of environment, agriculture, land-use, forest, water and urban have been brought out, and certain acts like those on the subjects of air pollution, water pollution, environment protection, forest, etc., have been enshrined. These are discussed in the chapter with relevance to the issue of mainstreaming DRR in the environment sector.

The present international policy environment has brought climate change to the forefront of the disaster management theme. Climate change is one of the main causes for the increasing trend of higher damages and greater variability in hydro-meteorological disasters. Chapter 5, "Climate Change: Mitigation and Adaptation for DRR", describes the current level of understanding of climate change in India, climate change impacts on disasters and vulnerability, climate change mitigation action, climate change adaptation, and efforts for integration of climate change adaptation with DRR.

Having discussed the environment sector, legislations, DRR and India, the report addresses its main agenda in Chapter 6, "Environmental Tools for DRR Mainstreaming". This chapter describes select tools for DRR mainstreaming, such as Environmental Impact Assessment, Strategic Environmental Impact Assessment, Regional Environmental Impact Assessment, Post-Disaster EIA and Environmental Auditing. The chapter is positioned at identifying select tools that can be effectively deployed to strengthen the process of mainstreaming of DRR in the environment sector. The main tools identified after a screening process of a larger pool of tools are:

1. Environmental Hazard Assessment
2. Environmental Vulnerability and Capacity Assessment
3. Regional EIA and Carrying Capacity Assessment
4. Environmental Risk Monitoring and Evaluation
5. Disaster Specific Strategic Environmental Assessment (SEA)
6. Post-Disaster Environmental Impact Assessment (EIA)
7. Post-Disaster Rapid Environmental Assessment (REA)
8. Post-Disaster Environmental Needs Assessment
9. Environmental Auditing
10. Remote Sensing and GIS

Any discussion about the environment cannot afford to miss the basic unit of environment, ecosystems, within which this knowledge of mainstreaming has to be applied and the identified tools deployed. The relevance of ecosystems is immense for ensuring effective and sustainable DRR mainstreaming. Chapter 7, "Environmental Approach to DRR", describes the basic steps to be taken in relation with different ecosystems and DRR. The ecosystems that have been taken into consideration are those of mountain areas, coastal areas, arid and desert areas, agro-ecosystems, forest ecosystems and urban systems.

Chapter 8, "Approach for Mainstreaming DRR in India", concludes the report and summaries the way forward with respect to policies, legal and institutional frameworks at the national, state, district and local levels, integration of DRR and DM plan provisions with district environment plan, role of stakeholders, need of specific toolkit and guidelines and operational agenda for action.

1.0 Background or Mainstreaming DRR

The term 'mainstreaming' has been used to describe the process of incorporating disaster risk reduction into humanitarian and development practice, and it also refers to the end result: where the fundamental elements of risk reduction are imbedded into normal development practice and fully institutionalised within a government's development agenda. The institutionalisation of DRR is meant to internalise and mainstream the concept in the government policy and programming; and all tiers of government should recognise the need for involving other stakeholders, including communities, in disaster risk management work in their policies and plans, allocate funds for DRR activities, assign responsibilities to operational-level staff members to provide support to community groups, develop appropriate strategies and programmes to support community action and establish technical resource centres in the country.

The DRR mainstreaming process in development sectors is new to all South Asian countries. India and Bangladesh are pioneers in this regard, where national development plans have clearly mentioned the mainstreaming of disaster management in sectoral policies and plans. India has established national bodies for coordinating disaster management activities in ministries and departments; however, these are quite few and their capacities are being developed.

This study has been carried out on behalf of the National Institute of Disaster Management with an aim of analysing available means for mainstreaming environmental concerns into disaster risk reduction, and identifying tools for the same.

The following methodological approach has been adopted for the study, based on the Terms of Reference and additional inputs through consultation meetings and a brainstorming workshop at NIDM:

- A comprehensive review of evidence-based case studies has been made on the following:
  - Impact of various types of natural and manmade disasters on environment
  - Degradation of environment accentuating prevailing risks of disasters or creating new risks of disasters
  - Environmental issues in post-disaster recovery and reconstruction
  - Various measures that have worked or not worked for mainstreaming DRR in environment sector, before, during and after disasters.
- A comprehensive review has been made of various risks of disasters in different environmental/geographical settings such as (a) mountain areas (b) coastal areas (c) arid and desert areas, and on different ecosystem-specific issues like (v) agro-ecosystems (b) forest ecosystems (c) urban systems, etc.
- A comprehensive review has been made of the tools developed and used by various international, regional, academic, technical and professional organisations for mainstreaming DRR in environment sector.
- Based on such reviews, a set of practical and usable tools has been identified with guidance notes, which would facilitate its acceptance by the users.

- Based on preliminary studies and analysis, an inception report on approach and structure of the proposed study was developed and presented before a brainstorming workshop of experts conducted by the NIDM.
- Based on the recommendations of the workshop the ToR was reviewed as mutually agreed.
- This draft report has been prepared as per the final ToR, using information gathered through desktop research, key informant interviews with government sources, and interviews with civil society and academic stakeholders in DRR and environment fields.
- Case studies have been prepared and included in the report to illustrate the applicability of tools to various contexts, and the case studies have been developed based on desktop research and key informant interviews.

In recent years, there has been a growing concerns and focus of the links between disaster risk reduction and poverty alleviation in developing countries. This new discourse has led to the development of frameworks and policy commitments of bilateral agencies, NGOs and development organisations, including UNDP.[1] These policy documents and tools have attempted to clarify the processes, roles and responsibilities and end results of mainstreaming disaster risk reduction into development policy and programming.

In a recent paper, BCPR has suggested UNDP a DRR mainstreaming framework with the specific component and practical guidance for governments and their partners on how to go about mainstreaming approach and specific components and linkages.[2]

The Hyogo Framework for Action (HFA), adopted at the 2005 UN World Conference on Disaster Reduction by 168 states, provided a systematic approach to reducing disaster losses and laid out a detailed set of priorities to achieve this by 2015. It recognises the importance of effective integration of disaster risk reduction into sustainable development policies, planning and programming at all governance levels. In its guideline for implementing the HFA, ISDR outlines the roles and responsibilities of states, regional and international organisations including ISDR, offers a set of guiding principles for implementing disaster risk reduction and provides a set of indicators to measure each task of all priority actions.

The BCPR report, "Reducing Disaster Risk: A Challenge for Development", has highlighted that inappropriate development can increase level of vulnerability to disaster risk and in turn how disasters negatively impact poor countries' development. It demonstrates development policies, strategies and programmes must, therefore, seek to prevent or mitigate the negative impact of disasters by effectively incorporating DRR.

[1] Some of the recent documents which include DRR mainstreaming contexts and frameworks of various organisations include: ISDR/World Bank Report- Global Facility for Disaster Reduction and Recovery: A Partnership for Mainstreaming Disaster Mitigation in Poverty Reduction Strategies (2006); DFID Policy Paper- Reducing the Risk of Disasters-Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World (2006); Tearfund paper- Mainstreaming Disaster Risk Reduction: A Tool for Development Organisations (2005); A Global Review: UNDP Support to Institutional and Legislative Systems for Disaster Risk Management (2007).

[2] Wilkinson 2008. Frameworks of Mainstreaming of DRR in Development, Consultant draft

Efforts have also been made to provide systematic approaches to integrate DRR into specific policies, such as Poverty Reduction Strategy Papers (PRSPs).[3] ProVention Consortium has suggested five steps to integrate DRR into PRSs. These include:

1. Analytical and diagnostic work
2. Set poverty reduction objectives
3. Prioritise public actions for poverty reduction
4. Establish monitoring and evaluation procedures
5. Implementation, evaluation and feedback.

The CCA/UNDAF process is the common strategic framework for the operational activities of the United Nations at the community level. The CCA is the main diagnostic tool available to United Nations Country Teams and their partners for assessing and developing a common understanding of the underlying challenges faced by a country in its development process.[4]
The CCA analysis includes three major steps:

- Incorporating DRR into the CCA/UNDAF process
- Preparing the CCF incorporating disaster risk assessment in CCA
- Preparing the UNDAF

[3] PRSPs are prepared by governments in low-income countreies through a particiaptory porcess involving domestic stakeholders and expternal parters, including the International Monetary Fund (IMF) and the World Bank.
[4] See: UN ISDR 2007. Words into Action:A Guide for Implementing the Hyogo Framework. Switerland.

2.0 Description of Environment Sector in India

2.1 Defining Environmental Sector in India

Environment has become a priority in recent times due to the increasing consciousness and concern regarding Climate Change and its impacts. India had taken proactive measures in the 1980s and 90s for bringing about legislation and establishing protocols on environmental protection, including pollution control measures and Environmental Impact Assessment procedures. The Prime Minister's Office has taken the lead by setting up a mission and bringing out a National Action Plan on Climate Change. The plan, however, still does not address disaster risk issues in an adequate measure. It is expected, though, that the pressure to respond to the Climate Change threat through mitigation and adaptation measures will bring about further action on this front in the near future.

In India, this study brings out the needs and also the various dimensions of appropriate tools that can be deployed towards mainstreaming of DRR in the environment sector. Many of these tools have been piloted, but have so far demonstrated only limited successes primarily due to isolated deployment and the absence of a comprehensive approach. It is, therefore, recommended to view the approach as one of an overall addressing of the issue through a holistic approach comprising a toolkit with a range of mainstreaming tools. The broad categories derived from the study are listed as below.

2.1.1. Assessment and Planning Tools

The study has reviewed assessment tools such as EIA (Environmental Impact Assessment), and planning tools embedded in development planning that has a strong implication on the environment. EIA is a major platform on which further assessment approaches can be based. This will, however, need to be developed further and customised to suit the cross-cutting aspect of DRR as it draws in multi-sectoral indicators to the assessment framework.

Planning tools can be similarly structured around the cross-sectoral parameters of environmental and risk reduction domains, both of which have already strong linkages with developmental criteria. The deployment of planning tools can be at policy, strategy or action levels. The principle will remain the same for all levels, with a focus on ameliorating the developmental impacts on the environment and on the risk profile of the communities in question and their context.

2.1.2. Institutional Support Framework

The application of assessment and planning tools for mainstreaming DRR in the environment sector will need to cover the basic levels of governance and planning:

a) National Level

b) State Level

c) District Level

d) Local Level (urban and rural)

Application across these diverse levels will require appropriate institutional support mechanisms at each level, which will provide the window for engagement. This is all the more critical since both environment and DRR are already cross-cutting issues

requiring the involvement of a number of sectors and organisations. Identification of stakeholder institutions, as outlined in this study, and subsequently developing appropriate engagement mechanisms across their operational areas and protocols so as to address all areas of overlap of mandate, are essential for effective mainstreaming.

It is recommended that nodal agencies be identified at all levels, and these be at appropriate levels in the environmental agencies of significance in governance. Besides, primary and secondary stakeholder agencies need to be identified for each sectoral overlap such as urban development, transportation, industry etc. Based on the nature of role in the engagement, standard operating procedures will be needed to clearly state each stakeholder's roles and responsibilities.

2.1.3. Legislative Support Framework

One of the major findings of the study has been the fact that the strong legislative framework developed in the country around environmental issues during the seventies and eighties has provided a very strong basis for making environmental controls effective. The range of legislations, protocols and subsequent tools has very significantly contributed to the establishment of a strong environmental management system in the country.

A similar legislative support framework is required for the effective grounding of DRR efforts in the country, including mainstreaming of DRR in the environment sector. For the specific purpose of mainstreaming in the environment sector, the tools may emerge through enactment of appropriate new legislative instruments and also the adaptation of existing ones. The domain of NOCs (No Objection Certificates) that so far has primarily focused on the environmental impacts as a basis needs to cover issues of `Risk Assessments' and their integration with the parameters that determine the environmental viability of projects.

2.1.4. Financial Instruments

The areas of environment and disaster management both being pervasive and fraught with risks associated with implementation at grassroots level, it is highly desirable to have a regime of strong financial incentives and disincentives. These will partly stem from the legislative support framework, but can also be strongly supported through existing environmental governance tools through levying of heavy penalties on the detrimental actions identified through assessment tools. Similarly, creation of an incentive mechanism around risk reduction in the environmental sector can provide the encouragement to industry, the development sector, communities and other role players to manage the risks of their actions. As with the case of legislative support framework, the establishment of financial instruments can also be done through introduction of new mechanisms as well as adaptation of provisions in the existing systems

It is recommended that a well worked out strategy of these four tool sets be developed and be made available to the environmental governance domain for the effective mainstreaming of DRR. It also needs to be noted here that the dynamic nature of this sector, mainly due to the diverse cross-sectoral dimensions, also makes it imperative that sufficient flexibility be maintained in the tools so as to make them equally applicable in different sectoral settings, socio-economic contexts and geographic locations.

2.2 Brief Description of Sub-Sectors

An overview of sectoral observations and analysis is as follows:

2.2.1. Agriculture

Agriculture emerges as a sector wherein there is evidence of a reasonable amount of risk reduction principles being integrated in most countries, with India having done the most and Afghanistan and Maldives the least. The evidence of mainstreaming in the Agriculture sector stems largely from drought-related backgrounds in most countries, and from programmes that were taken up on drought mitigation and management. Some of these have evolved over time from drought relief measures. Outreach programmes and community participation in innovative local water harvesting and management systems, seed and grain banking etc. form the core of this work.

2.2.2. Health

All countries, with the exception of Afghanistan, Bhutan and Pakistan have demonstrated instruments and cases of DRR mainstreaming in the health sector. Many of the initiative have, though, taken off from emergency response systems that have been put to test in these countries in the recent past due to major disasters. The three lagging countries are those from the total list that did not get hit by the South Asian Tsunami. Though there have been other disasters such as the Pakistan earthquake of 2008, the impact of that in DRR mainstreaming in the health sector is still not very visible. The progress from major disaster to upgrading of emergency health services and subsequently to risk reduction in the health sector appears to be a linear process. Community-based approaches, such as that of Maldives, can be looked at as good practices, particularly in view of the socio-economic context of the region.

2.2.3. Water and Sanitation

Water and sanitation as a sector shows very little evidence of DRR mainstreaming. Most strategies, plans and cases found are related to augmentation of service levels, which, though improving quality of life and general resilience, does not necessarily translate into risk reduction. Water management measures such as water policies, river water sharing arrangements, water harvesting programmes, river linking programmes and community-based water management programmes were found across the region, and do constitute to drought and flood mitigation in direct or indirect way. In many cases, it was the indigenous knowledge and systems that have come to the rescue while finding solutions for water problems. The canals and karees in Afghanistan and Pakistan, the rainwater harvesting structures of India, local actions for protecting drinking water sources from flood waters in Bangladesh, and the traditional water tank systems in Sri Lanka are all practices that demonstrate risk reduction elements within the water sector. There is, however, less evidence of conscious state approaches to mainstream disaster risk reduction in the sector. It is also observed that water supply and waste management are harder hit in urban areas since the dependence on state infrastructure is more in such areas of concentrated population, and the mainstreaming of disaster risk reduction has still not percolated down to the municipal levels.

2.2.4. Land & Land-use

- The conventional town and country Master Plan is patterned on the following themes:

- Demographic projection and decision on the levels at which the population will be contained;
- Allocation of population to various zones depending on existing density level, infrastructure capacity and future density levels;
- Land-use zoning to achieve the desired allocation of population and activities in various zones as projected; and
- Large-scale acquisition of land with a view to ensuring planned development.

The reasons why most Plans reduce risk fail may be attributed to three main issues:

- The considerable investments required for protection works are usually out of reach of most local Governments, or low down in their priorities
- Monitoring/regulation systems to check processes of land occupation are a must since it is much easier to prevent than to cure
- Effective implementation is necessary. All the paraphernalia of plans, investments, legislation etc. can come nothing not implemented.

The poor and unemployed from the rural hinterland, attracted by the economic opportunities cities offer, arrive in large numbers and squat (occupy illegally) on any available piece of land. They live in temporary structures often made of materials discarded by the better-off section of the city's population. In such a scenario, lands designated as vacant for future expansion or as environmentally sensitive zones under the Master Plan become soft targets. Besides being the cause for 'unplanned' growth of city, such settlements reflect poor physical, social and economic characteristics.

Since squatters do not own the land they live on, they have little or no incentive to make improvements in the dwelling structures on land that might be taken from them any time. Physical structures are temporary in nature made with cheap building material that offers little or no protection against disasters. As it is, housing in most informal settlements consists of temporary structures that are damaged easily; they collapse or are washed out during heavy rains, floods and earthquakes and are burnt in fires, etc. Many a time these settlements also have additional incompatible uses, as they accommodate storehouses of materials for recycling/refuse, and at times, chemicals. In case of fires in these settlements, it truly becomes a case of "throwing the fat into the fire" as these aid the rapid spread of fire.

As it is, many are migrants, poor and unemployed, with no permanent source of income. Frequent disasters in their area disrupt their livelihoods. The heterogeneity of their ethnic background coupled with competition for limited economic opportunities are a cause for social tensions. Coherent social structures are seldom found to be in place, leading to easy manipulation by local politicians seeking to establish 'vote banks'. These are also the areas that have the lowest literacy levels in any city and where family sizes are the highest. These two factors invariably translate into poor awareness levels, haphazard development and unsanitary living conditions, all adding up to a recipe for disaster.

The genesis and the ensuing germination of the informal settlements thus completely defy the original themes under which the city master plans were set. Obviously, the objectives of the conventional planning system were completely detached from the socio-economic realities the informal sectors represent.

2.2.5. Forest

Sustainable management of natural resources of land, water and vegetation is essential to providing livelihood and environmental security. Ever-increasing demographic pressures coupled with developmental activities are causing tremendous pressure in the utilisation of these resources, leading to various kinds of ecological disasters, such as droughts, floods, cyclones, landslides, mine spoils, siltation of reservoirs, deterioration of waterbodies, loss of biodiversity etc. In recent times, India has witnessed large-scale disasters such as frequent floods in the Indo-Gangetic and Brahmaputra plains, the cyclones of the east-coast and Gujarat, the earthquakes of Uttarkashi, Latur, Jabalpur, Chamoli and Gujarat; and small-scale hazards, such as landslides in the Himalayan range, forest fires and desertification. These natural disasters have not only affected the economy but also took a huge toll of human lives. The increasing frequency of these disasters is the outcome of excessive biotic and abiotic interferences which have resulted into considerable degradation of our natural resources.

Large-scale deforestation across the globe generally and in under-developed and developing countries particularly and faulty management practices have resulted in various kinds of environmental degradation such as wind and water erosion; physical and chemical degradation of soil, water and biodiversity and global warming. Deforestation is a slow onset disaster that contributes to other cataclysmic disasters. The rapid rate of deforestation in the tropics is the key factor in increasing the frequency of flood disasters. The greatest and most immediate danger of deforestation is that gradually diminishing forested areas contribute or worsen other types of disasters such as accelerated soil erosion, floods, drought and desertification. Deforestation of watersheds, especially around smaller rivers and streams, increases the severity of flooding, reduces stream flows and dries up springs during dry seasons and increases the load of sediment entering the waterways. Most hazards in the Himalayan region emanate primarily from the natural geologic, hydrologic and physiographic processes, but are greatly affected by human interventions. Ever-increasing demand for food and fodder has resulted in conversion of forests and exploitation of fragile and marginal lands into agriculture, migratory grazing and shifting cultivation practices. Mining and other human activities have led to over-exploitation of natural resources and consequently occurrence of ecological disasters. Rapid degradation of the Himalayan ecosystem is posing a potential danger to the greenery of the Indo-Gangetic basin, causing sporadic floods in some areas and drought in others. As a result, more than half of the geographical area of the country is now partially exposed to various forms of land degradation processes such as water and wind erosion, salinisation, waterlogging, flooding, ravines, shifting cultivation, mining, quarrying, landslides etc. About two-thirds of the 142 million ha of agricultural land in the country is drought-affected and about 40 million ha area is

prone to flooding, of which about 8 million ha area gets annually flooded. It is estimated that about 56 per cent of the country is susceptible to earthquake damages.

Human population of India has already crossed the 1 billion mark and the livestock population has reached a figure of 445 million. The per capita availability of cultivated land has declined over the years from 0.53 ha in 1950 to 0.15 ha in 2000 and is expected to further reduce to 0.12 ha by 2015 owing to population pressures. The requirements of food grains, fodder and fuel wood by 2015 have been estimated at 275 million tonnes, 1,083 million tonnes and 235 million m^3, respectively to meet the requirements of 1,225 million human and 600 million livestock population indicating a shortfall of 73 million tonnes, 570 million tonnes and 195 million m^3 of food grains, fodder and fuel wood at the current level of production. Besides, tremendous pressure on limited forest resources (63 million ha) and over-exploitation of land resources, particularly the marginal lands, might further aggravate land degradation and jeopardise sustainability of these resources beyond repair. Agriculture is the mainstay of rural population in the country. There has been a spectacular increase in the food production since independence which has increased four times from 51 million tonnes in 1950-51 to 203 million tonnes in 2000-01 against the three-fold increase in population. However, uneven development of agriculture across regions and also among different sections of farming community has widened the disparity between resource-rich and resource-poor farmers and has resulted in low levels of productivity especially in rainfed areas and degradation of natural resources. Of the 142 million ha cultivated area in the country 63 per cent (89 million ha) is rainfed which accounts for only 45 per cent of the total food production while 37 per cent irrigated area (53 million ha) contributes 55 per cent to the national food basket. Moreover, agriculture on marginal and fragile lands in the hilly regions has resulted in enormous soil loss to the tune of 40 t ha^{-1}. The government has, therefore, accorded high priority to holistic and sustainable development of rainfed areas.

Diversification of land-use systems is a necessary strategy for providing variety of products for meeting varied requirements of the people, insurance against risks caused by weather aberrations, controlling erosion hazards and ensuring sustainable production of the land on a long-term basis. Agroforestry is a viable alternative to prevent and mitigate natural disasters. Besides, agroforestry may be one of the important tools for disaster management. Agroforestry may be defined as a technique of growing food crop annuals in association with woody perennials to optimise the use of natural resources, minimise the need for inputs derived from non-renewable resources and reduce the risk of environmental degradation. Agroforestry, a multiple use concept of land management, is also capable of meeting the present challenges of shortage of fuel wood, fodder, fibre, timber, unemployment, environmental degradation, protection and improvement of wastelands and agriculture land. It has immense potential to ensure stability and sustainability in production and to provide ecological and economic security. In India, agroforestry practices are intertwined in the various developmental programmes/schemes in the Five-Year Plans of the Government

of India either to prevent natural disasters or to overcome the problems of the affected people during and after the natural disasters. These programmes include Flood Control/Management Programmes, Multipurpose River Valley Projects, Agriculture Development Programmes, Integrated Rural Development Programmes (IRDP), and National Watershed Development Programme for Rainfed Areas (NWDPRA), Forestry Development Scheme, Drought Prone Area Development Programme (DPAP) and Desert Development Programme (DDP). In other words, agroforestry has a wide and diverse potential to protect the environment in varying agro-climatic situations. The major environmental functions of agroforestry may be summarised as:

- Control of soil degradation
- Control of desertification
- Flood control
- Drought moderation
- Reduction in the pollution of groundwater resulting from high inputs of fertilisers
- Increasing biodiversity in the farming system and watershed scale
- Increasing food security and thereby reduce pressure on land resources
- Checking deforestation and its associated impact on environment
- Reducing pressure on forests through on-farm supply of fuel wood, fodder and other forest products
- Reduction in the build-up of atmospheric carbon dioxide and other greenhouse gases
- Disaster prevention, rehabilitation and reconstruction.

2.2.6. Water (Ground & Surface)

Although India occupies only 3.29 million square km geographical area, which forms 2.4 per cent of the world's land area, it supports over 15 per cent of the world's population. The population of India as on 1 March 2001 stood at 1,027,015,247 persons. Thus, India supports about 1/6th of world population, 1/50th of world's land and 1/25th of world's water resources. India also has a livestock population of 500 million, which is about 20 per cent of the world's total livestock population. More than half of these are cattle, forming the backbone of Indian agriculture. The total utilisable water resources of the country are assessed as 1,086 km3. In the past, several organisations and individuals have estimated water availability for the nation. Recently, the National Commission for Integrated Water Resources Development estimated the basin-wise average annual flow in Indian river systems as 1,953 km3. Utilisable water resource is the quantum of withdraw-able water from its place of natural occurrence. Within the limitations of physiographic conditions and socio-political environment, legal and constitutional constraints and the technology of development available at present, utilisable quantity of water from the surface flow has been assessed by various authorities differently. The utilisable annual surface water of the country is 690 km3. There is considerable scope for increasing the utilisation of water in the Ganga–Brahmaputra basins by construction of storages at suitable locations in the neighbouring countries.

Risk Reduction
• Develop a disaster management plan for the sector in line with the national DM planning approach • Designate Focal Point for DM coordination on behalf or the sector • Conduct community capacity-building and awareness programmes on environment and sustainable development issues a. Develop and upgrade risk assessment and vulnerability analysis at national and sub-national levels b. Research on mitigation methods and technologies for addressing environment related hazards and impacts of disasters on the environment c. Develop strategies for appropriate management of forests and natural resources as a means to reducing disaster risks d. Research on climate change impacts and develop mitigation and adaptation strategies e. Share the findings related to hazard and vulnerabilities mapping and environmental studies taken up by the department

2.2.7. Ocean

Oceans cover about 70 per cent of the Earth's surface. The oceans contain roughly 97 per cent of the Earth's water supply. The oceans of Earth are unique in our Solar System. No other planet in our Solar System has liquid water (although recent finds on Mars indicate that Mars may have had some liquid water in the recent past). Life on Earth originated in the seas, and the oceans continue to be home to an incredibly diverse web of life. The oceans of Earth serve many functions, especially affecting the weather and temperature. They moderate the Earth's temperature by absorbing incoming solar radiation (stored as heat energy). The always-moving ocean currents distribute this heat energy around the globe. This heats the land and air during winter and cools them during summer. The Earth's oceans are all connected to one another. Until the year 2000, there were four recognised oceans: the Pacific, Atlantic, Indian, and Arctic. In the Spring of 2000, the International Hydrographic Organisation delimited a new ocean, the Southern Ocean (it surrounds Antarctica and extends to 60 degrees latitude). There are also many seas (smaller branches of an ocean); seas are often partly enclosed by land. The largest seas are the South China Sea, the Caribbean Sea, and the Mediterranean Sea.

2.3 Disaster Risks in Environment Sector

DRR within overall sectoral approach identified for environment in the region, based on the national disaster management plans and the plans at sub-national and line-ministry levels,can be seen in the form of specific issues related to risk reduction within the standard operating procedures:

Disaster Risks in Sub-Sectors

2.3.1. Agriculture

Agriculture has a role in assessment of damage to agricultural crops from disasters, and impact of possible pest attacks. The DRR component of the overall disaster management capacity of the agriculture sector, based on the structures of various countries, is as given below.

DRR within overall sectoral approach identified for Agriculture in the region, based on the national disaster management plans and the plans at sub-national and line-ministry levels can be seen in the form of specific issues related to risk reduction within the standard operating procedures:

Risk Reduction
• Preparation of a sectoral plan at national and sub-national levels for the line ministry and its departments, in line with the national disaster management approach • Designate a focal point for disaster management within the department and set up protocols and operations procedures • Identify areas likely to be affected through mapping and analysis exercises • Determine what damage, pests or diseases may be expected, and what drugs and other insecticide items will be required, in addition to requirements of setting up extension teams for crop protection, and accordingly ensure that extra supplies and materials, be obtained quickly. • Organise distribution of appropriate seeds, seedlings, fertiliser and implements to the vulnerable people under loan/grant • Arrange for keeping stock of seeds, fertilisers and pesticides • Provide information to all concerned, about disasters, likely damages to crops and plantations, and information about ways to protect the same. • Appoint focal point for coordinating role of Agriculture ministry and its departments • Check available stocks of equipment and materials that are likely to be most needed after the disaster, and organise for required stocks at strategic locations • Train teams at national and sub-national levels for effective response

2.3.2. Health

DRR within overall sectoral approach identified for Health in the region, based on the national disaster management plans and the plans at sub-national and line-ministry levels, can be seen in the form of specific issues related to risk reduction within the standard operating procedures:

Risk Reduction
• Develop disaster management plans for the health sector at national, sub-national, local and hospital levels • Conduct hospital safety assessments, identification of structural and non-structural mitigation activities, and appropriate actions to be taken • Prioritise risk reduction activities and ensure budget allocation to such mitigation activities • Carry out and disseminate a risk evaluation of the population • Ensure local DM plans are developed in health centres and hospitals • Ensure that all hospital staff have been informed about the possible disasters in the district, likely damages and effects, and information about ways to protect life, equipment and property • Prepare a list of medical and para-medical personnel in disaster-prone areas and disseminate it to governors and administrators concerned a. Ensure that orientation and training for disaster response plans and procedures are undertaken. Special skills required during disaster situations are imparted to the officials and the staff. b. Ensure adequate availability of Emergency Health Kits in high-risk areas c. Train volunteers on emergency preparedness programmes such as first aid and preventive measure against diseases in disaster-prone areas d. Establish and operate an early warning system for health threats based on the routine health information and in collaboration with other departments to conduct damage assessment of hospital infrastructure and request of medical equipment required. e. To prepare and keep ready Mobile Hospitals and stock them with emergency equipment that may be required after the disaster. f. Assess likely health impacts and share with SEOC for planning purpose g. To ensure pre-positioning of Emergency Health Kits and Personnel. h. Direct the activation of health/medical personnel, supplies and equipment as required.

2.3.3.Water and Sanitation

DRR within overall sectoral approach identified for Water and Sanitation in the region, based on the national disaster management plans and the plans at sub-national and line-ministry levels, can be seen in the form of specific issues related to risk reduction within the standard operating procedures:

Risk Reduction
• Designate Focal Points for coordination with other sectors and stakeholders for disaster management purposes • Prepare sectoral disaster management plans at national and sub-national levels and ensure their implementation • Take action to protect drinking water systems so that sustained water supply can be ensured during floods and other times of threat ▪ Identify flood-prone areas and ensure efficient management of flood forecasting and warning centres and improve procedure of flood forecasts and intimation to appropriate authorities • Operate an information centre in the flood and water-borne/sanitation-related disease season every year • Collect all the information on weather forecast for different places within the country and in surrounding countries, and use it to inform all concerned about impending risks ▪ Establish systems for keeping watch on infrastructure and protection works, and take steps for strengthening of protection works before the flood season

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3.0 Environment & Disasters

3.1 Environmental Origin of Disasters

Disasters take a high toll on the global society. Between 2000 and 2008, an average of 392 disasters occurred per year, with around 216 million people affected per year (the equivalent to the population of Russia, Spain and Australia combined), and causing a total damage of 104 billion USD per year (around four times the development aid of the European Union) (Guidelines for Mainstreaming Disaster Risk Reduction in Development, 2009). In general, the poor countries are most exposed to the risks of disasters, and are the least able to deal with the consequences of disastrous events. Within these countries, it is often the most marginalised, like the ultra-poor, women, and children, who are the most affected by disasters. While the humanitarian sector has become better at saving lives in the wake of a disastrous event, it is not yet very good at saving livelihoods. Hazardous events often have a huge negative impact on the livelihoods these persons depend upon; assets are destroyed, vital services disrupted, infrastructure damaged, and the environment people depend degraded.

3.2. Environment – Disaster Relations

3.2.1 Environmental degradation leading to disaster risk & vulnerability

Disasters are the result of exposure of a community to a hazardous event (e.g. earthquake, tropical cyclone) and the vulnerability of the community towards this event. Disasters can be avoided or the negative effects attenuated by building capacity. Increasing capacity and addressing hazard threats is what the discipline of Disaster Risk Reduction (DRR) aims to achieve. DRR is a cross-cutting issue; it is an approach where disaster risk is systematically assessed in a holistic way, and where relevant and possible, addressed through the development of activities that will increase the resilience of the community. These activities can consist of actions preventing disasters from happening (prevention), reducing the impact disasters have (mitigation), or that prepare societies so as to deal with the effects of a disaster when they happen (preparedness). These activities will often integrate several sectors (e.g. food security, WASH, shelter) and other cross-cutting issues (e.g. environment, gender). The international community is more and more interested in Disaster Risk Reduction, and DRR is becoming more and more recognised as the best practice in programming. In January 2005, the World Conference on Disaster Reduction adopted the Hyogo Framework for Action (HFA), 2005 – 2015: building resilience of Nations http://www.crid.or.cr/digitalizacion/pdf/eng/doc17597/doc17597-a.pdf). The UN and other institutions were called to integrate DRR considerations into development frameworks. This included the Common Country Assessments, the United Nations Development Assistance Framework and poverty reduction strategies (http://www.unisdr.org/eng/hfa/docs/HFA-brochure-English.pdf). To reduce the risk of disaster and to support DRR, mainstreaming is the key process which helps the welfare and sustainability of the society. The term ‘mainstreaming’ has been used to describe the process of incorporating disaster risk reduction into humanitarian and development practice, and it also refers to the end result: where the fundamental elements of risk reduction are imbedded into normal development practice and fully institutionalised

within a government's development agenda. There are many different areas or aspects of a development agency's work within which mainstreaming should be addressed.

3.2.2 Disasters Causing Environmental Degradation

Due to the vast size of the country, the number of disaster events and as well as the losses (death, total affected and economic losses) are high for India when compared to other SAR countries. India is highly vulnerable to natural hazards, particularly earthquake, flood, drought, cyclone and landslides. The country also experienced massive losses due to extreme temperatures and epidemics. The geologic formation of the region along with the human activities accentuated the impact of natural hazards like earthquake and landslides. The lower Himalayan region experiences landslides due to loose debris, heavy rainfall and human interventions like deforestation and cultivation on steep slopes, while in the Western Ghats region, intense intervention of human activities along with rainfall triggers landslides. Since the Himalayan mountain ranges are considered to be the world's youngest fold mountain ranges, the subterranean Himalayas are geologically very active. The Himalayan frontal arc, bordered by the Arakan Yoma fold belt in the east and the Chaman fault in the west, forms one of the most seismically active regions in the world. The country has experienced three great earthquakes (magnitude greater than 8) since 1900. These are the Kangra earthquake of 1905, great Assam earthquakes of 1950, and the Bihar-Nepal earthquake of 1934. The other recent large damaging Himalayan earthquakes are: 1991 Uttrakashi earthquake of magnitude 6.5, 1988 Nepal–Bihar earthquake of magnitude 6.8, 1999 Chamoli earthquake of magnitude 6.8, and recent 2005 Kashmir (POK) earthquake of magnitude 7.7. These are a few of the earthquakes, which have caused colossal loss of life and property. The peninsular part of the country comprises continental crust regions, which are considered stable as they are far away from the tectonic activity of the boundaries. These regions were considered seismically less active; however, 1967 Koyna earthquake of magnitude 6.5, 1993 Latur earthquake of magnitude 6.3, 1997 Jabalpur earthquake of magnitude 6.0 and 2001 Bhuj earthquake of magnitude 7.7 are the few recent earthquakes in this region, which have caused considerable loss of life and property.

Thus, the entire country is prone to earthquakes of varying intensities. Based on the observed past damage and fault patterns (SEISAT, 2000), the country has been divided into four seismic zones (IS: 1893, 2002), seismic zone II (least seismic zone) to Zone V (most severe seismic zone). As per Vulnerability Atlas of India (BMTPC, 2006), 10.9 per cent and 17.3 per cent of the area of the country falls in very high and high damage risk zones respectively.

Flood is considered as a common natural hazard that recurs almost every year in many parts of India and more than once in certain parts of the country. The heavy southwest monsoon rains cause flooding in north, north-eastern and southern parts of India. The heavy rain also causes flash floods in many of the urban cities impacting life and causing heavy economic losses.

Almost entire India is flood-prone. Flash floods resulting from extreme precipitation have become increasingly common in central India over the past several decades, coinciding with rising temperatures. Recently, on July 26, 2005, Mumbai experienced

a major flood, in which a record rainfall of 1,011 mm occurred at the Vihar Lake area. This has exceeded the record of one day rainfall of 985 mm at Cherrapunjee. On the other hand, the variation of rainfall distribution also causes drought conditions in many parts of the country, particularly Gujarat, Rajasthan, southern and eastern Maharashtra, northern Karnataka, Andhra Pradesh and Orissa. In the past, droughts have led to regular famines in India, including the Bengal famine of 1770, in which up to one third of the affected population died; the 1876–1877 famine, which led to the death of about five million people; the 1899 famine, with over 4.5 million fatalities; and the Bengal famine of 1943, with over five million starvation death and famine-related illnesses.

The oscillatory movement of Inter tropical Convergence Zone and the pressure difference development in peninsular India and in the Bay of Bengal, Arabian Sea leads to cyclonic situations. Cyclones bring with them strong winds, heavy rains and storm surges that often affect life, livelihood and assets in the coastal areas. On an average, a major (Category 3 or higher) cyclone develops every other year. The Cyclone 05B, a 'Super Cyclone' that struck Orissa on October 29, 1999, was the worst in terms of damage and loss of life in more than a quarter-century.

The tsunami resulted from the 2004 Indian Ocean earthquake struck the Andaman and Nicobar Islands and east coast of India causing an estimated 10,000 deaths. Until then, it was believed that India has negligible threat from tsunamis, though there is historical anecdotal evidence of its occurrence in the past.

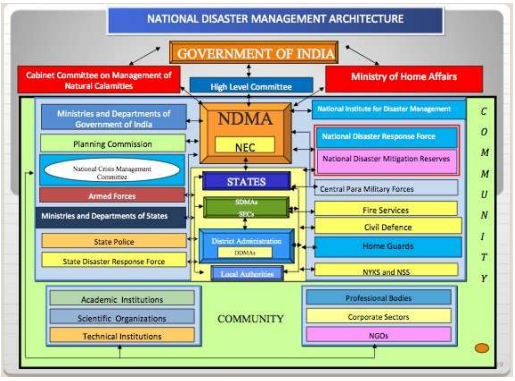
India has two active volcanoes: the Barren Island volcano which last erupted in May 2005 and the Baratang in Andaman Sea in 2005. The Narcondam volcano in Andaman sea is considered dormant. No deaths or economic losses are reported due volcanoes in India.

3.2.3 Environmental Impact of Humanitarian Relief Action

At the national level, the Ministry of Home Affairs (MHA) is the nodal Ministry for all matters concerning disaster management. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include: India Meteorological Department, Central Water Commission, Ministry of Home Affairs, and various line ministries. Each agency nominates its nodal officer to the Crisis Management Group chaired by the Central Relief Commissioner.

The National Disaster Management Authority (NDMA), empowered as the nodal agency for disaster management, preparation of disaster management plans at various levels, and institutionalisation of disaster management authorities at national, state and district levels, is a relatively new mechanism, and is still in stages of establishment. While there is a lack of absolute clarity between the roles of the MHA and NDMA, the response functions are largely with MHA and risk reduction and preparedness functions are shared between NDMA and MHA.

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



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 Ministries concerned. The CMG's functions are to review every year contingency plans formulated by various Ministries/Departments/Organisations in their respective sectors, and to take up measures required for dealing with natural disasters.

National level DRR mainstreaming:GOI-UNDP Disaster Risk Management Programme

The GOI-UNDP National Disaster Risk Management Programme targets 169 multi hazard districts across 17 states of the country. Initiated in 2002, the programme is to enter its next phase in 2009. Anchored under the MHA, it worked closely with line ministries and departments, and state governments, for large scale capacity building and implementation of DRR activities at the ground level.

The programme placed DRR in the centre-stage through state project offices attached to the state relief departments, and district project offices attached to the District Collectors' offices in the project areas. This ensured a continued presence and focus on DRR activities at these implementation levels.

Activities were very wide-ranging, including curriculum development for architecture and engineering courses, school safety, training of masons, training of government officials, preparation of local disaster management plans, creation of IEC materials, and carrying out of awareness campaigns.

At the State level, disaster management is handled by the Departments of Relief & Rehabilitation. The Government of India is working with the State Governments to convert the Departments of Relief & Rehabilitation into Departments of Disaster Management with an enhanced area of responsibility to include mitigation and preparedness apart from their present responsibilities of relief and rehabilitation. The change has already happened in eight State Governments/Union Territory Administrations.

3.3. Environmental Concerns in Relief and Recovery

The Government of India has adopted mitigation and prevention as essential components of their development strategy. For the first time ever, the tenth five-year plan (2002-2007) document had a detailed chapter on disaster management, which provides guidelines for mainstreaming disaster risk reduction into development planning. In addition, the National Disaster Management Act, 2005, has been promulgated, laying down the requirements for National, State and District Disaster Management Authorities, and a National Institute of Disaster Management.

Agriculture: Drought management policy replaces relief-based approach

Drought management is a priority for the Government of India and the Ministry of Agriculture (MoA) is the nodal agency for this natural disaster. The emphasis has shifted in the last few years from large-scale drought relief interventions to prevention of physical and socio-economical deterioration. In order to minimise increased use of resources for relief interventions, the government is keen on promoting a long-term strategy by strengthening the preparedness mechanism and making sure that factors such as climate variability, soil conditions and environmental degradation are taken into consideration. Drought-Prone Area Programme [DPAP] and Desert Development Programme [DDP] are among the several area development programmes undertaken in select districts identified on the basis of moisture index and percentage area under assured irrigation. An initiative called Hariyali has been launched by the Prime Minister of India to promote integrated development of watersheds through Panchayati Raj Institutions. The Government has also earlier modified its Watershed Development policy to make it contemporary, transparent and easy to follow. This provides greater degree of flexibility in view of the large variation in local conditions, needs and the social structure.

As per the Act, the NDMA has been entrusted with responsibility to "lay down guidelines to be followed by the different Ministries or Departments of the Government of India for the purpose of integrating the measures for prevention of disaster or the mitigation of its effects in their development plans and projects". It also emphasises to monitor the implementation of the guidelines laid down by the National Authority for integrating of measures for prevention of disasters and mitigation by the Ministries or Departments in their development plans and projects. The Disaster Management Act 2005 also states that a National Plan would have "measures to be taken for the integration of mitigation measures in the development plans".

Furthermore, the Act has also provided for formation of dedicated funds at national, provincial and local levels for disaster risk mitigation. NDMA has issued comprehensive guidelines for holistic management of specific types of disasters. Every Ministry is expected to develop its disaster management plan, which would include measures for prevention, mitigation and preparedness.

Over the past couple of years, the Government of India has brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process.

The changed approach is being put into effect through:

1. Institutional changes
2. Enunciation of policy
3. Legal and techno-legal framework
4. Mainstreaming Mitigation into Development process
5. Funding mechanism
6. Specific schemes addressing mitigation
7. Preparedness measures
8. Capacity-building
9. Human Resource Development

State Governments are primarily responsible for disaster management, including prevention and mitigation, while the Government of India provides assistance where necessary as per the norms laid down from time to time and proposes that this overall framework may continue.

The States have been advised to enact Disaster Management Acts. These Acts provide for adequate powers for authorities coordinating mitigation, preparedness and response as well as for mitigation/prevention measures required to be undertaken. Two States, Gujarat and Bihar, have already enacted such a law. Other States are in the process. In line with the changed approach, the State Governments have also been advised to convert their Relief Codes into Disaster Management Plans

DRR through safe construction under housing and employment programmes

Rural housing and community assets for vulnerable sections of the population are created on a fairly large scale by the Ministry of Rural Development under the Indira Awas Yojna (IAY) and Sampooran Grameen Rojgar Yojna (SGRY). About 250 thousand small but compact housing units are constructed every year, besides community assets such as community centres, recreation centres, crèches etc. Technology support is provided by about 200 rural housing centres spread over the entire country. The Ministry of Home Affairs is working with the Ministry of Rural Development for changing the guidelines so that the houses constructed under IAY or school buildings/community buildings constructed under SGRY are earthquake/cyclone/flood resistant; as also that the schemes addressing mitigation are given priority under SGRY. Ministry of Rural Development is carrying out an exercise for this purpose. This initiative is expected to go a long way in popularisation of seismically safe construction at village/block level.

with elements of risk reduction and preparedness apart from response and relief.

The chapter on Disaster Management in the Tenth Five-Year Plan document also emphasises the fact that development cannot be sustainable without mitigation being built into developmental process. Each State is supposed to prepare a plan scheme for disaster mitigation in accordance with the approach outlined in the plan.

3.4. Traditional Environmental Knowledge and Disaster Risk Reduction

Over the recent years, there has been a growing concern for and focus on the links between disaster risk reduction and poverty alleviation in developing countries. This new discourse has led to the development of frameworks and policy commitments of bilateral agencies, NGOs and development organisations, including UNDP.[5] These policy documents and tools have attempted to clarify the processes, roles and responsibilities and end results of mainstreaming disaster risk reduction into development policy and programming.

In a recent paper, UNDP BCPR has suggested a DRR mainstreaming framework with the specific component and practical guidance for governments and their partners on how to go about mainstreaming approach and showing how these components are linked.[6]

The Hyogo Framework for Action (HFA), adopted at the 2005 UN World Conference on Disaster Reduction by 168 states, provided a systematic approach to reducing disaster losses and lays out a detailed set of priorities to achieve this by 2015. It recognises the importance of effective integration of disaster risk reduction into sustainable development policies, planning and programming at all governance levels. In its guideline for implementing the HFA, ISDR outlines the roles and responsibilities of states, regional and international organisations including ISDR, offers a set of guiding principles for implementing disaster risk reduction and provides a set of indicators to measure each task of all priority actions.

The UNDP report, “Reducing Disaster Risk: A Challenge for Development” has highlighted that inappropriate development can increase level of vulnerability to disaster risk and in turn how disasters negatively impact poor countries’ development. It demonstrates development policies, strategies and programmes must, therefore, seek to prevent or mitigate the negative impact of disasters by effectively incorporating DRR.

[5] Some of the recent documents which include DRR mainstreaming contexts and frameworks of various organisations include: ISDR/World Bank Report- Global Facility for Disaster Reduction and Recovery: A Partnership for Mainstreaming Disaster Mitigation in Poverty Reduction Strategies (2006); DFID Policy Paper- Reducing the Risk of Disasters-Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World (2006); Tearfund paper- Mainstreaming Disaster Risk Reduction: A Tool for Development Organizations (2005); A Global Review: UNDP Support to Institutional and Legislative Systems for Disaster Risk Management (2007).

[6] Wilkinson 2008. Frameworks of Mainstreaming of DRR in Development, Consultant draft

Efforts have also been made to provide systematic approaches to integrate DRR into specific policies, such as Poverty Reduction Strategy Papers (PRSPs).[7] Prevention Consortium has suggested five steps to integrate DRR into PRSPs. They include:

1. Analytical and diagnostic work
2. Set poverty reduction objectives

DRR in Health sector: National Rural Health Mission

The Ministry of Health and Family Welfare, Government of India, launched the National Rural Health Mission (2005-12) on April 12, 2005, throughout the country with special focus on 18 States. The mission, with its extensive network of health care facilities, forms the backbone of the health infrastructure at the national level. In line with the approach of community-based disaster management being taken up by the national government as illustrated in the guidelines issued by the National Disaster Management Authority, the presence of health professionals and facilities at the frontlines has created a sizeable potential for bringing about DRR initiatives with a wide outreach. The initiative has a holistic approach in combination with other programmes of the Ministry, such as:

- National Aids Control Programme
- Revised National TB Control Programme
- National Vector-Borne Disease Control Programme
- National Cancer Control Programme (NCCP)
- National Leprosy Elimination Programme
- Non-Communicable Disease Control Programmes
- Emergency Medical Relief
- Establishment of Postgraduate Institutes
- Intra-health Portal

3. Prioritise public actions for poverty reduction
4. Establish monitoring and evaluation procedures
5. Implementation, evaluation and feedback.

The CCA/UNDAF process is the common strategic framework for the operational activities of the United Nations at the community level. The CCA is the main diagnostic tool available to United Nations Country Teams and their partners for assessing and developing a common understanding of the underlying challenges faced by a country in its development process.[8]

The CCA analysis includes three major steps:

- Incorporating DRR into the CCA/UNDAF process
- Preparing the CCF incorporating disaster risk assessment in CCA
- Preparing the UNDAF

[7] PRSPs are prepared by governments in low-income countreies through a particiaptory porcess involving domestic stakeholders and expternal parters, including the International Monetary Fund (IMF) and the World Bank.
[8] See: UN ISDR 2007. Words into Action:A Guide for Implementing the Hyogo Framework. Switerland.

3.4.1 NDMA Guidelines

NDMA has already released guidelines. These guidelines will also be part of guidelines for urban planning and development wherever required, compatible and justified.

Already released

1. Earthquake
2. Floods (urban flood)
3. Cyclones
4. Chemical (Industrial) Disaster
5. Drought
6. Tsunami
7. Chemical (Terrorism) Disaster
8. Nuclear and Radiological Emergencies (Part – I)
9. Biological Disaster
10. Psycho Social support and mental health service in Disaster

On the Anvil

1. Post-Disaster Reconstruction
2. Protection of Heritage Monuments
3. Microfinance and Risk Transfer
4. National Disaster Communication and Information Network
5. Fire Services
6. Minimum Standards of Relief for Food, Water, Medical Cover and Sanitation during Disaster
7. Nuclear Emergencies (Part-II)
8. Community based Disaster Management
9. Urban Planning and Development

3.4.2 SAARC framework on disaster management

With the initiative of the SAARC Disaster Management Centre, a framework on disaster management for the SAARC region has recently been developed (SAARC, 2008). The framework is also aligned with the implementation of the Hyogo Framework for Action. The framework provides a platform for South Asian countries to:

1. Establish and strengthen the regional disaster management system to reduce risks and to improve response and recovery management at all levels.
2. Identify and elaborate country and regional priorities for action.
3. Share best practices and lessons learnt from disaster risk reduction efforts at national level.
4. Establish a regional system to develop and implement regional programmes and projects for early warning.
5. Establish a regional system of mechanism information on prevention, preparedness and management of natural disasters.
6. Create a regional response mechanism dedicated to disaster preparedness, emergency relief and rehabilitation to ensure immediate response.

7. Create a regional mechanism to facilitate monitoring and evaluation of achievements towards goals and strategies.

One of the strategic goals of this framework is to mainstream disaster risk reduction in the development sectors of all member countries.

3.4.3 Expected outputs of the comprehensive framework on DM

The framework has articulated six key expected outputs and priority actions. Key expected outputs of the SAARC comprehensive framework on disaster management include:

1. An efficient disaster management system.
2. Mainstreaming disaster risk reduction into the development policies and practices of the government at all levels.
3. Disaster resilient communities that have enhanced coping capacities in relation to all hazards.
4. Development of policies and programmes that recognise all risks to the communities and mitigation strategies that are based on a risk management assessment.
5. Greater levels of coordination and cooperation at national, regional and international levels.
6. Enhanced information, warning and reporting systems within governments at all levels (IBID, 2008).

Taking into account the recommendations of the HFA and directives of SAARC meetings including the Dhaka Declaration 2005 of the 13th SAARC Summit, the framework envisages the following key priority areas for action:

1. Develop and implement risk reduction strategies which include: development of methodologies and standards for hazard and vulnerability assessment; development of strategies to make right balance across prevention, preparedness, response and recovery (PPRR) programming
2. Establish regional and national response mechanisms
3. Establish a regional sharing and develop network of institutions and organisations including but limited to, the followings:
    a. Mainstreaming and advocacy
    b. Community risk assessment
    c. Geo-information technologies
    d. Research information database
    e. Emergency response management
    f. Networking with relevant national, regional and international systems
4. Develop and implement disaster management training, education, research and awareness programmes
5. Apply ICTs (Information & Communication Technologies) for disaster management
6. Establish an effective monitoring and evaluation mechanisms.

Member countries are also advised to develop individual plans of action to achieve the goals and objectives of this framework. Following HFA strategic goals and priorities for action, South Asian countries have started to mainstream DRR in development policy and planning. Most countries and NGOs in the region are using UNDP/HFA

indicators to measure the process of mainstreaming of DRR in the development programming.

The need for the integration of disaster risk reduction into the development sectors has been recognised by the countries in South Asia only recently. All the countries in South Asia have endorsed the Hyogo Framework for Action 2005-2015 which envisages "integrating disaster risk reduction into development policies and plans at all levels of Government, including poverty reduction strategies and multi-sectoral policies and plans". The countries have recently formulated and adopted the SAARC Comprehensive Framework on Disaster Management, which identifies "mainstreaming disaster risk reduction into development policies and practices of the government at all levels" as one of the key priority areas for developing resilience to disaster in SAARC region (SAARC, 2008).

The second Asian Ministerial Conference on Disaster Risk Reduction, held on 7-8 November 2007 in New Delhi, issued a declaration entitled the "Delhi Declaration on the Hyogo Framework for Action", for the purpose of mainstreaming disaster risk reduction, enhancing early warning system and preparedness, integrating climate change and DRR into recovery and reconstruction and the development of regional mechanisms.

3.4.4 Delhi Declaration and mainstreaming of disaster risk reduction

The Delhi Declaration on mainstreaming of disaster risk reduction calls to:

1. Encourage the national governments to mainstream disaster risk reduction into national sustainable development strategies, plans and programmes in key areas such as poverty eradication, housing, water, sanitation, energy, health, agriculture, education, infrastructure and environment and to ensure that development does not create further disasters.
2. Urge the national governments to further strengthen the legislative frameworks and institutional mechanisms for disaster risk reduction, promote multi-stakeholder coordination through the mechanism of National Platform, develop capacities at the national and local levels through awareness, education and training and strengthen the governance systems for disaster risk reduction, particularly at the local level.
3. Encourage the national governments to place communities at the centre of all aspects disaster risk management through community-based disaster preparedness, mitigation and response.
4. Urge the national governments and scientific, academic and technological institutions to carry out risk assessment as an ongoing process and strengthen the technology-driven initiatives in research and development, early warning and their dissemination, while simultaneously linking scientific knowledge with indigenous coping mechanisms in these areas.
5. Urge the national governments to strengthen financial mechanisms for disaster reduction, including risk transfer and risk finance including innovative approaches in microfinance, micro insurance, etc.

6. Encourage the national governments to make special efforts to mainstream gender issues in disaster risk reduction so as to reduce the vulnerability of women and to recognise the important role women can play in disaster risk reduction.
7. Urge the national governments to integrate disaster risk reduction in school education and make the schools safer for the children as per the Bangkok Action Agenda 2007.
8. Further urge the national governments, the civil society and other stakeholders to develop mechanisms to protect the interests of physically and mentally disabled persons, senior citizens, children, orphans and other vulnerable sections of society and promote social inclusiveness in disaster reduction, including preparedness activities.

3.5. Environmental Management and Disaster Risk Reduction

"Melting glaciers, denuded slopes, expanding deserts – these images of environmental change have long captured public attention". With the threat of global climate change, the environment has moved from casual concern to the forefront of the international agenda. The scale of change is so great that the society must now address the challenges of adapting to an altered environment while at the same time strengthening efforts to prevent further damage. Scientists and decision-makers have only recently recognised the need for policy to tackle the complexity of this interaction. Growing interest in adaptation to climate change is evidence of this realisation. The scientific community now stresses that both the underlying causes of human vulnerability to hazards, and the role of environmental conditions in exacerbating those hazards should be taken into account. The Hyogo Framework for Action (2005), the Millennium Declaration and the UN Millennium Ecosystem Assessment (2006) have different points of departure but come to the similar conclusion that environmental degradation, poverty and disaster risk share common causes as well as common consequences for human security and well-being. They also make clear that ecosystem services, environmental management and environmental information offer opportunities to reduce risk, decrease poverty and achieve sustainable development. In order to support advocacy, capacity-building and training programmes, and to facilitate the design and implementation of environmentally sound solutions to the challenges posed by hazards, there is now an urgent need to effectively communicate the strategic issues linked to addressing the environmental dimensions of disaster risk reduction. The Millennium Declaration recognises the risk to development stemming from disasters and calls on the global community to "intensify our collective efforts to reduce the number and effects of natural hazards and manmade disasters" (UN General Assembly Resolution, 2000). Several studies have recently highlighted the fact that investments in development are in jeopardy unless precautionary action is taken toward reducing disaster risk (DFID, 2005). Yet few development organisations adopt a precautionary approach in the design and management of projects and fewer still recognise the role of environmental management in reducing disaster risk. Environmental degradation, settlement patterns, livelihood choices and behaviour can all contribute to disaster risk, which in turn adversely affects human development and contributes to further environmental degradation. The poorest are the most vulnerable to disasters because

they are often pushed to settle on the most marginal lands and have least access to prevention, preparedness and early warning. In addition, the poorest are the least resilient in recovering from disasters because they lack support networks, insurance and alternative livelihood options.

A comprehensive approach to disaster reduction acknowledges the role of the environment in triggering disasters and protecting communities. At the same time, it recognises that the environment is itself vulnerable to disasters and post-disaster recovery. The potential contributions of environmental management (including environmental science, information, governance and technologies) towards reducing disaster risk. Most importantly, this approach recognises the vital role of environmental managers, whether they live in rural villages or earn their livelihoods in the offices of government buildings. Many of the impacts associated with climate change exacerbate or alter existing hydro meteorological hazards, such as droughts, floods, storms and heatwaves.

Climate change is caused by the anthropogenic emission of greenhouse gases and leads to alterations in global climate patterns with shifts in local precipitation, temperature and weather patterns. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will stress critical ecosystems and lead to water and food shortages this century. Climate change is already evident in many parts of the world. Scientists are careful not to attribute a single event to climate change, but do acknowledge the growing frequency and magnitude of hazards in general. Although climate change can be addressed by limiting activities that cause greenhouse gas emissions, the scientific community agrees that too little has been done so far. People will need to adapt to face the impact from the change that is already unavoidable due to past greenhouse gas emissions. In early 2007, the IPCC confirmed that adaptation to current weather extremes could increase resilience to climate change. The first step towards climate change adaptation is to address existing vulnerabilities to these extremes. It is also important to address the more subtle but ongoing changes in average climatic conditions and climatic variability, which may affect the capacity to deal with hazards. Many of the required climate change adaptation measures, such as early warning systems, risk assessment and the use of sustainable natural resources, are – in practice – disaster risk reduction activities.

The UN Millennium Ecosystem Assessment recognises floods and fires make necessary and valuable contributions to the environment and to human communities. It also draws attention to the significant services that ecosystems provide to human communities in regulating hazards. Ecological conditions not only modify the frequency and magnitude of hazard events, but also affect natural barriers that can moderate the impacts of a disaster and protect communities. Wetland ecosystems function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and floodwaters. Deforestation is often blamed for worsening the effects of flooding while mangroves, dunes and reefs create physical barriers between

communities and coastal hazards. In January 2005, countries at the World Conference on Disaster Reduction adopted the Hyogo Framework for Action (HFA) (ISDR, 2005), which guides disaster risk reduction activities globally. The Hyogo Framework recognises that environmental degradation contributes to disaster risk, and that disasters occur when hazards interact with, among other things, environmental vulnerability. The document urges governments to pursue the "substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries". As such, the Framework recognises both the role of environment as a trigger of disaster risk, and the sensitivity of the environment to the forces of hazards. Human societies cannot be dissociated from the environments that they shape and which in turn influence their development and livelihoods. Together they form a comprehensive system with intrinsic levels of vulnerability and inherent coping mechanisms. The less degraded the environmental component of this system, the lower its overall vulnerability and the higher its coping capacity.

The Hyogo Framework defines "reducing the underlying risk factors" as a Priority for Action and specifically recommends environmental and natural resource management and other efforts that:

1. Encourage the sustainable use and management of ecosystems, including through better land-use planning and development activities to reduce risk and vulnerabilities.
2. Implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction, including structural and non-structural measures, such as integrated flood management and appropriate management of fragile ecosystems.
3. Promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change, which would include the clear identification of climate-related disaster risks, the design of specific risk reduction measures and an improved and routine use of climate risk information by planners, engineers and other decision-makers.

Environmental concerns and opportunities are relevant to the implementation of all disaster risk reduction priorities. The following section looks at the process of environmental management and suggests ways in which environmental managers can engage with disaster managers and other development partners to reduce disaster risk. These opportunities are organised to align with the five 'priority areas for action' outlined in the Hyogo Framework for Action and briefly described below.

3.5.1 HFA Priority 1: Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.

The 2002 World Summit on Sustainable Development sharpened global awareness of the role of governance in reversing environmental degradation. Given that governance and institutions also play a critical role in reducing disaster risk, lessons should be

sought from environmental managers who have, for decades, accumulated experience in mainstreaming an area of concern that cuts across sectoral boundaries and is challenged by pressures to favour short-term gains over long-term security. Good governance is not only a matter of legislation: it is also based on appropriate, effective and flexible institutions. Regulatory frameworks need to be enforced, and the political will to balance competing interests and bring about the many changes that may be necessary must be continually reaffirmed. The creation and strengthening of national mechanisms such as multi-sectoral national platforms, and their integration within international governance mechanisms like conventions, are also important. Key options for improving how institutions address environment and disaster-related issues include fully engaging environmental managers in national disaster risk management mechanisms, and incorporating risk reduction criteria in environmental regulatory frameworks.

3.5.2 HFA Priority 2: Identify, assess and monitor disaster risks and enhance early warning.

Risk information helps answer questions such as where, when, how and why disasters are likely to occur. It comes in many forms, including telemetric data that alert to seismic activity in real time, climate projections that help explain long-term changes, and forecasts that indicate upcoming storms. In addition, risk information also conveys important descriptions of patterns and causes of vulnerability. Monitoring and observation of environmental conditions includes a mix of space- and ground-based systems. Environmental information is also the basis for spatial planning for identifying appropriate buffer zones, land uses or building codes. It feeds into the models, forecasts and projections that help anticipate and reduce risk. Because risk and vulnerability are dynamic, risk and vulnerability assessments must be continuous efforts.

3.5.3 HFA Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

Disasters can be substantially reduced if people are well informed and embrace a culture of prevention. Local communities often maintain vast traditional knowledge on environment and disasters. Universities and other research centers have produced other information for policymakers and operational disaster managers. Still, new technical knowledge of risk reduction, based on environmental principles, needs to be developed. Knowledge of the environmental dimensions of disaster needs to be made available for use in evidence-based analyses, public awareness, political advocacy, operational decisions and educational curricula.

3.5.4 HFA Priority 4: Reduce the underlying risk factors.

Natural resource exploitation, urban development and environmental degradation all directly affect risk. Changes in weather intensities, circulation, hydrology, and sea level brought about by climate change have increased risk. The loss of ecosystems services that regulate floods and fires increases the vulnerability of vast populations in densely populated coastal areas and flood plains. Addressing the factors that create

adverse environmental conditions requires strengthened governance systems, improved education, awareness and capacity-building systems and appropriate technologies based on both scientific advances and traditional knowledge. Environmental management supports risk reduction through protecting and enhancing the ecological conditions that promote resilience and adaptation to a changing climate.

3.5.5 HFA Priority 5: Strengthen disaster preparedness for effective response at all levels.

The coordination of evacuation, search and rescue operations, and provision of relief to survivors relies on contingency plans developed in advance of the disaster event and based on all available risk information. To develop and implement effective plans aimed at saving lives, protecting the environment and property threatened by disaster, all relevant stakeholders must be engaged: multi-stakeholder dialogue is key to successful emergency response. Environmental managers must be prepared to deliver vital services. Damage to industrial facilities and environmental infrastructure can pose immediate risks to survivors and threaten public health. Recovery, if ill-planned, can re-create vulnerabilities, generate new risks and undermine sustainability and security. In both the relief and recovery phases, attention to the environment is first about saving lives and then about livelihoods. Dynamic mechanisms for disaster risk reduction usually demonstrate strong national ownership and leadership of risk reduction activities. Not only should environmental concerns be fully integrated into such measures at the national level, but environment related institutions should also become pillars of efforts to develop broader national systems for disaster risk reduction and sustainable development. Other opportunities include involving environmental managers more closely in the relief and recovery processes that follow disaster events. Despite the environmental implications of disaster risk and vulnerability, and the long-term consequences for sustainable development, the role of environmental managers in disaster reduction, response or recovery has so far been ad hoc. Likewise, disaster managers have given little attention to the environmental aspects of their work and should regularly be engaged in environmental programmes as partners.

Environmental managers have successfully used a number of regulatory frameworks to prevent further environmental degradation by requiring developers to assess the potential environmental impacts of proposed plans and activities. A guidance note prepared by the Prevention Consortium (currently hosted by the International Federation of Red Cross and Red Crescent Societies) on the use of environmental impact assessment (EIA) methodologies as a tool for mainstreaming disaster risk reduction identifies three essential actions as part of the EIA process:

- The environmental assessment process should include collation of data on natural hazard-related risks as a fundamental first step in broader project scoping.
- Systematic analysis of natural hazards and related vulnerability should be undertaken as a Central component of environmental assessment in areas of risk of natural hazards.

- A full impact assessment should be required for certain types of projects in high-risk areas.

In addition to EIAs, a number of instruments are commonly used for country-level environmental analyses. Most notably, strategic environmental analysis (SEA), a methodology for developing concrete inputs to specific policies or plans, has been applied in at least 14 countries in Asia, Latin America, Africa and Central Europe. The Government of Sri Lanka, for example, has recently pursued steps to institutionalise SEAs to review the environmental implications and options available in township development plans and explored the potential for integrating disaster risk concerns in SEA methodologies. Ecological conditions not only modify the frequency and magnitude of hazard events, but also affect natural barriers that can moderate the impacts of a disaster and protect communities. Moreover, maintaining ecosystems to decrease disaster risk can also contribute to the reduction of greenhouse gases and thereby further minimise the risk of future hazard events. Finally, ecosystems managed to support sustainable livelihoods also help to lessen the social, economic and environmental impacts of disasters on communities. Investments in ecosystems can, therefore, lead to significant savings, as compared to the cost of a disaster on human livelihoods. The proliferation of new technologies and processes for managing natural resources, including new knowledge of the ecological, social and cultural dimensions of resource management, presents many opportunities for reducing disaster risk.

While the degree of protection provided by ecosystems depends on a number of factors, social and natural scientists have been working to calculate the 'prevention dividend' of protecting ecosystems services. Consider the following examples:

- A study of the value of conserving upland forests that form the watershed for the Vohitra River in eastern Madagascar estimated the net present value (NPV) of protection benefits at USD 126,700. This value is derived from the reduced costs of flooding and the increased net market value when fewer paddies are damaged by flooding.
- Sri Lanka's Muthurajawela marsh, a coastal peat bog covering some 3,100 ha, plays an important part in local flood control. The marsh significantly buffers floodwaters from the Dandugam Oya, Kala Oya and Kelani Ganga rivers and discharges them slowly into the sea. The annual value of these services was estimated at more than USD 5 million, or USD 1,750 per hectare of wetland area.
- Shoreline stabilisation is also important for inland rivers. In the eastern United Kingdom, the cost of the loss of vegetation along riverbanks was estimated at USD 425 per metre of bank. This is the cost of maintaining artificial bank reinforcement to prevent erosion17.
- In Indonesia, the value of coastal protection afforded by intact mangrove forest is estimated at up to USD 1 million per kilometre.

Upland forests and watersheds: The significant role of forest degradation in the impact of Hurricane Jeanne in Haiti gained widespread media attention and raised public awareness of deforestation as a disaster risk factor. Watershed management

efforts, the most successful of which involve forest communities and include provisions for sustaining local livelihoods, are widespread around the world. Forest management also plays an important role in reducing the risk of devastating wild land fires. Indonesia, Malaysia, China, Russia, Canada and the US have all improved their forest management techniques, for example by minimising debris on the forest floor to reduce fire risk.

Wetlands: Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and floodwaters. Saturated wetlands lose this ability, so maintaining them is vital. In 2005, contracting Parties to the Ramsar Convention on Wetlands issued a new statement on the role of the Convention in disaster prevention, mitigation and adaptation. Among other points, the Convention encouraged its contracting Parties to ensure that wetland ecosystems are managed in such a way as to mitigate the impacts of hazards, for example by impeding floodwaters and tidal surges and providing resilience against drought in arid and semi-arid zones. In the US, the Coastal America Initiative illustrates how government, private sector and other partners can join together to support broad-ranging wetland management efforts.

Coastal forests: There are many examples of coastal forests protecting communities from hazards. In Vietnam, the Red Cross has worked closely with local communities to restore coastal forests as protection against tropical storms. While there is conflicting evidence regarding the role of mangroves in protecting communities against the 2004 Indian Ocean tsunami, it is generally accepted that they provide critical protection against tsunamis of lesser magnitude, storm surges and coastal flooding19. In September 2006, the World Conservation Union, with support from the UN Special Envoy for tsunami recovery, President Bill Clinton, launched the landmark 'Mangroves for the Future' initiative to restore and conserve mangrove forests throughout the tsunami-affected areas.

3.6. Case Studies

i) Vietnam

Vietnam is one of the most typhoon-struck countries in Asia, and the Vietnamese Red Cross is working on disaster mitigation strategies that reduce the vulnerability to the impacts of typhoons of people living and working in the Red River delta – an extensive rice-growing area in northern Vietnam and one of the most densely populated regions in the world. The mudflats of the delta were claimed for agriculture over several centuries by building dykes. Local communities traditionally left a band of natural salt water tolerant mangrove forest between the dykes and the sea in order to help protect the rice fields from waves, wind and typhoon damage. However, the cutting of the mangrove forests for fuel and the spraying of chemical defoliants during the war in the 1970s destroyed most of this natural protection belt. As a result, some of the dykes started to erode, posing an increasing risk to people and their rice fields.

The government and several NGOs campaigned to reforest the coastline and with the support of the International Federation, the Japanese Red Cross Society and the Danish Red Cross, the Vietnamese Red Cross planted more than 175 km² of mangrove forest along almost 200 km of coastline, representing nearly the entire coastline (where natural conditions allowed). Local communities carried out the planting and were granted the right to harvest marine products such as crabs and mussels in the areas they had planted for a number of years. Now that most of the planting has been completed, the Red Cross is focusing its efforts on dyke maintenance, applying other techniques to inland river dykes and developing new activities to support vulnerable people in the area The benefits of the project are significant. In financial terms alone, this mangrove project proves that preparedness and mitigation pay. Indeed, the planting and protection of 12,000 ha of mangroves cost around USD 1.1 million, but helped reduce the cost of dyke maintenance by USD 7.3 million a year. The Red Cross also estimates that 7,750 families improved their livelihoods, and hence their resilience to further hazards, through the selling of crabs, shrimps and mollusks.
(Source: ISDR Report, 2004)

ii) China

Of the world's 10 deadliest natural disasters throughout history, six have occurred in China, including the top 3: the 1931 floods, with a death toll of 1 million-4 million; the 1887 Huang He (Yellow) River flood (0.9 million-2.0 million); and the 1556 Shaanxi earthquake (0.83 million). China has been making disaster management one of its priorities at policy, institutional and operational levels. It has invested in the world's largest flood control project, the dam on the Yangtze River. Meanwhile, work is under way to channel water from the Yangtze River to arid regions prone to drought about 1,000 kilometres to the north. China has been improving its technical systems for monitoring and forecasting disasters, and it has established emergency response plans.

The earthquake on 12 May 2008, the epicentre of which was in Wenchuan County in the south-west of Sichuan Province, ranked as the most devastating disaster in the 59-year history of China. With a magnitude of 8.0 on the Richter scale, the earthquake brought a quake intensity of between VIII and XI to an area of 13,000 square kilometres, in which 29.6 million people live and where most of the casualties occurred. About one third of the 4.56 million people living in the 440,000 square kilometre area impacted by the quake were relocated. By 25 September, the losses had been put at 69,227 deaths, with 17,923 missing and 374,643 hospitalised. In addition, 6.52 million rooms had collapsed in buildings. The city of Beichuan in Beichuan County and the town of Yinxiu in Wenchuan County had been totally razed. Road, electricity, water supply and communications infrastructures were paralysed over large areas, and 154 major roads and five railway lines were broken. Direct economic losses were estimated at a total of $125 billion.

Immediately after the quake, China began high-level response actions, as specified in level I of the National Emergency Response Plan for Earthquake Disasters and the

National Emergency Response Plan for the Relief of Natural Disasters. Within 2½ hours after the quake, China's Premier boarded an aeroplane to the quake-hit areas in his capacity as Director of the newly established Cabinet Headquarters for Earthquake Response. He quickly established eight working groups, which comprised major Government departments, the military and local governments and were responsible for efforts in: field rescue and mitigation; emergency medical treatment and public health; evacuation, displacement and relief; logistics; infrastructure restoration; the restoration of productive capacity; public security; and public relations. The China Earthquake Administration's first field team of 33 persons and a national earthquake emergency rescue team of 183 persons were dispatched to the disaster area. For the first time in history, professional search and rescue teams from abroad joined Chinese rescue efforts, with teams from Japan, the Republic of Korea, the Russian Federation and Singapore coming to the disaster site. Teams from Hong Kong, China and Taiwan Province of China also assisted. In addition, medical assistance teams were sent by the Governments of Cuba, France, Indonesia, Italy, Japan, Pakistan, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland and the United States of America and by the German Red Cross Association.

Following measures were taken for disaster mitigation:

a. Providing services such as reconstruction planning, building design and expert advisory, construction and supervision services;
b. Building and repairing residential buildings and public service facilities such as schools, hospitals, broadcasting and television facilities, and cultural, sports and welfare facilities;
c. Building and repairing infrastructures for services such as roads, water and gas supply, drainage, sewage and garbage disposal;
d. Building and repairing the agricultural infrastructure and providing agricultural technical services;
e. Providing machinery, tools, equipment, building materials and other support goods;
f. Providing teachers and medical personnel, organising training and assisting in the provision of human resources and in job placement;
g. Encouraging investments in industrial and commercial service facilities and in commercial infrastructure development.

(Source: United Nations Economic and Social Council, 2009)

iii) Bangladesh

In Bangladesh, riverbed mud has been used for many years to raise homesteads above annual flood levels. People are encouraged to plant trees around their homesteads to prevent erosion and secure the soil. This small-scale structural mitigation measure is unique to the region. The Asian Disaster Preparedness Centre, together with CARE Bangladesh, has encouraged and supported the continued use of this flood mitigation measure in the municipalities of Tongi and Gaibandha. The project initiated the partnership of local organisations and the municipal disaster management committee.

Participation of key stakeholders, community leaders and members of the community was a vital component of developing a Disaster Risk Management (DRM) plan. The community was engaged to determine their vulnerability with the use of Participatory Rural Appraisal tools. This information was then used to develop a community DRM plan. In addition, mitigation and preparedness activities were identified and implemented in the community. A public awareness campaign was used to inform people of simple household measures they could employ to prepare for annual flooding. Demonstration homesteads were made flood-resistant using the technique of homestead raising, with financial assistance from the project and community contributions. To date, this project has been replicated in four more municipalities around northern Bangladesh. Other organisations also promote and support the use of this indigenous technique in Bangladesh.

(Source: Mainstreaming Hazard Risk Management in Rural Projects, World Bank, 2006)

iv) Ampara, Sri Lanka

Thirty-two per cent of Sri Lanka's estimated 20 million population lives within the coastal zone. Over the past 25 years, a lack of alternative livelihood sources or opportunities coupled with the overexploitation of resources has led to a rapid and significant environmental degradation. A study in 1992 revealed that nearly 44 per cent of the mangroves on the eastern shore were lost during the period 1981 to 1992 whilst 734 ha of salt marsh, which are a natural flood defence, were also destroyed. In addition, the 2004 Asian Tsunami affected heavy losses on coastal vegetation and its biodiversity. Many areas of natural sea defences have been left incapacitated and the displacement of the natural coastline has left the area far more vulnerable to sea level rise and storm inundation. Within the Panama lagoon system approximately 40 per cent of mangroves have suffered heavy damage with total damage occurring within the first 200-300m from the lagoon mouth with partial damage of those 300-500m from the mouth.

In view of the above, the Government of Sri Lanka, including the Central Environment Authority, started promoting the idea of establishing a Green Belt and mangrove vegetation along the coast as it could bring about numerous benefits to the local community and to the coastal environment at large. Sewalanka Foundation has been piloting this initiative aiming at effective restoration and establishment of thick green vegetation (shelter belt) and mangrove vegetation along the lagoon shores and beach plants along the coast.

In Ampara District the local Fisheries Societies and Sewalanka Foundation who had previously worked together gained financial assistance from Diakonie Katastrophenhilfe of Germany to rehabilitate mangroves in three lagoons in 2006. The following are the agencies which are actively involved in this programme:

- Sewalanka Foundation – Executing Agency
- IUCN Sri Lanka –Supporting Research
- Mangrove Action Project – Training and Technical Support

- Diakonie Katastrophenhilfe, Germany - Funder (Disaster Prevention in the Context of Climate
- Change Programme)

(Source: Mangrove Action Project, 2008)

v) Sri Lanka

The Government of Sri Lanka has produced a landmark Road Map for Disaster Risk Management. Its key objectives are to:

- Complement the ongoing policy and legislative efforts with risk identification and reduction strategies;
- Strengthen national- and local-level institutions while paying due attention to Community-based Disaster Risk Management (CBDRM); and
- Consider the different kinds of hazard risks and vulnerabilities across the country, while formulating national- and provincial-level action plans for poverty alleviation and infrastructure development, which will enable the strengthening of local and national governance structures as well as emphasise national and community-based environmental resource management for long-term risk reduction.

The Road Map calls for a broad range of environmental initiatives and provides a plan with environmental management initiatives featuring urgent priorities. These include disaster impact assessments within environmental impact assessments, monitoring changes in hazard risk due to environmental trends, monitoring nuclear radiation, preventing and improving response to oil spills, soft engineering solutions to coastal protection (vegetation belts), solid waste management, and advocating for environmentally sound disaster reduction technologies.

(Source: United Nations Social and Economic Council, 2006)

vi) Gujarat

This case study will look at a community-based disaster mitigation programme that is implemented by the Disaster Mitigation Institute, Ahmedabad, Gujarat, India. This programme focuses on drought-proofing and consists of the following sub-projects:

a) Construction of roof rainwater harvesting tanks in the districts of Kutch, Surendranagar, and Patan in collaboration with Kutch Craft Association (KCA), Banaskantha DWCRA Mahila SEWA Association (BDMSA), and Surendranagar Mahila and Balvikas Mandal;
b) Local capacity-building cycles for local government officials, CBOs, NGOs and community members; and
c) Rainwater harvesting newsletter published in the local language, Gujarati, in collaboration with the distinguished Centre for Science and Environment (CSE) in Delhi.

DMI exists with the mission to mitigate and reduce the impact of disasters risks on communities by raising awareness, helping to establish and strengthen sustainable institutional mechanisms, enhancing knowledge and skills, and facilitating exchange of information, experience and expertise captured through local learning. DMI is an

organisation that has multiple access and presence at grassroots, national and international levels in conducting mitigation programmes for disaster managers.

In places where groundwater is not accessible or not fit for human consumption, and where there are no nearby rivers and lakes, rainwater harvesting provides a viable alternative to transporting water over long distances. Roof rainwater harvesting structures use the roof of a house or shelter as catchment area. Water is collected through a gutter and consequently stored, in an underground tank, for instance. With an average annual rainfall of around 300 mm. a roofing area of 30 square metres provides a family of with 9,000 litres of water, enough for a period of three months.

Roof rainwater harvesting offers a number of important advantages:

1. it is a simple technology and local people can be easily trained to construct and to use this technology while the needed construction materials are mostly locally available;
2. it provides safe drinking water at the doorstep greatly reducing the time women need to spend on collecting drinking water;
3. construction costs are limited (around Rs. 15,000 or US$ 300) whilst running costs are almost negligible;
4. local masons can easily be trained to construct roof rainwater harvesting structures thereby creating employment at the local level.

To construct the roof rainwater harvesting structures DMI collaborated with local membership based organisations such as the Kutch Craft Association (KCA) in Kutch district and Banaskantha DWCRA Mahila SEWA Association (BDMSA) in Patan district. In total, 260 individual structures and six community structures were built. Since November 2001, DMI is publishing a newsletter on rainwater harvesting in the local language, Gujarati, called Jal Shankal. The newsletter is part of a nationwide programme initiated by the CSE to develop successful models for rainwater harvesting and to create a common platform for non-governmental organisations (NGOs), community-based organisations (CBOs) and government to exchange information on rainwater harvesting. However, the need for local, shared and usable information was realised by DMI in its earlier work of drought. Presently, DMI's newsletter is bi-monthly and a total of 1,000 copies are sent to national- and state-level politicians from Gujarat, government administrators of many levels in urban and rural areas, NGOs, CBOs, and people who are actively involved in rainwater harvesting. Partly the newsletter contains articles published by CSE, which are translated by DMI in the local language. However, an increasing part of the newsletter is used to publish the experiences of local individuals and organisations and local water-related news.

(Source: Community Based Disaster Risk Mitigation: A Case Study in the Semi-Arid Areas of Gujarat, 2003)

vii) Maharashtra

The concept of Technical Demonstration Unit (TDU) has been propagated for adoption of earthquake-resistant construction techniques. In Osmanabad, the mason training was combined with the construction of TDU. In association with the Public

Works Department, a five-day Masons' Training Programme on Safe Construction Practices was organised. The resource persons were from from Swayam Sikshan Prayog – an NGO. During this five-day training programme, the masons were exposed to the effects of the earthquake on house, essential features for earthquake resistant construction, quality of materials, etc. The theory was followed by hands-on training in which masons constructed an 18x12 TDU. The masons were given participation certificates. The TDU has been constructed in the District Collectorate campus as every day several thousand people visit different offices located on the campus. All necessary information including the bands, openings in wall, etc regarding the earthquake-resistant constructions have been prominently displayed near the TDU.

On the aegis of the DRM programme an innovative idea of using auto-rickshaws as message carrier was used. The process started with a meeting between the DRM implementing agency of Satara and Regional Transport Office (RTO), Satara district. During the discussions, it was decided that the rear side of auto-rickshaw had a very high visibility and that space was not yet tapped. Moreover, the auto-rickshaw has to visit the RTO for registration. Considering these aspects, it was decided that slogans on disaster awareness theme may be written on the back of the auto-rickshaw.

It is a well-established fact that one of the least expensive yet highly effective preparedness measures is the mass awareness generation. To create awareness among the public about disasters and precautionary measures required to be taken before and at the time of various disasters such as earthquake, flood and fire, screening of dos and don'ts in cinema halls is being undertaken in several cities of the State. In a meeting with city administration, this issue was discussed and administration accepted the idea. Considering the diverse population, slides were prepared in Marathi, Urdu, Hindi and Telugu languages. Simultaneously, a meeting was held with the owners of the cinema halls to obtain their consent to display slides in cinema halls. During this meeting, it was decided that the slides would be screened during intervals. In Bhiwandi city, the slides were made in four languages namely Marathi, Urdu, Hindi and Telugu and are being screened in all 16 cinema halls. In Kolhapur also, the slides are being screened in Marathi. Slide contents are dos and don'ts related to earthquake, flood and fire. A few more cities are in the process of screening the dos and don'ts in the cinema hall situated under their respective jurisdiction for mass awareness generation.

(Source: Relief and Rehabilitation, Govt of Maharashtra Mantralaya, 2008)

4.0 Legal & Institutional Provisions

4.1 Environmental Concerns in DM Act, Policy and Guidelines

In line with the International Strategy for Disaster Reduction's (ISDR) mandate of increasing public awareness to understand risk, vulnerability and disaster reduction globally, the dissemination of clear messages is crucial for the development of disaster reduction programmes at global, regional, national and local levels. International agencies, non-governmental organisations, government representatives, local decision-makers, scientists, educators and local communities all have the opportunity to participate in the World Disaster Reduction Campaign, bringing each of their complementary roles and responsibilities, generating more widespread commitment and understanding to disaster reduction. Organised by the Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR), the overarching goal of the annual World Disaster Reduction Campaign is to raise awareness through an interactive movement in which different parties are engaged, to create social pressure and change peoples' perceptions towards reducing the risks and vulnerabilities to the negative impacts of natural hazards.

By bringing together diverse experiences and initiatives taking place worldwide, more people learn about disaster reduction, which can ultimately lead to changed perceptions and behaviours, such as the organisation of educational community gatherings to design risk maps, school classes on what to do in the event of a disaster, training opportunities for disaster reduction practitioners and the development of national disaster management policies. The Campaign builds momentum throughout the year, culminating in the International Day for Natural Disaster Reduction, whereby it is celebrated internationally by global organisations, regional institutions and local communities alike. Celebrations of the Day bring together representatives of all facets of society, such as national governments, local emergency volunteers, school children and journalists. Natural disasters can affect us all, wherever and whoever we may be. In keeping with the International Year of Freshwater, ISDR's 2003 World Disaster Reduction Campaign looks at how we can cope with water-related hazards. Hydrometeorological hazards (such as floods, droughts, landslides, tropical cyclones, hurricanes and typhoons) are noticeably on the rise, affecting more communities than ever due to human activities that increase vulnerability and change the natural balance of ecosystems. This is why disaster reduction needs to be successfully incorporated into the broader goals of sustainable development to enable the building of disaster resilient communities.

While the statistics on the impacts of disasters are sobering enough to make us appreciate the extent of their impacts -- including shocking death counts, costs and figures based on economic, social, property losses -- it seems that few of us have actually taken steps to act upon this knowledge to adequately protect ourselves against the risk of disaster. Today, hydro meteorological hazards are having a greater impact due to human activities that increase vulnerability and change the natural balance of

ecosystems, interfering more than ever with the natural surroundings that make our world a livable home. In addition to this worrying trend, water-related disasters are predicted to increase both in frequency and intensity due to climate change, environmental degradation, and phenomena such as the El Niño Southern Oscillation, affecting the patterns and intensity of natural hazards. This is precisely the reason why sustainable development, along with the international strategies and instruments aiming at poverty reduction and environmental protection, must take into account the risk of natural hazards and their impacts. Sustainable development is not possible without addressing vulnerability to natural hazards; it is in fact a crosscutting concern related to the social, economic, environmental and humanitarian sectors. Water-related disasters -- too much or too little water -- have major impacts on the well-being of countries in all of these sectors, and appropriate policies for the assessment of risk and vulnerability, strategies to reduce and share risk, as well as strengthened preparedness, early warning and response measures are essential for the successful incorporation of disaster reduction into sustainable development. Disaster reduction includes the activities taken to assess and reduce both vulnerable conditions and, when possible, the impact of the hazard especially when addressing droughts, floods and landslides (UNISDR, 2003).

The Secretariat of the International Strategy for Disaster Reduction (UN/ISDR), which falls under the direct authority of the Under-Secretary-General for Humanitarian Affairs, was established together with the United Nations Inter-Agency Task Force (IATF) on Disaster Reduction, as the international mechanisms to coordinate the development and implementation of the ISDR. Based on the lessons drawn from the International Decade for Natural Disaster Reduction (IDNDR, 1990-99), four overriding objectives have been identified as the guiding principles of the International Strategy for Disaster Reduction. These overall objectives provide broad guidelines for action by national governments, civil society organisations, regional institutions and international organisations:

Obtaining political commitment from public authorities. This objective needs to be addressed through increased inter-sectoral coordination at all levels, the adoption of risk management strategies and the allocation of appropriate resources, including the development of new funding mechanisms. Disaster reduction should be dealt with as a primary policy issue for which public authorities should assume responsibility and should be pursued as a crosscutting issue aimed at ensuring policy integration among various sectors and across topics such as agriculture, food security, health and education.

Increasing public awareness and public participation to reduce vulnerability to hazards. This involves programmes related to formal and non-formal education and should be addressed through public information, education and multidisciplinary professional training. The media, schools and higher education systems, as well as

organisations such as the Red Cross and Red Crescent and locally based NGOs around the world, have a crucial role to play.

Fostering better understanding and knowledge of the causes of disasters through the transfer and exchange of experiences and by providing greater access to relevant data and information. The issues to be addressed in this context are: the assessment and analysis of gender-specific socio-economic impact of disasters; the construction of databases on disasters; the formulation of suitable coping strategies for different social groups; the introduction of early warning systems; and the promotion of relevant scientific research, which takes into account both indigenous or traditional knowledge and the development and transfer of new knowledge and technologies. Efforts to link natural resource management with disaster reduction should also be encouraged.

Stimulating interdisciplinary and intersectional partnerships and the expansion of risk reduction networking amongst governments at national and local levels, greater involvement of the private sector, academic institutions, the Red Cross and Red Crescent Societies, NGOs and community-based organisations (CBOs). This will require effective coordination mechanisms, such as appropriate institutional arrangements for disaster management, preparedness, emergency response and early warning, as well as the incorporation of disaster reduction concerns in national planning processes.

Building on the legacy of the International Decade for Natural Disaster Reduction (1990-1999) and the Action Plan adopted at the First World Conference on Natural Disaster Reduction held in Yokohama in 1994, the World Summit on Sustainable Development provided the opportunity for the conceptual integration of disaster reduction within the agenda of sustainable development. Disaster risk reduction was therefore an emerging issue taken into consideration during the preparatory phase of WSSD. The outcome of the World Summit on Sustainable Development brought more relevance and commitment towards disaster reduction and a multi-hazard approach to reduce risk and vulnerability, within the context of sustainable development, through:

1. The political statement adopted by Heads of State at the WSSD acknowledges that today, the impacts of natural disasters are more frequent and more devastating, with developing countries more vulnerable to hazards than ever before. The challenge, therefore, lies in recognising the severe threat that natural disasters pose to sustainable development, and requires immediate attention at the global, regional and local levels.

2. The Plan of Implementation, which includes commitments related to disaster and vulnerability reduction and improved early warning capacities under the sections of protecting and managing the natural resource base of economic and social development, Africa, small island developing States and means of implementation.

3. A set of initiatives and partnerships, which support the implementation of the areas committed to, were launched during the WSSD. Partnerships already under way, in support of the ISDR objectives, include: integrating early warning and disaster risk management into the sustainable development agenda and practice; regional partnerships for Central America and SIDS for increased coping capacities to confront and reduce vulnerability to natural hazards; resilient cities; and environmental emergency preparedness.

4.2 Environment Related Policies in India and DRR Concerns

4.2.1 Environment Policy

The National Environment Policy, 2006, is the outcome of extensive consultations with experts in different disciplines, Central Ministries, Members of Parliament, State Governments, Industry Associations, Academic and Research Institutions, Civil Society, NGOs and the Public. The present national policies for environmental management contained in National Forest Policy, 1988, National Conservation Strategy and Policy Statement on Environment and Development, 1992, Policy Statement on Abatement of Pollution, 1992, National Agriculture Policy, 2000, National Population Policy, 2000, National Water Policy, 2002 have also contributed towards environmental management. All of these policies have recognised the need for sustainable development in their specific contexts and formulated necessary strategies to give effect to such recognition. The National Environment Policy seeks to extend the coverage, and fill in gaps that still exist, in light of present knowledge and accumulated experience. It does not displace, but builds on the earlier policies.

The principal Objectives of this policy are enumerated below. These Objectives relate to current perceptions of key environmental challenges. They may, accordingly, evolve over time:

4.2.1.1. Conservation of Critical Environmental Resources:

To protect and conserve critical ecological systems and resources, and invaluable natural and manmade heritage, which are essential for life support, livelihoods, economic growth, and a broad conception of human well-being.

4.2.1.2. Intra-generational Equity: Livelihood Security for the Poor:

To ensure equitable access to environmental resources and quality for all sections of society, and in particular, to ensure that poor communities, which are most dependent on environmental resources for their livelihoods, are assured secure access to these resources.

4.2.1.3. Inter-generational Equity:

To ensure judicious use of environmental resources to meet the needs and aspirations of the present and future generations.

4.2.1.4. Integration of Environmental Concerns in Economic and Social Development:

To integrate environmental concerns into policies, plans, programmes and projects for economic and social development.

4.2.1.5. Efficiency in Environmental Resource Use:

To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output, to minimise adverse environmental impacts.

4.2.1.6. Environmental Governance:

To apply the principles of good governance (transparency, rationality, accountability, reduction in time and costs, participation, and regulatory independence) to the management and regulation of use of environmental resources.

4.2.1.7. Enhancement of Resources for Environmental Conservation:

To ensure higher resource flows, comprising finance, technology, management skills, traditional knowledge, and social capital, for environmental conservation through mutually beneficial multi-stakeholder partnerships among local communities, public agencies, the academic and research community, investors, and multilateral and bilateral development partners.

4.3. Agriculture Policy

Agriculture is a way of life, a tradition, which, for centuries, has shaped the thought, the outlook, the culture and the economic life of the people of India. Agriculture, therefore, is and will continue to be central to all strategies for planned socio-economic development of the country. Rapid growth of agriculture is essential not only to achieve self-reliance at national level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels. Indian agriculture has, since Independence, made rapid strides. In taking the annual food grains production from 51 million tonnes in early fifties to 206 million tonnes at the turn of the century, it has contributed significantly in achieving self-sufficiency in food and in avoiding food shortages.

Over 200 million Indian farmers and farm workers have been the backbone of India's agriculture. Despite having achieved national food security, the well-being of the farming community continues to be a matter of grave concern for planners and policymakers. The establishment of an agrarian economy which ensures food and nutrition to India's billion people, raw materials for its expanding industrial base and surpluses for exports, and a fair and equitable reward system for the farming community for the services they provide to the society, will be the mainstay of reforms in the agriculture sector.

The National Policy on Agriculture seeks to actualise the vast untapped growth potential of Indian agriculture, strengthen rural infrastructure to support faster agricultural development, promote value addition, accelerate the growth of agro-business, create employment in rural areas, secure a fair standard of living for the farmers and agricultural workers and their families, discourage migration to urban

areas and face the challenges arising out of economic liberalisation and globalisation. Over the next two decades, it aims to attain:
The salient features of the new agricultural policy are:

1. Over 4 per cent annual growth rate aimed over next two decades.
2. Greater private sector participation through contract farming.
3. Price protection for farmers.
4. National agricultural insurance scheme to be launched.
5. Dismantling of restrictions on movement of agricultural commodities throughout the country.
6. Rational utilisation of country's water resources for optimum use of irrigation potential.
7. High priority to development of animal husbandry, poultry, dairy and aquaculture.
8. Capital inflow and assured markets for crop production.
9. Exemption from payment of capital gains tax on compulsory acquisition of agricultural land.
10. Minimise fluctuations in commodity prices.
11. Continuous monitoring of international prices.
12. Plant varieties to be protected through a legislation.
13. Adequate and timely supply of quality inputs to farmers.
14. High priority to rural electrification.
15. Setting up of agro-processing units and creation of off-farm employment in rural areas.

4.4. Water Policy

Water is a prime natural resource, a basic human need and a precious national asset. Planning and development of water resources need to be governed by national perspectives.

It has been estimated that out of the total precipitation of around 400 million hectare metres in the country, the surface water availability is about 178 million hectare metres. Out of this, about 50 per cent can be put to beneficial use because of topographical and other constraints. In addition there is a groundwater potential of about 42 million hectare metres. The availability of water is highly uneven in both space and time. Precipitation is confined to only about three of four months in the year and varies from 10 cm in the western parts of Rajasthan to over 1,000 cm at Cherrapunjee in Meghalaya. Further, water does not respect state boundaries. Not merely rivers but even underground aquifers often cut across state boundaries. Water as a resource is one and indivisible: rainfall, river waters, surface ponds and lakes and groundwater are all part of one system, water is also a part of larger ecological system.

Floods and drought-affected vast areas of the country transcend state boundaries. A third of the country is drought-prone. Floods affect an average area of around 9 million hectares per year. According to the National Commission on floods, the area

susceptible to floods is around 40 million hectares. The approach to the management of drought and floods has to be coordinated and guided at the national level.

Even the planning and implementation of individual irrigation or multi-purpose projects, though done at the state level, involve a number of aspects and issues such as environmental protection, rehabilitation of project-affected people and livestock, public health consequences of water impoundment, dam safety, etc. On these matters, common approaches and weaknesses have affected a large number of projects all over the country. There have been substantial time and cost overruns on projects. In some irrigation commands, problems of waterlogging and soil salinity have emerged, leading to the degradation of good agricultural land. There are also complex problems of equity and social justice in regard to water distribution. The development and exploitation of the country's groundwater resources also give rise to questions of judicious and scientific resource management and conservation. All these questions need to be tackled on the basis of common policies and strategies.

The growth process and the expansion of economic activities inevitably lead to increasing demands for water for diverse purpose: domestic, industrial, agricultural, hydro-power, navigation, recreation, etc. So far, the principal consumptive use of water has been for irrigation. While the irrigation potential is estimated to have increased from 19.5 million hectares at the time of Independence to about 68 million hectares at the end of Sixth Plan, further development of a substantial order is necessary if the food and fiber needs of a growing population are to be met. The country's population which is over 750 million at present is expected to reach a level of around 1,000 million by the turn of the century.

The production of food grains has increased from around 50 million tonnes in the fifties to about 150 million tonnes at present, but this will have to be raised to around 240 million tonnes in the coming year. The drinking water needs of people and livestock have also to be met. In keeping with the objective of the International Drinking Water Supply and Sanitation Decade Programme (1981-1991), adequate drinking water facilities have to be provided to the entire population in both urban and rural areas and sanitation facilities to 80 per cent of the urban population and 25 per cent of the rural population by the end of the decade. Domestic and industrial water needs have largely been concentrated in or near the principal cities, but the demand from rural society is expected to increase sharply as the development programmes improve economic conditions in the rural areas. The demand for water for hydro and thermal power generation and for other industrialises is also likely to increase substantially. As a result, water which is already a scarce resource will become even scarcer in future. This underscores the need for the utmost efficiency in water utilisation and a public awareness of the importance of its conservation.

Another important aspect is water quality. Improvements in existing strategies and the innovation of new techniques resting on a strong science and technology base will be needed to eliminate the pollution of surface and groundwater resources, to improve

water quality and to step up the recycling and re-use of water. Science and technology and training have also important roles to play in water resources development in general.

Water is one of the most crucial elements in developmental planning. As the country prepares itself to enter the 21st century, efforts to develop, conserve, utilise and manage this important resource have to be guided by national perspectives. The need for a national water policy is thus abundantly clear: water is a scarce and precious national resource to be planned, developed and conserved as such, and on an integrated and environmentally sound basis, keeping in view the needs of the State concerned.

For effective and economical management of our water resources, the frontiers of knowledge need to be pushed forward in several directions by intensifying research efforts in various areas, including the following:

- Hydro-meteorology
- Assessment of water resources;
- Snow and lake hydrology;
- Groundwater hydrology and recharge;
- Prevention of salinity ingress;
- Water harvesting;
- Evaporation and seepage losses;
- Economical designs for water resource projects;
- Crops and cropping systems;
- Sedimentation of reservoirs;
- The safety and longevity of water-related structures;
- River morphology and hydraulics;
- Soil and materials research;
- Better water management practices and improvements in operational technology
- Recycling and re-use;
- Use of sea water resources;

4.5. Forest Policy

In Resolution No.13/52/F, dated the 12th May, 1952, the Government of India in the erstwhile Ministry of Food and Agriculture enunciated a Forest Policy to be followed in the management of State Forests in the country. However, over the years, forests in the country have suffered serious depletion. This is attributable to relentless pressures arising from ever-increasing demand for fuel wood, fodder and timber; inadequacy of protection measures; diversion of forest lands to non-forest uses without ensuring compensatory afforestation and essential environmental safeguards; and the tendency to look upon forests as revenue earning resource. The need to review the situation and to evolve, for the future, a new strategy of forest conservation has become imperative. Conservation includes preservation, maintenance, sustainable utilisation, restoration,

and enhancement of the natural environment. It has thus become necessary to review and revise the National Forest Policy.

The basic objectives that should govern the National Forest Policy are the following:

- Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country.
- Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country.
- Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs in the "interest of soil and water conservation, for mitigating floods and droughts and for the retardation of siltation of reservoirs".
- Checking the extension of sand dunes in the desert areas of Rajasthan and along the coastal tracts.
- Increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.
- Meeting the requirements of fuel wood, fodder, minor forest produce and small timber of the rural and tribal populations.
- Increasing the productivity of forests to meet essential national needs.
- Encouraging efficient utilisation of forest produce and maximising substitution of wood.
- Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests.

The principal aim of Forest Policy must be to ensure environmental stability and maintenance of ecological balance, including atmospheric equilibrium, which are vital for sustenance of all life forms -- human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim.

4.6. Land-use policy

Land policy in India has been a major topic of government policy discussions since pre-Independence days. The peasants of the country strongly backed the independence movement and the "Land to the Tiller" policy of the Congress Party because of the prevailing agrarian conditions. The agrarian structure during British administration emerged with a strong historical background (Baden Powel, 1974; Dutt, 1976; Appu, 1996). The land revenue system implemented by Todar Mal during Akbar's regime can be traced as the possible beginning of systematic efforts to manage the land. This method incorporated measurement, classification and fixation of rent as its main components. Under the various pre-British regimes, land revenues collected by the state confirmed its right to land produce, and that it was the sole owner of the land. The British rulers took a cue from this system and allowed the existence of non-cultivating intermediaries. The existence of these parasitic intermediaries served as an

economic instrument to extract high revenues (Dutt, 1947) as well as sustaining the political hold on the country. Thus at the time of Independence, the agrarian structure was characterised by parasitic, rent-seeking intermediaries, different land revenue and ownership systems across regions, small numbers of land holders holding a large share of the land, a high density of tenant cultivators, many of whom had insecure tenancy, and exploitative production relations (Appu, 1996).

Immediately after Independence, a Committee, under the Chairmanship of the late Shri J. C. Kumarappa (a senior Congress leader), was appointed to look into the problem. The Kumarappa Committee's report recommended comprehensive agrarian reform measures. India's land policy in the decades immediately following its independence was dominated by legislative efforts to address the problems identified by the Kumarappa Committee (NCA, 1976; Joshi, 1987). A substantial volume of legislation was adopted, much of it flawed and little of it seriously implemented.

Several important issues confronted the policymakers.

- Land was concentrated in the hands of a few and there was a proliferation of intermediaries who had no vested interest in self-cultivation. Leasing out land was a common practice.
- The tenancy contracts were expropriative in nature and tenant exploitation was ubiquitous.
- Land records were in extremely bad shape giving rise to a mass of litigation. It is ironic that the Supreme Court of India in 1989 commented that the revenue records are not legal documents of title (Wadhwa, 1989). This is a sad commentary on the land records of the country.
- It is against this background that land policy has been shaped in India. While land reform legislation remained active, land policies in more recent decades have focused less on land reform and more on land development and administration.

Land policy in India has undergone broadly four phases since Independence.

- The first and longest phase (1950-72) consisted of land reforms that included three major efforts: abolition of the intermediaries, tenancy reform, and the redistribution of land using land ceilings. The abolition of intermediaries was relatively successful, but tenancy reform and land ceilings met with less success.
- The second phase (1972-85) shifted attention to bringing uncultivated land under cultivation.
- The third phase (1985 - 95) increased attention towards water and soil conservation through the Watershed Development, Drought-Prone Area Development (DPAP) and Desert-Area Development Programmes (DADP). A central government Wasteland Development Agency was established to focus on wasteland and degraded land. Some of the land policy from this phase continued beyond its final year.
- The fourth and current phase of policy (1995 onwards) centres on debates about the necessity to continue with land legislation and efforts to improve land revenue administration and, in particular, clarity in land records.

4.7. Urban sanitation Policy

Sanitation is defined as safe management of human excreta, including its safe confinement treatment, disposal and associated hygiene-related practices. While this policy pertains to management of human excreta and associated public health and environmental impacts, it is recognised that integral solutions need to take account of other elements of environmental sanitation, i.e. solid waste management; generation of industrial and other specialised/hazardous wastes; drainage; as also the management of drinking water supply.

According to Census 2001, 27.8 per cent of Indians, i.e. 286 million people or 55 million households, live in urban areas1 – projections indicate that the urban population would have grown to 331 million people by 2007 and to 368 million by 2012. 12.04 million (7.87 per cent) urban households do not have access to latrines and defecate in the open. 5.48 million (8.13 per cent) urban households use community latrines and 13.4 million households (19.49 per cent) use shared latrines. 12.47 million (18.5 per cent) households do not have access to a drainage network. 26.83 million (39.8 per cent) households are connected to open drains. The status in respect of the urban poor is even worse. The percentage of notified and non-notified slums without latrines is 17 per cent and 51 per cent respectively. In respect of septic latrines the availability is 66 per cent and 35 per cent. In respect of underground sewerage, the availability is 30 per cent and 15 per cent respectively. More than 37 per cent of the total human excreta generated in urban India, is unsafely disposed**.**

This imposes significant public health and environmental costs to urban areas that contribute more than 60 per cent of the country's GDP. Impacts of poor sanitation are especially significant for the urban poor (22 per cent of total urban population), women, children and the elderly. The loss due to diseases caused by poor sanitation for children under 14 years alone in urban areas amounts to Rs 500 crore at 2001 prices (Planning Commission-United Nations International Children Emergency Fund, UNICEF, 2006). Inadequate discharge of untreated domestic/municipal wastewater has resulted in contamination of 75 per cent of all surface water across India. The Millennium Development Goals (MDGs) enjoin upon the signatory nations to extend access to improved sanitation to at least half the urban population by 2015, and 100 per cent access by 2025. This implies extending coverage to households without improved sanitation, and providing proper sanitation facilities in public places to make cities free from open defecation.

In order to achieve the above Vision, following key policy issues must be addressed:

■ **Poor Awareness**: Sanitation has been accorded low priority and there is poor awareness about its inherent linkages with public health.

■ **Social and Occupational Aspects of Sanitation**: Despite the appropriate legal framework, progress towards the elimination of manual scavenging has shown limited

success. Little or no attention has been paid towards the occupational hazard faced by sanitation workers daily.

■ **Fragmented Institutional Roles and Responsibilities**: There are considerable gaps and overlaps in institutional roles and responsibilities at the national, state, and city levels.

■ **Lack of an Integrated City-wide Approach**: Sanitation investments are currently planned in a piecemeal manner and do not take into account the full cycle of safe confinement, treatment and safe disposal.

■ **Limited Technology Choices**: Technologies have been focused on limited options that have not been cost-effective, and sustainability of investments has been in question.

■ **Reaching the Un-served and Poor**: Urban poor communities as well other residents of informal settlements have been constrained by lack of tenure, space or economic constraints, in obtaining affordable access to safe sanitation. In this context, the issues of whether services to the poor should be individualised and whether community services should be provided in non-notified slums should be addressed.

However, provision of individual toilets should be prioritised. In relation to "Pay and Use" toilets, the issue of subsidies inadvertently reaching the non-poor should be addressed by identifying different categories of urban poor.

■ **Lack of Demand Responsiveness**: Sanitation has been provided by public agencies in a supply-driven manner, with little regard for demands and preferences of households as customers of sanitation services.

The overall goal of this policy is to transform Urban India into **community-driven, totally sanitised, healthy and liveable cities and towns.**

The specific goals are:

A. Awareness Generation and Behaviour Change

a. Generating awareness about sanitation and its linkages with public and environmental health amongst communities and institutions;

b. Promoting mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices;

B. Open Defecation Free Cities

Achieving Open Defecation Free Cities

All urban dwellers will have access to and use safe and hygienic sanitation facilities and arrangements so that no one defecates in the open. In order to achieve this goal, the following activities shall be undertaken:

a. Promoting access to households with safe sanitation facilities (including proper disposal arrangements);

b. Promoting community-planned and managed toilets wherever necessary, for groups of households who have constraints of space, tenure or economic constraints in gaining access to individual facilities;

c. Adequate availability and 100 per cent upkeep and management of Public Sanitation facilities in all Urban Areas, to rid them of open defecation and environmental hazards;

C. Integrated City-Wide Sanitation

Re-Orienting Institutions and Mainstreaming Sanitation

a. Mainstream thinking, planning and implementing measures related to sanitation in all sectors and departmental domains as a cross-cutting issue, especially in all urban management endeavours;

b. Strengthening national, state, city and local institutions (public, private and community) to accord priority to sanitation provision, including planning, implementation and O&M management;

c. Extending access to proper sanitation facilities for poor communities and other unserved settlements.

4.8. Environment Legislation in India

4.8.1 Related to protection and conservation

1) The Environment (Protection) Act, 1986.
2) The National Environment Appellate Authority Act, 1997.
3) The National Environment Tribunal Act, 1995.
4) The Prevention of Cruelty to Animals Act, 1960.
5) The Indian Wildlife (Protection) Act, 1972.
6) The Wildlife (Protection) Amendment Act, 2002.
7) The Indian Forest Act, 1927.
8) Forest (Conservation) Act, 1980.
9) Biological Diversity Act, 2002.

4.8.2 Related to pollution and waste

1) The Water (Prevention and Control of Pollution) Cess Act, 1977.
2) The Water (Prevention and Control of Pollution) Act, 1974.
3) The Air (Prevention and Control of Pollution) Act 1981.
4) The Public Liability Insurance Act, 1991.

4.8.3 Related to safety and emergency

1) The Public Liability Insurance Act, 1991.

5.0 Climate Change: Mitigation and Adaptation for DRR

5.1 Climate Change in India

Climate change in India represents an additional stress on ecological and socioeconomic systems that are already facing tremendous pressures due to rapid urbanisation, industrialisation, and economic development. (UK-India Joint Study: Investigating the impacts of climate change in India, Department for Environment, Food & Rural Affairs)

The cost of climate change in India…could be as high as a 9-13 per cent loss in GDP by 2100 compared with what could have been achieved in a world without climate change. (Stern Review)

By 2100, climate change could cause an additional 145 million people to be living on less than $2 a day in South Asia and sub-Saharan Africa (100 million people and 45 million people respectively). (Stern Review)

Climate change is a global problem affecting countries regardless of their income status. However, for poorer states the economic and social impacts will be worse due to the increased vulnerability of their populations and limited capacity for adaptation.[9] Certain factors make India particularly susceptible to the effects of global warming. These include its large and growing population, which is fuelling increased demand for climate-sensitive natural resources such as water and forests; a long, densely-populated coastline (7,500 km), which will increase the impact of sea level rises and worsening natural disasters; and the importance of agriculture for the country's economy (it employs about 60 per cent of the workforce) and food security. At the same time, the country's exponential economic growth and rising levels of consumption have resulted in large increases in energy production and use, and consequently greenhouse gas emissions. Now the world's fifth largest CO_2 emitter, international calls are growing for India to join a post-Kyoto framework for emissions reductions.

The aim of this paper is to spark off a debate within CA and with our Indian partners about the contribution we can make on the issue of climate change in India. The intention is not to duplicate the UK campaign but instead to (i) enrich it with examples from of the world's largest developing nations and (ii) expand on it via a national campaign in the South. Sections 1 to 4 set out some of the main challenges for India in relation to impacts, adaptation and mitigation. This includes a section on India's energy policies and consumption patterns, which are important for the debate on emissions (I term this the 'development paradox'). Section 5 explores the question of which themes a campaign could focus on. Sections 6 and 7 relate more to the mechanics of the campaign – these sections will be completed after further consultation with CA staff in London and Delhi, and also partners.

[9] For example, there are more deaths due to natural disasters in poorer states due to less advanced prevention and early-warning systems and also the greater number of poor people living in high risk areas.

A number of reports have already been published which analyse the expected impact of climate change in India. These include the Indian Government's 2004 national communication to the UNFCCC[10], the Stern Review, and a collaborative research initiative between the British and Indian governments that was completed in 2005. All of these present credible evidence of a severe impact on Indian society from climate change in this century. For instance, the Stern Review reported that it could result in a maximum loss of 9-13 per cent in India's GDP by 2100.

5.2 Climate Change impacts on disaster and vulnerability

Some of the most important likely climatic effects are[11]:

- Temperatures are projected to increase by 3-4°C by 2100. Warming will be widespread across all parts of the country but will be more pronounced in the north.
- Rainfall will become heavier, but it will also rain on fewer days of the year in some parts of the country (eg. centre and north-west). Both these facts suggest an increased likelihood of flooding and drought (see also below monsoon patterns).
- Extreme weather events, such as rainstorms, floods and heatwaves will become more common.
- There does not appear to be a consensus yet regarding the effects of climate change on water flows in India's main rivers.[12] However, the rapid melting of the Himalayan glaciers is going to have dramatic effects on the dry season flows in India's northern rivers, where meltwater from snow and ice contributes up to 85 per cent of the total flow. This could be reduced to about 30 per cent of its current contribution over the next 50 years due to glacial retreat and climate change.[13] It would mean in effect that rivers such as the Ganges would become seasonal rivers. 400 million people currently rely on this river's water for their survival.
- Within 50 years, 70 per cent of vegetation is likely to find itself 'less than optimally adapted to its existing location' and the impact of climate change on forest ecosystems could be 'irreversible'.

5.3 Climate Change mitigation actions in India

Maintaining a high growth rate is essential for increasing living standards of the vast majority of the people and reducing their vulnerability to the impacts of climate change. In order to achieve a sustainable developmental path that simultaneously advances economic and environmental objectives, the National Action Plan for Climate Change (NAPCC) will be guided by the following principles:

1. Protecting the poor and vulnerable sections of the society through an inclusive and sustainable development strategy, sensitive to climate change.

[10] www.unfccc.org/resource/docs/natc/indnc1.pdf
[11] Facts and figures from the Initial National Communication to the UNFCCC (2004) and from the UK-India Joint Study (2005), unless otherwise indicated.
[12] Eg. The national communication said that flows would decline in most rivers, while the Indian Institute of Tropical Meteorology reported the opposite for the Ganges, Krishna and Godavari.
[13] Stern, p.104

2. Achieve national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gases emissions.

3. Devising efficient and cost-effective strategies for end use Demand Side Management.
2. Deploying appropriate technologies for both adaptation and mitigation of greenhouse gases emissions extensively as well as at an accelerated place.
3. Engineering new and innovative forms of market, regulatory and voluntary mechanisms to promote sustainable development.
4. Effecting implementation of programmes through unique linkages, including with civil society and local government institutions and through public-private-partnership.
5. Welcoming international cooperation for research, development, sharing and transfer of technologies enabled by additional funding and a global IPR regime that enables technology transfer to developing countries under the UNFCC.

5.4 Climate Change adaptation in India

Climate Change Adaptation (CCA) as defined by UNISDR is "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." CCA is a long-term strategy, which focuses on increasing social capacity and physical infrastructure to address the changes of a future climate. Climate change is an increasingly important topic gaining attention at last among governments and international organisations. Though governments and international organisations still primarily focused on climate change mitigation, the field of CCA continues to grow as we have started to realise that we are unable to fully mitigate the effects of climate change.

Though the CCA field is growing in terms of the number of groups participating and funding available, it is a vast complex field that requires effective actions to prioritise and respond to the growing issues. As stated in the Hyogo Framework for Action (HFA) and referenced in the UNISDR 2008 Briefing Note 1 on CCA and DRR, it is important to "promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change CCA and DRR require long-term strategies with upfront investment to properly prepare and minimise future risk of disasters. Both focus on taking proactive steps towards reducing risks and adapting instead of simply responding to events. It is necessary to assure that DRR policies and programmes operate in synergy with CCA strategies from the local to the national and international level. Conceptually, it makes sense that DRR is a means for CCA; however, this does not always transfer to the operational level. According to UNISDR, (2009a), "environment authorities usually have responsibility for climate change adaptation, whereas authorities for disaster management, civil defence and home affairs typically have responsibility for disaster risk reduction". This is a misinterpretation of the principles behind CCA and DRR, and in the future there needs to be greater collaboration between the respective parties.

5.5 Integration of Climate Change Adaptation with DRR

The study primarily considered the flow of information from researchers to policymakers and the way in which the decision-making process in climate adaptation and risk reduction is commonly managed. The study looked into practical cases of European regional and national adaptation strategies and specific projects and initiatives addressing climate adaptation and DRR. Based on the literature and cases reviewed, a critical analysis of the key elements of good governance of CCA and DRR in Europe is proposed.

Specific steps and tasks followed in the course of the research were as follows:

- Information and data collection from relevant literature (EC, UNISDR, EUR-OPA, etc.) on ongoing activities that in Europe address CCA and DRR.
- A desk review of the current European policy frameworks related to CCA (e.g. EU White Paper, EU Water Framework Directive, etc.) and main international policy agreements (e.g. Hyogo Framework for Action – HFA).
- Review a sample of the ongoing FP7 projects addressing climate risk modeling, CCA and DRR.
- Mapping of the organisations (international/regional organisations, governmental organisations, academia, National Platforms, NGOs, etc.), which at the European level are involved in implementing adaptation and DRR programmes and projects providing information on their main current activities, how and from where these institutions/organisations get their climate and risk information, and from where they receive resources.
- Interviewing relevant key informants (FP7 project coordinators, EUR-OPA specialised centres managers, international and regional organisation officers, governmental officers, academia representatives, etc.) to collect information and data relevant to the study's objective.

This study looks at the major players in CCA and DRR at the European level. And it frameworks in the field of CCA and DRR:

1. Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters
2. The EU's White Paper 'Adapting to Climate Change: Towards a European framework for action'.
3. Cancun Adaptation Framework, Part of the Cancun Agreements at the 2010 Climate Change Conference in Cancun, Mexico (COP 16), Paras 11-35.
4. The EU Water Framework Directive on establishing a framework for Community action in the field of water policy (DIRECTIVE 2000/60/EC).
5. European Parliament and Council of the European Union Communication on "Addressing the challenge of water scarcity and droughts in the European Union".
6. The EU Flood Framework Directive on the assessment and management of flood risks (DIRECTIVE 2007/60/EC).
7. EU Civil protection, prevention of disasters (Council Decision 2007/779/ EC).

The study identifies five main areas of recommended strategies for enhancing DRR and consequently, CCA for researchers, policy makers and international organisations:

1. **Expanding and enhancing Networks and Communication**
   - UNISDR shall further promote its visibility as "broker" of contacts and information in Europe among relevant regional and national institutions working in areas related to CCA and DRR.
   - Projects should include relevant policymakers from the beginning. It is important to make sure that the EC science adviser is engaged.
   - Hold an annual meeting for the major European donors and funders in which they present their current and next year's funding and project initiatives.
   - Increase and create opportunities for researchers and policymakers to exchange information.

2. **Capacity-building**
   - International institutions such as EC, Council of Europe, UNISDR and regional platforms such as the European Forum for DRR and their national actors (HFA Focal points, National Platform Coordinators, Permanent Correspondents, etc.) should be involved in hosting workshops focusing on specific aspects of CCA and DRR, on a central topic of science/policy interface.
   - Governments and policymakers should be more involved in preparing educational curricula for universities and post-graduates, as well as being invited to speak at lectures.
   - EU/UN level should fund projects which look at facilitating good communication practices as well as potentially trying to quantify the cost of communication both in terms of benefits achieved and costs of achievement.
   - The promotion of the use of the existing UNISDR terminology in CCA and DRR2 is an important starting point to build a common correct understanding of the concepts attached to CCA and DRR and improve communication among different stakeholders and communities.

3. **Joint Projects and Programmes**
   - Have international organisations host joint capacity-building workshops, which will increase resource efficiency and enhance networks.
   - At the EC level, have the topic evaluators of major EC projects (FP7, FP6, etc.) identify selected projects where there is either an overlap or potential links and synergies for working together.

4. **Increasing the effectiveness of and number of National Platforms**
   - National Platforms need to serve as an intermediate body between policy and researchers, playing an active role in research by joining the steering committees of their country's major research projects as well as becoming more involved with the relevant European research projects.
   - National Platforms can create partnerships among research communities, governments and the private sector.

- National Platforms need to extend beyond their countries' borders. Twinning among European National Platforms is a cost-efficient tool to share best practice and techniques on practical issues.

5. **Improving the Flow of Information**
   - The EU clearinghouse and Prevention Web can build specific synergy to assure that the data and information that will be published in the EU clearinghouse website (expected to go live in 2012) are well disseminated among the CCA and DRR community reached by Prevention Web and its mailing list.
   - Given the importance of local knowledge in addressing CCA and DRR, it is imperative to record local disaster data, particularly damage and loss at the local level.
   - Develop entities responsible for English translation either as part of National Platforms, regional or international organisations and incorporate translation to main European languages as part of a project or institution's budget.

5.6 Linkages between CCA and DRR with sustainable development

For sustainable development, the importance of linkages between DDR and CCA is paramount and was duly recognised during the discussion. Several pros and cons were discussed such as "business as usual" for ongoing development is no longer an option and an early action needs to be taken and vulnerability must be addressed in public policy strategies. In that regard, linkages to food security and climate change mitigation were highlighted as means towards sustainable development such as development of dams to generate electricity. In some countries there is evidence that certain types of development (e.g., construction of roads) lead to increased vulnerability and potential disasters (like landslides and floods in Mexico) affecting the areas where the informal sector is concentrated. In many cases, urbanisation is rising too fast, which coupled with sea level, can lead to more disasters. Irrespective of a country's developmental situation and process, most important for a country to strategise CCA and DRR effectively is to have political stability, commitment from leaders and community participation (governance issues).

5.7 What the CCA practitioners can do

Enable and facilitate policy dialogues between CCA and HFA-related policy processes. Support analysis and interpretation of risk issues in non-environmental government departments (in all sectors as all are exposed to natural hazards and, if vulnerable, can lead to disasters). Share concrete examples and case studies of CCA initiatives with DRR colleagues. Use more narratives & examples and avoid conceptual jargon. Facilitate co-financing between CCA and DRR projects. Conduct economic valuation of CCA impacts in particular countries & sectors and share info with DRR practitioners.

5.8 What the DRR practitioners can do

Conduct more scenario planning exercises (looking forward) rather than applying a planning envelope that is based on historic hazard occurrences. Support analysis and interpretations of risks in non-DM government departments. Promote a multi-hazard approach rather than single-hazard to early warning systems (EWS need to be hazard-specific but they can be develop, policy-wise, as a DRR component with a multi-hazard approach). Support systematic management and analysis of hydro-meteorological data. DRR practitioners need to get acquainted and understand better CC and its potential impacts (the increase in intensity and frequency of hazards happening in same areas; the same of those happening in new areas where they didn't happen before; and most importantly the potential impact of new hazards, e.g., melting of glaciers, GLOFs, sea level and sea temperature rise.) They should be aware of the IPCC Special Report on Managing Risk of Extreme Events (SREX) to be finalised in 2011.

5.9 What the Adaptation Knowledge Platform can do

Promote institutional mechanisms to support decision-making processes for managing risks at all levels (HFA priority one). Conduct CCA stakeholder mapping (at the community level there is no difference between CC or DRR stakeholders) Because climate change is also a risk for the private sector, CSR agencies and the media to get the right messages across to relevant stakeholders. Improve communication strategies to interpret data & information for decision-makers to conduct long-term planning and knowledge-based solutions. Target local governments to enhance their understanding of CCA and DRR through strategic communications. Improve communication with the general public (the purpose is to raise awareness of the public on the need to reduce risk and vulnerability to natural hazards and to do it as a first urgent step in adapting to CC. (UNEP, 2010).

6.0 Environmental Tools for DRR Mainstreaming

6.1 Environmental Clearance Procedure in India

Environmental Clearance - General

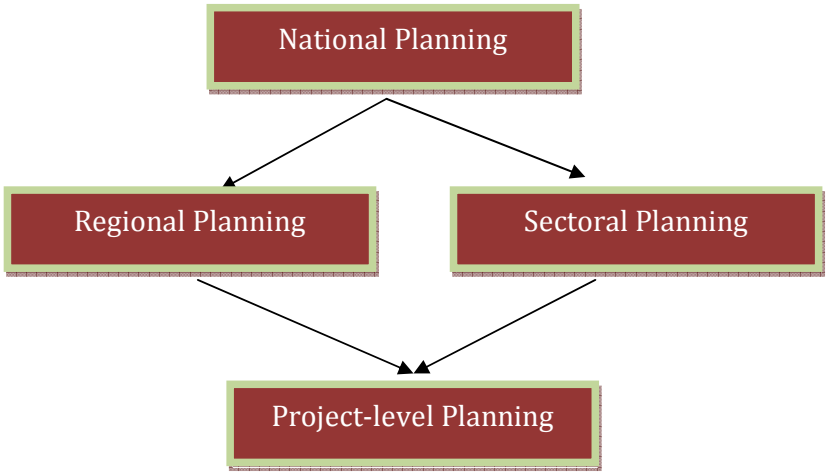
1. S.O.1533(E), [14/09/2006] - Environmental Impact Assessment Notification-2006.
2. Environmental Impact Assessment Notifications and amendments - 2006.
3. S.O.582(E), [13/04/2007] ,Notification - State Level Environment Impact Assessment Authority (SEIAA) , West Bengal.
4. S.O.945(E), [11/06/2007] - Environmental Impact Assessment Notification-2007.
5. S.O.948(E), [12/06/2007] - Environmental Impact Assessment Notification-2007.
6. S.O.1105(E), [4/07/2007] - Environmental Impact Assessment Notification-2007.
7. S.O.1134(E), [12/07/2007] - Environmental Impact Assessment Notification-2007.
8. S.O.1203(E), [23/07/2007] - Environmental Impact Assessment Notification-2007.
9. S.O.60(E), [27/1/1994] - Restrictions & Prohibitions on the Expansion & Modernisation of any activity or new projects unless Environmental Clearance has been accorded, amended 2001.
    1. S.O.1087(E), [22/9/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    2. S.O.891(E), [4/8/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    3. S.O.506(E), [7/5/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    4. S.O.248(E), [28/2/2003] - Amendments to S.O.60(E) dated 27/1/1994.

9. S.O.801(E), [7/7/2004] - Amendments to S.O.60(E) dated 27/1/1994.
10. S.O.1735(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
11. S.O.1736(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
12. S.O.1737(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
13. S.O.2674(E), [17/11/2008] - Environmental Impact Assessment Notification-2008.
14. S.O.2244(E), [22/11/2008] - Environmental Impact Assessment Notification-2008.
15. S.O.195(E), [19/01/2009] - Environmental Impact Assessment Notification-2009.

6.2 Environmental Impact Assessments

6.2.1 Role of EIA in developmental planning

EIA has an important role to play in resolving these environmental problems through its ability to contribute to environmentally sound and sustainable development. Developing countries in Asia have recognised the importance of incorporating EIA processes into development planning. Development planning takes place at a number of different scales:



The aim of national planning is to set broad economic, environmental, and social development goals for the country's continuing development. At this level, mechanisms employed include the formulation of a national conservation strategy, environment and natural resources management plans, state-of-the-environment reports, environment and natural resources profiles for developing countries and incorporation of environmental and natural resources considerations in economic planning and national development plans. These activities are specific elements of the overall national environmental policy. Regional planning defines broad land use allocations for a geographic region, normally at the sub-country level. At the regional level, the approach should integrate environmental concerns into development planning. Such an approach is referred to as economic-cum-environmental (EcE) development planning (Asian Development Bank, 1993a). This approach facilitates adequate integration of economic development with management of renewable natural resources to achieve sustainability. It fulfils the need for macro-level environmental integration, which the project-oriented EIA is unable to address effectively.

Such regional plans can set the context for project-level EIA. In considering regional plans, the environmental impacts of alternatives need to be assessed. At the project planning level, EIA is the primary tool for integrating environmental considerations into project design and execution. Project proponents and regulatory agencies prefer to consider the environmental impacts of a single project. Ideally, EIA at the project level should take place in the context of regional and sectoral-level planning; if this is not feasible, the scope of EIA reports may have to consider broad land use issues. In addition, if environmental effects are considered only at the project level, decision-makers will have difficulty taking account of cumulative environmental effects. These are impacts which may appear minor for any one project, but which become significant when groups of related projects are considered together. The absence of regional and sectoral planning increases the time and cost involved in the preparation of the EIA report and project approval. Sectoral planning focuses on the needs of individual development sectors (for example, energy, transport, and forestry). At the sectoral level, environmental guidelines and sectoral reviews and strategies should be

formulated and integrated into various sectoral plans. This will help to address specific environmental problems that may be encountered in planning and implementing sectoral development projects. Sectoral plans, however, must also consider the relationships between sectors to avoid land use and infrastructure conflicts. EIA, EcE, and sectoral planning are important mechanisms by which environmental factors are included in the development planning process level. EcE and sectoral planning evaluates development from the national or sub-country perspective, whereas the EIA is project oriented. When EcE or sectoral plans are available, they simplify the EIA process. If they are not available (as is often the case), the project EIA must attempt to evaluate the regional and national implications of the project. The integration of environmental considerations within the planning process has evolved similarly in both developing and industrialised countries. In Asia, the Asian Development Bank (ADB) and other institutions are currently assisting developing countries to establish, formulate, and apply regional EcE development plans and project EIA planning tools and methodologies. As such, EIA is being used as a tool for influencing development decisions not only in industrialised countries, but in developing countries as well.

6.2.2 Role of EIA in choice of mitigation option

Once the scoping exercise is complete and the major impacts to be studied have been identified, prediction work can start. This stage forms the central part of an EIA. Several major options are likely to have been proposed either at the scoping stage or before and each option may require separate prediction studies. Realistic and affordable mitigating measures cannot be proposed without first estimating the scope of the impacts, which should be in monetary terms wherever possible. It then becomes important to quantify the impact of the suggested improvements by further prediction work. Clearly, options need to be discarded as soon as their unsuitability can be proved or alternatives shown to be superior in environmental or economic terms, or both. It is also important to test the "without project" scenario.

An important outcome of this stage will be recommendations for mitigating measures. This would be contained in the Environmental Impact Statement. Clearly, the aim will be to introduce measures which minimise any identified adverse impacts and enhance positive impacts. Formal and informal communication links need to be established with teams carrying out feasibility studies so that their work can take proposals into account. Similarly, feasibility studies may indicate that some options are technically or economically unacceptable and thus environmental prediction work for these options will not be required.

Many mitigating measures do not define physical changes but require management or institutional changes or additional investment, such as for health services. Mitigating measures may also be procedural changes, for example, the introduction of, or increase in, irrigation service fees to promote efficiency and water conservation. Table 6 in Chapter 4 describes the most common adverse impacts associated with irrigation and drainage schemes and some appropriate mitigating measures.

By the time prediction and mitigation are undertaken, the project preparation will be advanced and a decision will most likely have been made to proceed with the project. Considerable expenditure may have already been made and budgets allocated for the implementation of the project. Major changes could be disruptive to project processing and only accepted if prediction shows that impacts will be considerably worse than originally identified at the scoping stage. For example, an acceptable measure might be to alter the mode of operation of a reservoir to protect downstream fisheries, but a measure proposing an alternative to dam construction could be highly contentious at this stage. To avoid conflict it is important that the EIA process commences early in the project cycle.

This phase of an EIA will require good management of a wide range of technical specialists with particular emphasis on:

- Prediction methods;
- Interpretation of predictions, with and without mitigating measures; assessment of comparisons.

It is important to assess the required level of accuracy of predictions. Mathematical modelling is a valuable technique, but care must be taken to choose models that suit the available data. Because of the level of available knowledge and the complexity of the systems, physical systems are modelled more successfully than ecological systems which in turn are more successfully modelled than social systems. Social studies (including institutional capacity studies) will probably produce output in non-numerical terms. Expert advice, particularly from experts familiar with the locality, can provide quantification of impacts that cannot be modelled. Various techniques are available to remove the bias of individual opinion.

Checklists, matrices, networks diagrams, graphical comparisons and overlays, are all techniques developed to help carry out an EIA and present the results of an EIA in a format useful for comparing options. The main quantifiable methods of comparing options are by applying weightings, to environmental impacts or using economic cost-benefit analysis or a combination of the two. Numerical values, or weightings, can be applied to different environmental impacts to (subjectively) define their relative importance. Assigning economic values to all environmental impacts is not recommended as the issues are obscured by the single, final answer. However, economic techniques can provide insight into comparative importance where different environmental impacts are to be compared, such as either losing more wetlands or resettling a greater number of people.

When comparing a range of proposals or a variety of mitigation or enhancement activities, a number of characteristics of different impacts need to be highlighted. The relative importance of impacts needs agreeing, usually following a method of reaching a consensus but including economic considerations. The uncertainty in predicting the

impact should be clearly noted. Finally, the time frame in which the impact will occur should be indicated, including whether or not the impact is irreversible.

6.2.3 Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is one important tool for mainstreaming Disaster Risk Reduction in policies, plans and programmes at national and sectoral levels. It also serves its additional advantage of strategic participatory analysis of the ways that communities and their development are vulnerable to disasters and for developing an understanding of how different development choices can enhance or diminish community resilience and increase or diminish broader environmental sustainability. SEA has its set objectives as i) how development objectives can be affected by disaster risk and ii) how policies plans and programmes can influence the vulnerability of communities to disaster risk. These two main qualities of SEA can attract SEA practitioners wishing to incorporate DRR considerations in SEAs and for DRR practitioners wishing to use SEA as a tool for strategic considerations of vulnerability to disaster and the potential impact of various activities on disaster vulnerability. It is not a prescriptive blueprint. It provides a checklist of activities and pointers on key considerations relevant to disaster risk reduction. There are four main stages of an SEA process.

6.2.3.1 Step/Stage 1 Establishing the Context:

- The information about the natural and human hazards can be made available by identifying, collecting and assessing which can affect the region concerned by the policy, plan or programme as well as information on the vulnerability of regions, populations and sectors to those hazards.

- Policies or policy reforms can be identified that currently address disaster risks in relevant sectors and government agencies (e.g. health, water, energy, urban and land use planning, environment, climate change adaptation, education, agriculture, transport, forestry, mining, fisheries, or tourism).

- Identify stakeholders knowledgeable in disaster risk.

- Plan and organise consultations with stakeholders and groups particularly vulnerable to disaster risk, as well as with decision-makers, throughout the planning process of the strategic environmental assessment.

- Identify the need for institutional strengthening and capacity-building related to disaster risk assessment and risk reduction measures.

6.2.3.2 Stage /Step 2 Implementing the SEA:

- There should be special attention given to whether the relevant stakeholders have all the information they need on disaster risks and risk reduction options to participate in a meaningful way and whether their views can be considered fully in the decision-making process.

- Identification of key risks and vulnerability implications of the PPP under consideration and for alternative PPP options which is in collaboration with key stakeholders (e.g. relevant government agencies, NGOs, private sector and civil society representatives).

- Determine whether there are adequate political, institutional and managerial mechanisms (including monitoring arrangements) for including disaster risk assessment and disaster risk reduction in the policy, plan or programme and decision-making process.

- There should be proper assessment that whether the financial and human resources are sufficient to implement the activities identified as needed to ensure that risk reduction measures are considered and addressed.

- Identify measures for mitigating the impacts of natural hazards of the PPP and if necessary, related measures for climate change adaptation.

- Ensure that the SEA identifies the investments needed for dealing with disaster risks facing or resulting from the PPP in question.

6.2.3.3 Stage/Step 3 Informing and Influencing Decision-Making:

- Role of senior decision-makers (e.g. the Prime Minister and Cabinet, National Disaster Reduction platforms and climate change adaptation authorities) on the main risk and vulnerability implications of the strategy, policy, plan or programme under consideration are very important and on the potential means to address these risks and vulnerabilities.
- Prompt lower-level decision-makers to examine risk reduction issues and to work cross-sectorally to identify risks and responses.

6.2.3.4 Stage/Step 4 Monitoring and evaluation:

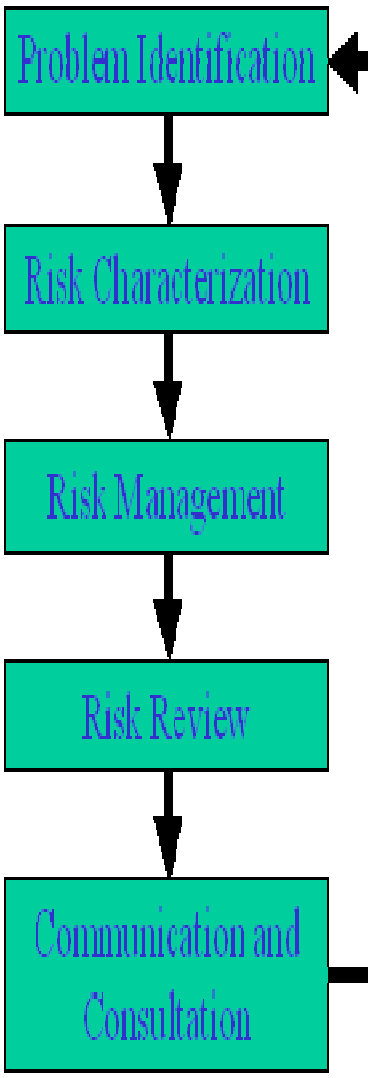
- There should be proper investigation that whether ongoing disaster risk and vulnerability monitoring or data collection activities have been identified and reviewed and also check out who is responsible for data collection and monitoring.
- Develop the strategy for reviewing, monitoring and evaluating disaster risk.
- Develop indicators and institutional capacity for carrying out monitoring and evaluation and determine how they will be used and tracked.

Another tool in case of EIA is Rapid Environmental Impact Assessment (REA) is a tool to identify, define, and prioritise potential environmental impacts in disaster situations. A simple, consensus-based qualitative assessment process, involving narratives and rating tables, is used to identify and rank environmental issues and follow-up actions during a disaster. The REA is built around conducting simple analysis of information in the following areas:

1. The general context of the disaster.
2. Disaster related factors which may have an immediate impact on the environment.
3. Possible immediate environmental impacts of disaster agents.
4. Unmet basic needs of disaster survivors that could lead to adverse impact on the environment.
5. Potential negative environmental consequences of relief operations.

6.2.4 Environmental Risk Monitoring and Evaluation

Environmental Risk Monitoring is a systematic analysis of the likelihood that the environment will experience a specified level of harm as a result of a natural disaster or a planned human activity.



All decisions and actions have environmental consequences and risks. Risk is the likelihood that a harmful consequence will occur as a result of an action, including those from natural or manmade disasters. ERM determines the potential impact of an action on ecosystems, habitats and other ecological resources, and on human health and well being.

It includes both risk management and risk communication. The use of ERM in environmental planning and management is fast becoming a standard practice, either as a stand alone procedure or as a support or complement to an EIA. Appropriate use of ERM will identify situations of potential environmental concern and allow decision-makers to select management options with the least, and still acceptable level of risk.

ERA is a well developed and systematic tool that provides the necessary information to take decisions that will mitigate and reduce the risks faced by vulnerable communities – whether from manmade aspects (such as chemical accidents or development projects) or natural aspects (such as earthquakes and typhoons). It calls for the clear identification and formulation of the problem and characterise the risks posed as a result. It calls for the instituting of a risk management plan that is periodically reviewed, and the results and decision properly consulted and communicated to all key stakeholders (http://www.gdrc.org/uem/disasters/disenvi/tools/index.html)

Monitoring and evaluation:

- There should be proper investigation that whether ongoing disaster risk and vulnerability monitoring or data collection activities have been identified and reviewed and also check out who is responsible for data collection and monitoring.
- Develop the strategy for reviewing, monitoring and evaluating disaster risk.
- Develop indicators and institutional capacity for carrying out monitoring and evaluation and determine how they will be used and tracked

6.2.5 Approach to Regional EIA and carrying capacity

The analysis of environmental carrying capacity (ECC) is one of the most important procedures to regional environmental impact assessment (REIA). Over the past ten years, ECC has become an important strategy and aroused many researchers' work. ECC was originally defined as the level of human activity which a region could sustain at an acceptable quality of life level. ECC meant the stocking density (of people or something else) at which growth was not food limited, and/or the stocking density (of something) at which some measure of ecosystem health was not compromised in many parts of the world. ECC covered aspects of resources, nature environment, recycling economy and sustainable development degree, etc. The concept of ECC could be defined as the ability that regional environmental system could afford human social activities under the condition of no essential change in environmental system construction and of no deterioration of regional environmental function during a certain time and within a certain area. It also meant the harmony degree of regional environment system structure to regional socio-economy activities. ECC has already become an important part of regional environment plan and REIA.

6.2.6 EIA of Disasters

The **Environmental Impact Assessment in Disaster** (EIA) is a tool to identify, define, and prioritise potential environmental impacts in disaster situations. A simple, consensus-based qualitative assessment process, involving narratives and rating tables, is used to identify and rank environmental issues and follow-up actions during a disaster. The EIA is built around conducting simple analysis of information in the following areas:

- The general context of the disaster.
- Disaster-related factors which may have an immediate impact on the environment.
- Possible immediate environmental impacts of disaster agents.
- Unmet basic needs of disaster survivors that could lead to adverse impact on the environment.
- Potential negative environmental consequences of relief operations.

The EIA is designed for natural, technological or political disasters, and as a best practice tool for effective disaster assessment and management. EIA can be use from shortly before a disaster up to 120 days after a disaster begins, or for any major stage-change in an extended crisis.

The EIA does not provide answers as to how to resolve environmental problems. It does provide sufficient information to allow those responding to a disaster to formulate common sense solutions to most issues identified. Where solutions are not evident, the EIA provides sufficient information to request technical assistance or to advocate action by a third party. The EIA contributes to activity and environmental M&E, but does not replace a formal M&E system.

The EIA does not require expert knowledge. Primary EIA users are people directly involved in disaster response operations, with a basic knowledge of the disaster management process but no background in environmental issues. The EIA process can be used by disaster survivors with appropriate support. The best results are expected to come when the EIA is completed with structured input from survivors and organisations providing relief assistance. Sections of the EIA can also be used for needs assessment and environmental impact screening during relief project design and review.

6.2.7 Environmental Loss and Needs Assessment (Post-Disaster)

The development of a Post-Disaster Needs Assessment (PDNA) methodology by the Inter-Agency Standing Committee (IASC) Early Recovery Cluster provides an opportunity to address the post-disaster events. Within this framework, the United Nations Environment Programme (UNEP) has been requested to take the lead in developing a post-emergency environmental needs assessment method in order to fully integrate environmental needs within early recovery programming.

- Identify environmental impacts and risks caused by the crisis and relief operations as well as potential environmental pressures from recovery.
- Identify the negative response-related activities or coping mechanisms resulting from an emergency that can impact the environment or create new environmental risks.
- Assess institutional capacities at the national and local levels to mitigate.
- Environmental risks and manage environmental recovery.
- Provide a forward looking plan that aims to “Build Back Better”, by integrating environmental needs within early recovery programming and across the relevant relief and recovery clusters.
- Provide a standard reference point for future environmental assessments in the post-crisis setting, in spite of the fact that this tool is expected to be modified to suite the needs of different situations.
- In addition to the above, a number of secondary objects might be highlighted, these being the opportunity to generate strategic baseline data that could eventually feed into a monitoring and evaluation system to track implementation of environmental recovery interventions.
- Identify initiatives that can be strengthened to provide or help rebuild livelihoods and sustain human security – especially those that depend on the environment and natural resources.

- Identify how environmental degradation may have contributed to the underlying causes of the emergency and how environmental vulnerabilities can be addressed during recovery.
- Identify opportunities to re-orient livelihoods along sustainable pathways, using environmentally sound construction practices and/or alternative energy options, by identify environmental impacts and risks caused by the crisis and relief operations as well as potential environmental pressures from recovery.

6.2.8 Environmental Auditing and Other Tools

A systematic, documented, periodic and objective review by a regulated entity of facility operations and practices related to meeting environmental requirements (USEPA).

Components of Auditing -

Assessment

Provides expert judgement/opinion on hazards, associated risks and management and control measures. Identifies knowable hazards. Estimates the significance of risks. Assesses current practices and capabilities. Provides the basis for recommendations to improve the organisation's management system and environmental performance

Verification

- Determines and documents performance by evaluating the application of, and adherence to, policies and procedures.
- Certifies the validity of data and reports. Evaluates the effectiveness of management systems.
- Verifies that regulations and policies are being adhered to.
- Assists in identifying gaps in organisational policies and standards. Basic Steps in the Typical Audit Process:

Pre-audit activities

These comprise scheduling; team selection; logistical arrangements; gathering background information and developing the audit plan

Audit process

Key activities include understanding management system; understanding plant process and operating systems; assessing the strengths and weaknesses; gathering audit evidence, evaluating audit findings and reporting audit findings to management

Post-audit activities

Objectives of these activities are to: ensure the audit results are clearly communicated to the appropriate level of management; ensure all findings and observations are addressed by management; evaluate effectiveness of audit and provide suggestions for improving future audits; share lessons learned during the audit.

Tasks are to: prepare a draft report (before the team leaves); issue a final report to legal counsel (as appropriate); develop action plans and follow up. A systematic, objective method of reviewing management systems and controls and verifying that

environmental standards -- regulatory, company and good industry standards -- are being met. (Arthur D. Little).

A systematic examination of performance to ensure compliance with requirements during the operational phase of industrial activity, including the following components (International Chamber of Commerce Position paper on environmental auditing adopted on November 29, 1988):

- Full management commitment
- Audit team objectivity
- Professional competence
- Well-defined and systematic approach
- Written reports
- Quality assurance.
- Follow-up

A management tool comprising a systematic, documented, periodic, and objective evaluation of the performance of the organisation, management and equipment designed to protect the environment with the aim of:

- Facilitating management control of environmental practices.
- Assessing compliance with company policies, including observance of the existing regulatory requirements (Commission of the European Communities).
- Eco-management and Audit Regulation.
- Environmental Audits should answer to the following questions:
- What are we doing? In particular, are we in compliance with government regulations, guidelines, codes of practice, permit conditions?
- Can we do it better? In particular, are there non-regulated areas where operations can be improved to minimise the impact on the environment?
- Can we do it more cheaply? What more should we do?

6.2.9 Remote Sensing and GIS

There are various stages of **Disaster Risk Reduction**, in which GIS and Remote Sensing is applied.

- Assessment of organisation's spatial data requirements
- Risk mapping and database generation
- Implementing Participatory GIS for community-based disaster risk management.
- GPS-based mobile GIS for hazard and vulnerability field data collection.
- Applications of Google Earth images
- Identification of spatial base data providers such as DEMs, topodata, and population data; thematic spatial data providers such as flood data, earthquake data and spatial data users including NGOs, government organisations and municipalities
- Developing a spatial data infrastructure for data sharing, restrictions, metadata, and clearing houses

- Developing country-level early warning systems for major hazards and integration them to community-based early warning systems
- Use of GIS and Remote Sensing in disaster preparedness planning
- Remote sensing and image processing techniques for change detection
- Disaster monitoring using remote sensing techniques.
- Generation of damage databases
- Developing webGIS solutions for visualisation and data sharing
- Updating organisations existing maps

(Ref: www.indepthresearch.org)

7.0 Environmental Approach to DRR

7.1 Mountain Areas

Human activities are prime cause of environmental degradation all over the world. The effects of human activities on environment may be direct or indirect, small or big, slow or fast, predictable or unpredictable depending on the nature, intensity or frequency of the disturbance to natural ecosystem. The hill regions of India, characterised by a wide variation in topography, geology, soil, climate, flora and fauna and various ethnic groups having different socio-cultural traditions, is a unique geographical entity of our country. All the major natural disasters hit this region causing disruption in the socio-economic life of the people and bring misery to the people.

The ongoing human activity results in recurring floods and landslides. Interference in the environmental system in the form of indiscriminate chopping down of trees disrupts the ecological balance thereby resulting in loosening of the soil and consequent soil erosion. Over a period of time, the eroded soil begins to settle down on the riverbed results in shifting of the river. This is one of the major reasons for the floods to occur. The Himalayan region with a soft and quickly weathering rocks covered with a thin layer of soil are increasingly susceptible and sensitive to landslides. And hence, causing disruption and creating blockades in the road network and river system thereby causing floods. A very befitting example in support of the above statement is the slash and burn cultivation technique called 'JHUM' that is practiced in the hilly areas. Development of the communication system by means of road construction and mining of rich mineral reserves over a period of time has destroyed the dense natural evergreen forest cover.

7.2. Coastal Areas

Carter (1988): coastal zone is a space where terrestrial environment effect the marine environment and on the contrary. This environment also indicates with very wide variable, which can change in a particular time. The coastline of the world, over 440,000 km in length, represent one of the most dynamic of natural environments and one of the most important contexts in which human activity and geomorphological processes interact. Coastline bring together a unique and extraordinarily varied group of processes, not only process associated with the sea itself, but also, in certain locations, those arising from water and sediment transfer by rivers to sea, from the sub-aerial degradation of cliffs and similar landforms above the waters edge and from Aeolian, glacial, and periglacial conditions. The coastal waters themselves comprise many kinds of ecosystems near the coastlines of land masses. Most of the systems under discussions lie shore-wards of 200 m depth contour. This contour marks the edge of the continental shelf. However, in places where the edge of the self is close to shore and major upwelling system occur. Hence, we shall discuss tropical estuaries with mangrove forest or we call mangrove ecosystem, estuary without mangrove, coral-reef ecosystem. Coastal areas on the terrestrial or land masses ecosystems are such as coastal forest, coastal dunes, and beaches (Mann 1982; Nybakken and Bertness 2005). Coastal ecosystem science is the study of interaction among the living organisms, physical features, bio-chemical processes, natural phenomena, and human

activities in coastal ecological communities. There are seven categories of ecosystem stressors: 1). Climate change, such as increases in sea level and ocean temperature; 2). Extreme natural events, such as tsunami, hurricane, drought, and harmful-algal bloom; 3). Sedimentation in estuary due to bad watershed managements; 4). Pollution, such as excess nitrogen from agricultural and urban runoff; the waste of heavy metals of gold mine or textile industries, and urban waste; 6). Noxious-predator species, such as the crown-of-thorn starfish (Acanthaster planci), and; 7) Land and resource use, such as over-harvested fisheries, over cutting of mangrove trees, or land reclamation of mangrove forest for shrimp industries, or sea-ford, or human settlements. In tropical, 60-75 per cent of protected bays, estuaries of the tropical regions are lined with mangroves (Nybakken and Bertness 2005). Mangroves are ecological important communities and play significant roles in near-shore of tropical and subtropical system.

Mangrove forest buffer tropical shorelines from erosion, serve as biochemical filters on terrestrial runoff, and are important nursery grounds for wide varieties of tropical-migratory organism, such shrimps and fishes. Those organisms are not only ecologic but also have economic values. Beside the ecologic and economics values, mangrove forests are important in protecting the settlement in lowland adjacent to the seashore (Ronnback 1999; Mitch and Gosselink 2000). Indonesia is an archipelago country with 81,000 km of coastline, which means at estuaries, protected bays, and coastal lagoons are mangrove ecosystems. Healthy-mangrove vegetation plays important roles not only to the mangrove ecosystem itself, but also to the coastal and open sea fisheries. Moreover, mangrove tree vegetation gives protection to the costal settlement from tsunami, especially at western and northern coasts of Indonesia. However, the present conditions of these ecosystems in Indonesia are threatened due to bad management of watershed areas, and mangrove tree cutting, and mangrove reclamation for intensive-shrimp ponds (Djohan 2007). The Indonesian coasts next to the Indian Ocean are fragile area for tectonic earthquake, which creates tsunami. Mangrove trees also protect the coast areas from the tsunami. It was reported that, the mangrove vegetation has the ability to reduce the tsunami wave up to 50 per cent. The experience of tsunami in western coast of Aceh on 26 December 2004 showed that if the mangrove trees vegetation in Olele coast was not reclaimed to shrimp ponds, and this ecosystem was not filled and reclaimed for the settlement areas, perhaps more people of Banda Aceh could have survived the catastrophe.

In a programme of coastal management, the conservation issues and problems must first be identified before counter-measures can be proposed. This identification process – known as “issues analysis” – is mainly done in the “strategy planning” stage. Issues analysis means more than just listing the items; it requires categorising, weighting, balancing, evaluating, and prioritising the issues in the light of political, social and economic background of coastal zone development. Because ICZM-type programme cannot solve all community problems, the issues to be addressed may be prioritised in a kind of “triage” exercise.

- Sri Lanka Coast Conservation Act (1990)
- United States Federal Coastal Zone Management Act (1990), Section 304
- Australian Commonwealth Coastal Policy (1995)
- United Kingdom Government Environment Committee Report on Coastal Zone Protection and Planning (1992)

In most countries, a priority goal of coastal management should be arranged for the most extensive participation possible (starting with the strategy planning stage). Consultation should be held with all relevant agencies of central and local government, with developers, with resource users and other interests that would be affected by ICZM (fisherman, farmers, etc.), environmental advocacy groups, and investment sources (including international donor institutions). Coastal areas and coastal resource system are governmentally complex because of the degree of shared jurisdiction and the amount of common property resources involved.

Therefore, resource management programmes need to involve all levels from national to village governments, regardless of the particular institutional arrangement at the central level. People live in the environment right along with other flora and fauna. People affect their environment and in turn the environment affects people, immensely. The need for public awareness and education is often emphasised in discussion on integrated coastal zone management strategies. The recent emphasis on integrated coastal zone management is particularly appropriate as it may also help focus the need for integration of the public into the ICZM process-specifically at policy formation, programming of action and implementation stages. Four major objectives of participation according to Renard are:

- Participation is a way to ensure that popular knowledge and experience is indeed integrated into the planning and management process.
- Participation gives a better guarantee for the quality of the solution identified and for its adaptation to a particular condition.
- Participation in planning and problem identification promotes involvement in the actual implementation of decisions.
- Participation ensures that all needs and priorities are taken into account in the formulation of management decisions.

7.3. Arid and Desert Areas

Water scarcity is the major problem as far as environmental issues are concerned. Therefore, due to water stresses the problem of drought and arid and desert areas have risen. Drought is a perennial and recurring feature in many parts of the Asian region. Drought in many other parts of Asia cannot be seen as mere physical phenomenon any more and each drought produces a unique set of impacts, depending not only on its severity, duration, and spatial extent but also on ever-changing social conditions[i]. The complex interplay of climate factors (lack of enough rainfall, uneven distribution over time and space), and non-climate factors (such as land situation and water management practices) results in widespread and sometimes irreversible impacts on vulnerable

livelihood systems. During a drought season, low rainfall in many parts of the region and consequent depressed agricultural production and erosion of productive assets can result in malnutrition, migration and shifts in occupational patterns.

When the word "drought" is used commonly, the most often intended definition is meteorological drought, which is brought about when there is a prolonged period with less than average precipitation. However, there are generally three types of conditions that are referred to as drought. Other than the meteorological drought, the agricultural drought is brought about when there is insufficient moisture for average crop production and hydrological drought is brought about when the water reserves available in sources such as aquifers, lakes and reservoirs fall below the statistical average. These different types of droughts have a serious implication on the development context, as they have a direct bearing on agricultural and livestock-based livelihoods, and the impacts have the potential to spiral into secondary and tertiary impacts including health, malnutrition, migration, crime and other such social manifestations.

7.3.1 Drought Relief, Drought Management and Drought Proofing

Drought Relief is one activity under Drought Management. However, it comes into picture only after the drought conditions occur in an area. Various other terminologies, like watch, monitoring, mitigation, proofing and prevention, are attached with the drought. They form parts of activities under Drought Management.

Drought proofing is a holistic approach of securing livelihoods in a drought-prone area through water harvesting and management interventions. The United Nations Development Programme has supported a Drought Proofing (through watershed development and eco-regeneration for vulnerability reduction) Project for the district of Kachchh in Gujarat, India, with assistance from the Government of Netherlands. As part of the Project, UNDP in association with the Government of Gujarat, and its implementing partner Abhiyan (network of local NGOs) has set up a Kachchh Ecological Fund (KEF). The project aimed at supporting and facilitating the planning and implementation of initiatives towards long-term recovery and drought proofing of the region[ii].

7.3.2 Drought Monitoring

One of the important activities under the Drought Management is Drought Monitoring, which is incidental and primary for providing any relief to the drought affected. Coordination of drought relief is coupled with advance and preventive action to minimise the impact of drought. Drought Monitoring is directly related to rainfall and projected availability of water in an area. The associated factors like availability of groundwater, reservoir position and pest control also form part of Drought Monitoring.

7.3.3 Issues to be addressed

The last few years has been characterised by a worsening of the drought impact on populations in the Asian region. It is expected that in the coming decades drought vulnerability will increase, mainly due to development pressures, population increase,

and environmental degradation that is expected to lead to climate change. The strong and recurrent link between climate change and drought has highlighted the importance of initiating a new way of analysing the way communities can cope with drought. This could be done by strengthening the coping mechanism of the community through community-based drought preparedness planning, and integrated drought risk management plans at the district level using GIS-based risk and vulnerability mapping. Promoting short-term/medium-term dynamic drought mitigation interventions that can ultimately contribute to the long-term drought preparedness and mitigation plans at the grassroots level is also required.

Governments normally take up various initiatives to mitigate drought impacts through short-term contingency plans and intervention, which help the community to respond to their immediate needs. With increased frequency and recurrence of this phenomenon in the drought-affected regions, it has become important that the focus for the forthcoming years be shifted from crisis management to risk management. This is better done by analysing different cause-effects of the problems, promoting user-friendly early warning dissemination systems, and enhancing the ability of the communities to cope with drought by creating awareness and enhancing knowledge on drought risk reduction options.

As a wide range of factors, both physical and social, such as demographic trends and geographic characteristics, determine a society's vulnerability to drought, there is a need for a multi-sectoral approach. Also, efforts are required to guarantee that the affected communities are fully aware of the importance of a detailed analysis of the past drought years while deciding the crop patterns for the season.

In view of the above, the focus should be on:

- Awareness generation among the communities, especially among women and other vulnerable groups, in order to enhance their ability to predict, face and cope with a drought-like situation;
- Strengthening community-based initiatives and promoting Community-Based Drought Preparedness and Mitigation Plans through PRIs (Panchayati Raj Institutions, the rural local governance bodies in the form of elected village councils) in the most vulnerable districts in drought-prone regions, ensuring that women are a crucial participant in the development and implementation phases of the plans;
- Training and capacity-building of the central and state institutes and departments through an increased involvement of academic institutions; and
- Strengthening existing administrative, legal and institutional frameworks at national and state levels for drought risk management.

7.3.4 Effective Drought Monitoring and Use of Information Technology

Of late**,** it is seen that the report released after appearance of drought-like conditions is more theoretical, graphical and statistical. Even governments do not have a permanent mechanism for regular drought monitoring. National and regional monitoring centres

give medium range weather forecasting to supplement short-range and long-range weather forecasting given by meteorological departments. Agricultural universities and other premier institutions are also engaged for their Agro-Meteorological Advisory Services for their forecasting activity. At present, in India we approach the IMD (Indian Meteorological Department) for providing drought-related data over the decades. The Drought Research Unit of IMD at Pune has a huge data with analysis about the droughts that have occurred in the past many decades. The task before us is to formulate effective Drought Monitoring using latest information techniques. The integration of government monitoring machinery, spatial information, field level information and geological information pertaining to drought conditions under one roof and putting it in a web form for easy dissemination, as is done in the developed countries, could be thought out for effective drought monitoring.

7.4. Agro -Ecosystems

An agro ecosystem is the basic unit of study for an agroecologist, and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and includes the living and non-living components involved in that unit as well as their interactions. An agroecosystem can be viewed as a subset of a conventional ecosystem. As the name implies, at the core of an agroecosystem lies the human activity of agriculture. However, an agroecosystem is not restricted to the immediate site of agricultural activity (e.g. the farm), but rather includes the region that is impacted by this activity, usually by changes to the complexity of species assemblages and energy flows, as well as to the net nutrient balance. Traditionally, an agroecosystem, particularly one managed intensively, is characterised as having a simpler species composition and simpler energy and nutrient flows than "natural" ecosystem. Likewise, agroecosystems are often associated with elevated nutrient input, much of which exits the farm leading to eutrophication of connected ecosystems not directly engaged in agriculture.

Forest gardens are probably the world’s oldest and most resilient agroecosystem. Forest gardens originated in prehistoric times along jungle-clad river banks and in the wet foothills of monsoon regions. In the gradual process of a family improving their immediate environment, useful tree and vine species were identified, protected and improved whilst undesirable species were eliminated. Eventually superior foreign species were selected and incorporated into the family's garden.

One of the major efforts of disciplines such as agroecology is to promote management styles that blur the distinction between agroecosystems and "natural" ecosystems, both by decreasing the impact of agriculture (increasing the biological and trophic complexity of the agricultural system as well as decreasing the nutrient inputs/outflow) and by increasing awareness that "downstream" effects extend agroecosystems beyond the boundaries of the farm (e.g. the Corn Belt agroecosystem includes the hypoxic zone in the Gulf of Mexico). In the first case, polyculture or buffer strips for wildlife habitat can restore some complexity to a cropping system, while organic farming can

reduce nutrient inputs. Efforts of the second type are most common at the watershed scale. An example is the National Association of Conservation Districts, Lake Mendota Watershed Project, which seeks to reduce runoff from the agricultural lands feeding into the lake with the aim of reducing algal blooms.

7.5. Forest ecosystems

Forest ecosystem is one major ecologic unit that exists as "home" for a community of both native or introduced, classified organisms. The forest ecosystem is just one of a number of unique ecosystems including prairies, deserts, polar regions and great oceans, smaller lakes and rivers. A forest ecosystem typically is associated with land masses covered in trees and those trees are often classified by foresters into forest cover types.

The word "ecology" comes from the Greek "oikos, meaning "household" or "place to live". These ecosystems or communities are usually self-sustaining. I say "usually" because some of these communities can become unbalanced very quickly when detrimental factors occur. Some ecosystems, like tundra, coral reefs, wetlands and grasslands are very fragile and very small changes can affect their health. Larger ecosystems with wide diversity are much more stable and somewhat resistant to harmful changes.

A forest ecosystem community is directly related to species diversity. Generally, you can assume that the more complex the structure, the greater is its species diversity. You should remember that a forest community is much more than just the sum of its trees. A forest is a system that supports interacting units including trees, soil, insects, animals, and man.

Forest ecosystems tend to always be moving toward maturity or into what foresters call a climax forest. This maturing, also called forest succession, of the ecosystem increases diversity. One forestry example of this is growth of trees and the entire system toward an old growth forest. When the ecosystem is exploited and exploitation is maintained, then the maturity of the forest ecosystem declines.

Management of forests for sustainability is desirable when forest diversity is threatened by overuse, resource exploitation and poor management. Forest ecosystems can be disrupted and harmed when not properly sustained. A sustained forest that is certified by a qualified certification programme is assurance that the forest is managed to allow maximum diversity while satisfying the manager's environmental and economic demands.

Scientists and foresters have dedicated their entire careers trying to understand even a small part of forest ecosystems. Complex forest ecosystems are extremely diverse, ranging from dry desert shrub land to large temperate rain forests. These natural resource professionals have categorised forest ecosystems in North America by placing

them into forest biomes. Forest biomes are broad categories of natural tree/plant communities.

7.6. Urban Systems

Urban areas are growing at a very fast rate. In most of the cities, there is influx of population from the surrounding areas, mainly in search of employment and better living conditions. City authorities are unable to provide them basic infrastructure and services. In most of the larger cities, 30-60 per cent people are living in squatter settlements. There are areas in some of the cities, like Delhi and Kolkata, where population density is more than 150,000 persons per sq. km. (walled city of Delhi - 166,300 persons per sq. km.). The demand for land in cities has led to the use of marginal land, prone to natural hazards such as floodplains, unstable slopes and reclaimed land, unsuitable for any habitation. This has led to greater exposure of city dwellers to disasters. Disasters in urban areas are often distinguished from common or constant environmental hazards. Interestingly, if 1,000 people are killed by a flood, earthquake or industrial explosion in a large city, such a disaster is reported around the world. Yet the annual death in the same city of 1,000 people from traffic accidents, or 10,000 children from easily preventable diseases are not considered disasters. The difference between disasters and other environmental hazards becomes even less clear as the latter becomes particularly serious. For instance, when gradually worsening air pollution reaches certain levels it may be characterised as a disaster.

8.0 Approaches for Mainstreaming DRR in India

8.1 Policies, Legal Framework and Institutional Framework at National, State, District and Local Levels

The subjects of Disaster Risk Reduction and Environment, both being cross-cutting themes, their implications and intended impacts can be achievable only through multi-level and multi-sectoral interventions. These can broadly be classified as following:

Policy-level adjustments for ensuring cross relationships in related policies. This will imply that the environment policy needs to include disaster risk reduction elements, and the disaster management policy in its risk reduction part needs to include environmental aspects in required detail. The policy environment needs to be appropriately conducive at national and state levels, since many of the related issues are divided between these constituencies. Also, efforts will be required to engage and cross-relate with other sectoral policies such as water, agriculture, housing and urban development.

The legal and institutional frameworks are similarly crucial dimensions for ensuring that instruments are available for ensuring environmental and disaster risk reduction linkages, and that these also do get implemented on the ground. Reflections in the national and state legislation, and equally importantly, in the creation and operation of appropriate organisational structures to ensure effective implementation are required. These need to cut across national, state and district levels, and at the local level, for both panchayati and urban local bodies.

8.2 Integration of DRR and DM Plan provisions with District Environment Plan

With the initiative of the SAARC Disaster Management Centre, a framework on disaster management for the SAARC region has recently been developed.[14] The framework is also aligned with the implementation of the Hyogo Framework for Action. The framework provides a platform for South Asian countries to:

1. Establish and strengthen the regional disaster management system to reduce risks and to improve response and recovery management at all levels.
2. Identify and elaborate country and regional priorities for action.
3. Share best practices and lessons learnt from disaster risk reduction efforts at national level.
4. Establish a regional system to develop and implement regional programmes and projects for early warning.
5. Establish a regional system of mechanism information on prevention, preparedness and management of natural disasters.
6. Create a regional response mechanism dedicated to disaster preparedness, emergency relief and rehabilitation to ensure immediate response.

[14] SAARC 2008. Mainstreaming Disaster Risk Reduction in Development. SSARC Disaster Management, New Delhi, in collaboration with Disaster Management Centre of Government of Sri Lanka, Colombo.

7. Create a regional mechanism to facilitate monitoring and evaluation of achievements towards goals and strategies.

One of the strategic goals of this framework is to mainstream disaster risk reduction in the development sectors of all member countries. The framework has articulated six key expected outputs and priority actions. Key expected outputs of the SAARC comprehensive framework on disaster management include:

1. An efficient disaster management system.
2. Mainstreaming disaster risk reduction into the development policies and practices of the government at all levels.
3. Disaster resilient communities that have enhanced coping capacities in relation to all hazards.
4. Development of policies and programmes that recognises all risks to the communities, and mitigation strategies that are based on a risk management assessment.
5. Greater levels of coordination and cooperation at national, regional and international levels.
6. Enhanced information, warning and reporting systems within governments at all levels. [15]

Taking into account the recommendations of the HFA and directives of SAARC meetings including the Dhaka Declaration 2005 of the 13th SAARC Summit, the framework envisages the following key priority areas for action:

- Develop and implement risk reduction strategies which include: development of methodologies and standards for hazard and vulnerability assessment; development of strategies to make right balance across prevention, preparedness, response and recovery (PPRR) programming
- Establish regional and national response mechanisms
- Establish a regional sharing and develop network of institutions and organisations, including but limited to the followings:
  - Mainstreaming and advocacy
  - Community risk assessment
  - Geo-information technologies
  - Research information database
  - Emergency response management
  - Networking with relevant national, regional and international systems
- Develop and implement disaster management training, education, research and awareness programmes
- Apply ICTs (Information and Communication Technologies) for disaster management
- Establish an effective monitoring and evaluation mechanisms;

Member countries are also advised to develop individual plans of action to achieve the goals and objectives of this framework. Following HFA strategic goals and priorities

[15] Ibid.

for action, South Asian countries have started to mainstream DRR in development policy and planning. Most countries and NGOs in the region are using UNDP/HFA indicators to measure the process of mainstreaming of DRR in the development programming.

In a conceptual framework of integrating community-based disaster risk reduction into government policy and programming, Kafle[16] has highlighted the establishment and strengthening of institutional mechanisms, development of tools and techniques, and creation of conducive environment for the adoption and internalisation as the key elements of integration of the concept into government policy and programming. Adoption, internalisation and capacity development in various spheres are the prerequisites of this model, leading to institutionalisation of the concept into the government system (Figure 1).

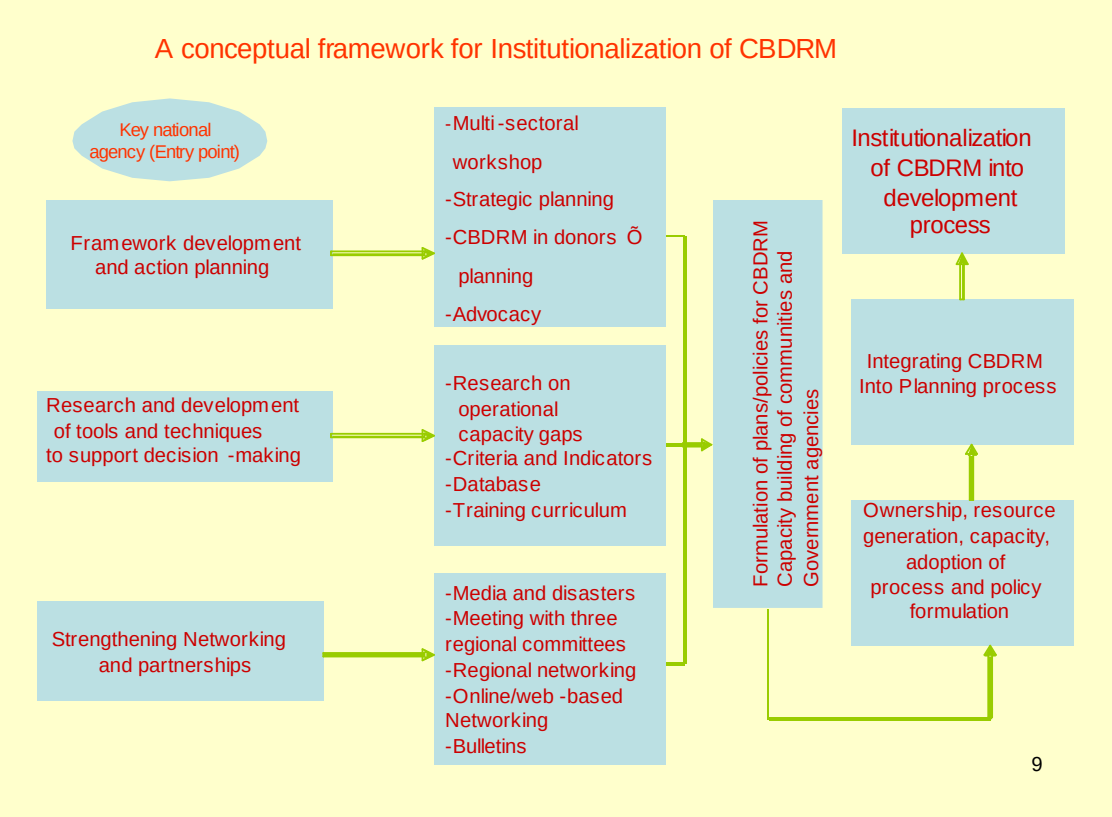


Figure 1: Conceptual framework of integrating community-based disaster risk reduction into government policy and programming

Tearfund[17] has put forward six performance targets and indicators along with four measurement levels as a tool for mainstreaming DRR into development planning. The

[16] Kafle, Shesh Kanta 2006. Integrating Community-Based Disaster Risk Reduction into Government Policy and Programming; In: Proceedings of the International Disaster Risk Reduction Conference, Davos, Switzerland.
[17] Tearfund 2005. Mainstreaming Disaster Risk Reduction: A Tool for Development Organizations. London.

targets and indicators include policy, strategy, geographic planning, project cycle management, external relations and institutional capacity.

UNDP has adopted five spheres and indicators as the measure for the mainstreaming DRR. This study largely follows the UNDP spheres and HFA indicators for measuring the DRR mainstreaming process and status in the countries of South Asia.

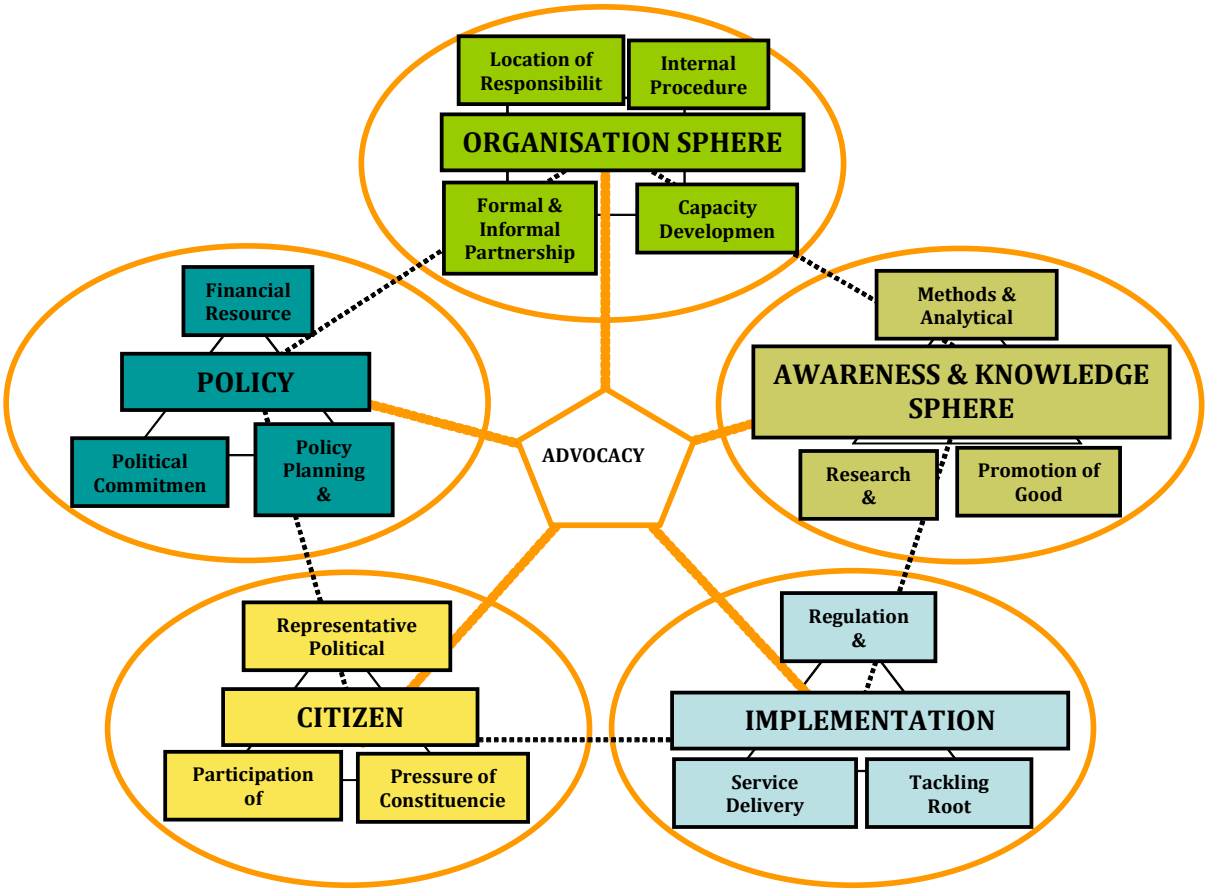


Figure 2. UNDP tools for mainstreaming DRR into development sectors

Mainstreaming has three purposes with regard to disaster risk reduction:

- To make certain that all the development programmes and projects that originate from or are funded by an agency are designed with evident consideration for potential disaster risk and to resist hazard impact.
- To make certain that all the development programmes and projects that originate from or are funded by an agency do not inadvertently increase vulnerability to disaster in all sectors: social, physical, economic and environmental.
- To make certain that all the disaster relief and rehabilitation programmes and projects that originate from or are funded by an agency are designed to contribute to developmental aims and to reduce future disaster risk.

The following are the key principles of mainstreaming:[18]

1. Mainstreaming is not a linear process; there is no set blue print; each country's national context requires a tailored approach.
2. Each country context will provide different opportunities for engagement/starting points & unique challenges.
3. Mainstreaming is not an end in itself; it is a process. The end goal is risk proof/sustainable development.

Mainstreaming is an ongoing process each step needs to be built and maintained. It has a range of possible applications, including:

1. Identification of gaps and future areas of interventions.
2. Basis for developing baselines, targets and indicators to measure progress in mainstreaming.

Identifies importance of moving beyond policy; it is not enough to 'integrate into poverty reduction strategy'.

8.3 Role of Stakeholders

This list is only indicative and not comprehensive

8.3.1 National Level

- Planning Commission
- Ministry of Environment & Forests
- Ministry of Mines
- Ministry of Home Affairs
- Ministry of Defence
- Ministry of Power and Energy
- Ministry of Urban development and Poverty Alleviation
- Ministry of Surface Transport
- Ministry of Water Resources
- Ministry of Railways
- Ministry of Science & Technology
- Ministry of Earth Sciences
- Ministry of Culture
- Ministry of Tourism
- National Disaster Management Authority

8.3.2 State Level

- Ministry of Housing and Urban Development
- State Disaster Management Authority
- State Disaster Response Force
- Public Works Department
- Electricity Board
- Jal Nigam
- Education Department

8.3.3 District Level

[18] UNDP 2008

- District Disaster Management Authority
- District Collector
- District Medical Officer
- District Education Officer
- District Police Commissioner
- District Superintendent Engineer (Power)
- District Superintendent Engineer (Water)
- Regional Transport Officer
- District-level officers of concerned central and state ministries

8.3.4 Local Level

- Urban Local Body
- Line Department of Ministries concerned, State- and District-level officers
- NGOs
- Local organisation

8.4 Need of Specific toolkit and guidelines

The study brings out the needs and also the various dimensions of appropriate tools that can be deployed towards mainstreaming of DRR in the environment sector. Many of these tools have been piloted, but have so far demonstrated only limited successes primarily due to isolated deployment and the absence of a comprehensive approach. It is, therefore, recommended to view the approach as one of an overall addressing of the issue through a holistic approach comprising a toolkit with a range of mainstreaming tools. The broad categories derived from the study are listed as below.

8.4.1. Assessment and Planning Tools

The study has reviewed assessment tools such as EIA (Environmental Impact Assessment), and planning tools embedded in development planning that has a strong implication on the environment. EIA is a major platform on which further assessment approaches can be based. This will, however, need to be developed further and customised to suit the cross-cutting aspect of DRR as it draws in multi-sectoral indicators to the assessment framework.

Planning tools can be similarly structured around the cross-sectoral parameters of environmental and risk reduction domains, both of which already have strong linkages with developmental criteria. The deployment of planning tools can at policy, strategy or action level. The principle will remain the same for all levels, with a focus on ameliorating the developmental impacts on the environment and on the risk profile of the communities in question and their context.

8.4.2. Institutional support framework

The application of assessment and planning tools for mainstreaming DRR in the environment sector will need to cover the basic levels of governance and planning:

a) National Level

b) State Level

c) District Level
d) Local Level (urban and rural)

Application across these diverse levels will require appropriate institutional support mechanisms at each level, which will provide the window for engagement. This is all the more critical since both environment and DRR are already cross-cutting issues requiring the involvement of a number of sectors and organisations. Identification of stakeholder institutions, as outlined in this study, and subsequently developing appropriate engagement mechanisms across their operational areas and protocols so as to address all areas of overlap of mandate are essential for effective mainstreaming.

It is recommended that nodal agencies be identified at all levels, and these be at appropriate levels in the environmental agencies of significance in governance. Besides this, primary and secondary stakeholder agencies need to be identified for each sectoral overlap such as urban development, transportation, industry, etc. Based on nature of role in the engagement, standard operating procedures will be needed to clearly state each stakeholder's roles and responsibilities.

8.4.3. Legislative support framework

One of the major findings of the study has been the fact that the strong legislative framework developed in the country around environmental issues during the seventies and eighties has provided a very strong basis for making environmental controls effective. The range of legislations, protocols and subsequent tools has very significantly contributed to the establishment of a strong environmental management system in the country.

A similar legislative support framework is required for the effective grounding of DRR efforts in the country, including mainstreaming of DRR in the environment sector. For the specific purpose of mainstreaming in the environment sector, the tools may emerge through enactment of appropriate new legislative instruments and also the adaptation of existing ones. The domain of NOCs (No Objection Certificates) that so far has primarily focused on the environmental impacts as a basis needs to cover issues of `Risk Assessments' and their integration with the parameters that determine the environmental viability of projects.

8.4.4. Financial instruments

The areas of environment and disaster management both being pervasive and fraught with risks associated with implementation at the grassroots level, it is highly desirable to have a regime of strong financial incentives and disincentives. These will partly stem from the legislative support framework, but can also be strongly supported through existing environmental governance tools through levying of heavy penalties on the detrimental actions identified through assessment tools. Similarly, creation of an incentive mechanism around risk reduction in the environmental sector can provide the encouragement to industry, the development sector, communities and other role players to manage the risks of their actions. As with the case of legislative support framework, the establishment of financial instruments can also be done through introduction of new mechanisms as well as adaptation of provisions in the existing systems.

It is recommended that a well worked out strategy of these four tool sets be developed and be made available to the environmental governance domain for the effective mainstreaming of DRR. It also needs to be noted here that the dynamic nature of this sector, mainly due to the diverse cross-sectoral dimensions, also makes it imperative that sufficient flexibility be maintained in the tools so as to make them equally applicable in different sectroral settings, socio-economic contexts and geographic locations.

8.5 Operational Agenda for Action

8.5.1. Specific sub-sectoral research

The current research helps identify a range of tools appropriate for mainstreaming of disaster risk reduction in the environment sector. The findings also highlight gaps in the coverage and appropriateness of currently available tools to address the complete range of contextual issues faced in the diverse geo-climatic regions of India. It is, therefore, recommended that further research be carried out on some of the key areas identified, including EIA for disaster contexts, forestry and disaster risk reduction with particular focus on stresses including climate change, urban environmental dimensions, and natural resource management and DRR.

8.5.2 . Policy consultations and advocacy

The overarching aim of an improved policy environment for cross-cutting influence across DRR and Environment can only be achieved through cross-sectoral policy adjustments. This is a significant objective and will require wide ranging consultations across the sectors concerned at the highest levels. A range of consultations need to be carried out for this purpose, and supporting instruments, including appropriate position papers, need to be prepared for this.

8.5.3. Legislative and financial framework review and advocacy

The backbone of any efforts to implement such new and cross-cutting efforts such as mainstreaming of DRR in environment is the legislative and financial support structure that helps practically implement the policies. This is a complex dimension as it requires national- and state-level interventions, and will vary widely in levels of appreciation and resource commitments across states. Preparation of position papers and subsequent consultations will be required for this purpose also, and these will need to be specifically tailored to the varying state-level contexts.

8.5.4 . National planning module and model state and local plan modules

Even with the policy, legal, institutional and financial systems in place, the implementation of the desired level of mainstreaming is a complex process and requires meticulous planning. The planning process is complex since it again involves a range of stakeholders and issues that are divergent across governance structures. It is, therefore, recommended that planning modules be prepared for this purpose, at national, state and local levels. The sub-national modules may be prepared as models that can be adopted and adapted by the implementing constituents. The planning modules will lay out the structures that need to be addressed, and will explicitly mark the areas of intervention and engagement.

8.5.5 . Development national training programme with appropriate modules

The aspect of capacity-building is an underlying need for being able to implement an agenda as comprehensive as mainstreaming of DRR in the environment sector. It is, therefore, recommended that an appropriate national training programme be designed in the form of a multi-layered TOT and training programme structure, and deployed through a network of national and sub-national training institutions.

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[ii] http://www.undpquakerehab.org/structural.htm

10.0. Appendix-Environment Legislation in India

Related to protection and conservation

Environment Protection Act

1. No.29 of 1986, [23/5/1986] - The Environment (Protection) Act, 1986, amended 1991.

Rules

2. S.O.844(E), [19/11/1986] - The Environment (Protection) Rules, 1986.
3. S.O.470(E), [21/6/1999] - Environment (Siting for Industrial Projects) Rules, 1999.

Notifications

4. **Coastal Regulation Zone**
   - S.O.16(E), [4/1/2002] - Gujarat State Coastal Zone Management Authority.
   - S.O.17(E), [4/1/2002] - Daman and Diu Coastal Zone Management Authority.
   - S.O.18(E), [4/1/2002] - Maharashtra State Coastal Zone Management Authority.
   - S.O.19(E), [4/1/2002] - Goa State Coastal Zone Management Authority.
   - S.O.20(E), [4/1/2002] - Kerala State Coastal Zone Management Authority.
   - S.O.21(E), [4/1/2002] - Karnataka State Coastal Zone Management Authority.
   - S.O.22(E), [4/1/2002] - Pondicherry Coastal Zone Management Authority.
   - S.O.23(E), [4/1/2002] - Tamil Nadu State Coastal Zone Management Authority.
   - S.O.24(E), [4/1/2002] - Orissa State Coastal Zone Management Authority.
   - S.O.25(E), [4/1/2002] - West Bengal State Coastal Zone Management Authority.
   - S.O.26(E), [4/1/2002] - Lakshadweep Coastal Zone Management Authority.
   - S.O.27(E), [4/1/2002] - Andhra Pradesh State Coastal Zone Management Authority.
   - S.O.28(E), [4/1/2002] - Andaman and Nicobar Coastal Zone Management Authority.
   - S.O.17(E), [8/1/2001] - Re-constitution of the National Coastal Zone Management Authority (NCZMA).
   - S.O.991(E), [26/11/1998] - Constitution of National Coastal Zone Management Authority.
   - S.O.577(E), [13/7/1999] - Amendments to S.O.991(E) dated 26/11/1998.
   - S.O.992(E), [26/11/1998] - Constitution of Andaman & Nicobar Islands Coastal Zone Management Authority.
   - S.O.993(E), [26/11/1998] - Constitution of Andhra Pradesh Coastal Zone Management Authority.
   - S.O.994(E), [26/11/1998] - Constitution of Tamil Nadu Coastal Zone Management Authority.

- S.O.996(E), [26/11/1998] - Constitution of Pondicherry Coastal Zone Management Authority.
- S.O.997(E), [26/11/1998] - Constitution of West Bengal Coastal Zone Management Authority.
- S.O.998(E), [26/11/1998] - Constitution of Damn and Diu Coastal Zone Management Authority.
- S.O.999(E), [26/11/1998] - Constitution of Gujarat Coastal Zone Management Authority.
- S.O.1000(E), [26/11/1998] - Constitution of Karnataka Coastal Zone Management Authority.
- S.O.1002(E), [26/11/1998] - Constitution of Lakshadweep Islands Coastal Zone Management Authority.
- S.O.1003(E), [26/11/1998] - Constitution of Maharashtra Coastal Zone Management Authority.
- S.O.995(E), [26/11/1998] - Constitution of Goa Coastal Zone Management Authority.
- S.O.518(E), [30/6/1999] - Amendments to S.O.995(E) dated 26/11/1998.
- S.O.1004(E), [26/11/1998] - Constitution of Orissa Coastal Zone Management Authority.
- S.O.399(E), [28/5/1999] - Amendments to S.O.1004(E) dated 26/11/1998.
- S.O.1001(E), [26/11/1998] - Constitution of Kerala Coastal Zone Management Authority.
- S.O.104(E), [12/2/1999] - Amendments to S.O.1001(E) dated 26/11/1998.
- S.O.88(E), [6/02/1997] - Constitution of Aquaculture Authority.
- S.O.114(E), [19/2/1991] - Declaration of Coastal Stretches as Coastal Regulation Zone (CRZ) amended 3/10/2001.
- S.O.1243(E), [15/09/2006] -Coastal Management Zone Notification, 2009.
- S.O.1761(E), [21/07/2008] -Coastal Management Zone Notification, 2008(Draft Re-publication).
- S.O.1070(E), [01/05/2008] -Coastal Management Zone Notification, 2008(Draft).
- S.O.838(E), [24/7/2003] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.636(E), [30/5/2003] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.635(E), [30/5/2003] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.460(E), [22/4/2003] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.1100(E), [19/10/2002] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.550(E), [21/5/2002] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.329(E), [12/4/2001] - Amendments to S.O.114(E) dated 19/2/1991.
- S.O.1122(E), [29/12/1998] - Amendments to S.O.114(E) dated 19/2/1991.

5. **Delegation of Powers**
   - S.O. 1219(E), [26/07/2007] - Constitution of the Environment Pollution (Prevention and Control) Authority for the NCR.
   - S.O.679(E), [27/04/2007] - Constitution of the Environment Pollution (Prevention and Control) Authority for the NCR.
   - S.O.1207(E), [27/7/2006] - Constitution of the Environment Pollution (Prevention and Control) Authority for the NCR.
   - S.O.729(E), [10/7/2002] - Delegation of Powers U/S 20 of E(P) Act, 1986 to CPCB.
   - S.O.730(E), [10/7/2002] - Delegation of Powers U/S 5 of E(P) Act, 1986 to CPCB.
   - S.O.1189(E), [29/11/1999] - Composition of Expert & Monitoring Committees for Haryana and Rajasthan.
   - S.O.93(E), [29/1/1998] - Constitution of the Environment Pollution (Prevention and Control) Authority for the NCR.
   - S.O.319(E), [10/4/1997] - Delegation of Powers to State Governments for EIA of Thermal Power Projects.
   - S.O.38(E), [14/1/1997] - Central Ground Water Board Authority, 1997, amended 2000.
   - S.O.479(E), [25/7/1991] - Delegation of Powers to State Governments of Tripura.
   - S.O.145(E), [21/2/1991] - Certain orders issued by Central Government.
   - S.O.408(E), [6/6/1989] - Delegation of Powers to State Governments of West Bengal and Manipur.
   - S.O.881(E), [22/9/1988] - Delegation of Powers to State Governments of Goa and Jammu & Kashmir.
   - S.O.488(E), [17/5/1988] - Delegation of Powers to State Governments of Maharashtra.
   - S.O.289(E), [14/4/1988] - Delegation of Powers to State Governments of Meghalaya, Punjab and Uttar Pradesh.
   - S.O.152(E), [10/2/1988] - Delegation of Powers to State Governments of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Mizoram, Orissa, Rajasthan, Sikkim and Tamil Nadu.
   - S.O.83(E), [16/2/1987] - Authorized Officers / Agencies to enter the Premises for Inspection.
   - S.O.84(E), [16/2/1987] - Officers / Agencies Authorized to take Samples.
   - S.O.394(E), [16/4/1987] - Officers Authorized for taking Cognizance of Offences.
   - S.O.584(E) - S.O.589(E), [1/10/2006] – Amendments.

6. **Eco-marks Scheme Notifications**

- G.S.R.85(E), [20/2/1991] - The Scheme on Labeling of Environment Friendly Products (ECOMARK).
- G.S.R.768(E), [24/8/1992] - The criteria for labeling Cosmetics as Environment Friendly Products.

Eco-sensitive Zone Notifications

- .S.O.1545(E), [25/06/2009] - Mount Abu as Eco- Sensitive Zone, Notification.
- S.O.1400(E), [03/06/2009] - Khaparwas Wildlife Sanctuary as Eco- Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1399(E), [03/06/2009] - Bhindawas Wildlife Sanctuary as Eco- Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1398(E), [03/06/2009] - Abubshaher Wildlife Sanctuary as Eco-Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1397(E), [03/06/2009] - Chhilchhila Wildlife Sanctuary as Eco-Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1396(E), [03/06/2009] - Nahar Wildlife Sanctuary as Eco- Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1395(E), [03/06/2009] - Bir Shikargarh Wildlife Sanctuary as Eco-Senstive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1394(E), [03/06/2009] - Kholhi Raitan Wildlife Sanctuary as Eco-Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1393(E), [03/06/2009] - Kalesar Wildlife Sanctuary as Eco- Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.1392(E), [03/06/2009] - Kalesar National Park as Eco- Sensitive Zone, Draft Notification for objections or suggestions. [Uploaded on 30.06.2009]
- S.O.364(E), [29/01/2009] - Sultanpur National Park as Eco- Sensitive, Draft Notification for objection or suggestions. [Uploaded on 23.02.2009]
- S.O.2497(E), [22/10/2008] - Draft Notification for objection or suggestions.
- S.O.133(E), [4/2/2003] - Matheran and surrounding region as an Eco-sensitive Zone.
- S.O.83(E), [16/01/2004] - Amendments to S.O.133(E) dated 4/2/2003.
- S.O.52(E), [17/1/2001] - Mahabaleswar Panchgani Region as an Eco-sensitive region.
- S.O.825(E), [17/9/1998] - Pachmarhi Region as an Eco-sensitive Zone.

- S.O.350(E), [13/5/1998] - Order Constituting the Taj Trapezium Zone Pollution (Prevention and Control) Authority.
- S.O.884(E), [19/12/1996] - Dahanu Taluka Environment Protection Authority, 1996, amended 2001.
- S.O.481(E), [5/7/1996] - No Development Zone at Numaligarh, East of Kaziranga.
- S.O.319(E), [7/5/1992] - Restricting certain activities causing Environmental Degradation at Aravalli Range.
- S.O.416(E), [20/6/1991] - Dahanu Taluka, District Thane (Maharashtra) to declare as Ecologically fragile Area, amended 1999.
- S.O.102(E), [1/2/1989] - Restricting location of industries, mining & other activities in Doon Valley (UP).
- S.O.20(E), [6/1/1989] - Prohibiting Industries in Murud-Janjira, Raigadh District, Maharashtra.

7. Environmental Clearance - General

- S.O.1533(E), [14/09/2006] - Environmental Impact Assessment Notification-2006.
- Environmental Impact Assessment Notifications and amendments - 2006.
- S.O.582(E), [13/04/2007] ,Notification - State Level Environment Impact Assessment Authority (SEIAA) , West Bengal.
- S.O.945(E), [11/06/2007] - Environmental Impact Assessment Notification-2007.
- S.O.948(E), [12/06/2007] - Environmental Impact Assessment Notification-2007.
- S.O.1105(E), [4/07/2007] - Environmental Impact Assessment Notification-2007.
- S.O.1134(E), [12/07/2007] - Environmental Impact Assessment Notification-2007.
- S.O.1203(E), [23/07/2007] - Environmental Impact Assessment Notification-2007.
- S.O.60(E), [27/1/1994] - Restrictions & Prohibitions on the Expansion & Modernization of any activity or new projects unless Environmental Clearance has been accorded, amended 2001.
    - S.O.1087(E), [22/9/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    - S.O.891(E), [4/8/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    - S.O.506(E), [7/5/2003] - Amendments to S.O.60(E) dated 27/1/1994.
    - S.O.248(E), [28/2/2003] - Amendments to S.O.60(E) dated 27/1/1994.

- S.O.801(E), [7/7/2004] - Amendments to S.O.60(E) dated 27/1/1994.
- S.O.1735(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
- S.O.1736(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
- S.O.1737(E), [11/10/2007] - Environmental Impact Assessment Notification-2007.
- S.O.2674(E), [17/11/2008] - Environmental Impact Assessment Notification-2008.
- S.O.2244(E), [22/11/2008] - Environmental Impact Assessment Notification-2008.
- S.O.195(E), [19/01/2009] - Environmental Impact Assessment Notification-2009.

8. Environmental Labs

- S.O.728(E), [21/7/1987] - Recognisation of Environmental Laboratories and Analysts.
- S.O.598(E), [26/04/2004] - Amendments to S.O.728(E) dated 21/07/1987.
- S.O.1139(E), [15/10/2004] - Amendments to S.O.728(E) dated 21/07/1987.
- S.O.774(E), [07/06/2005] - Recognisation of Environmental Laboratories.
- S.O.834(E), [31/05/2006] - Recognisation of Environmental Laboratories.
- S.O.2031(E), [27/11/2006]- Recognisation of Environmental Laboratories.
- S.O.773(E), [17/05/2007] - Recognisation of Environmental Laboratories.
- S.O.1174(E), [18/07/2007]- Recognisation of Environmental Laboratories.
- S.O.1539(E), [13/09/2007]- Recognisation of Environmental Laboratories.
- S.O.1811(E), Notification [24/10/2007] - Recognisation of Environmental Laboratories.
- S.O.55(E), [9/01/2008] - Recognisation of Environmental Laboratories.
- S.O.428(E), [4/03/2008] - Recognisation of Environmental Laboratories.
- S.O.865(E), [11/04/2008] - Recognisation of Environmental Laboratories.
- S.O.1894(E), [31/07/2008]- Recognisation of Environmental Laboratories.
- S.O.2728(E), [25/11/2008] - Recognisation of Environmental Laboratories
- S.O.1355(E), [27/05/2009]- Recognisation of Environmental Laboratories.
- S.O.1356(E), [27/05/2009]- Recognisation of Environmental Laboratories.
- S.O.1802(E), [22/07/2009]- Recognisation of Environmental Laboratories.

a. **Environmental Standards**

- G.S.R. 595(E), [21/08/2009] - Environment (Protection) Fifth Amendment Rules, 2009.(Mass based Standards SRU in Petroleum Oil Refinery)
- G.S.R. 543(E), [22/07/2009] - Environment (Protection) Amendment Rules, 2009.(Brick Kiln Sector)

- G.S.R. 512(E), [09/07/2009] - Environment (Protection) Amendment Rules, 2009.(Effluent Standards for Pharmaceutical Industry)
- G.S.R. 149(E), [04/03/2009] - Environment (Protection) Amendment Rules, 2009.(Incinerator for Pharmaceutical Industry)
- G.S.R. 97(E), [18/02/2009] - Environment (Protection) Amendment Rules, 2009. (Refractory Industry)
- G.S.R. 752(E), [24/10/2008] - Environment (Protection) Amendment Rules, 2008.(DG Sets)
- G.S.R. 600(E), [18/08/2008] - Environment (Protection) Amendment Rules, 2008.(Incinerator for Pesticide Industry)
- G.S.R. 579(E), [6/08/2008] - Environment (Protection) Amendment Rules, 2008.(Coffee Industry)
- G.S.R. 481(E), [26/06/2008] - Environment (Protection) Amendment Rules, 2008.(Common Hazardous Waste Incinerator)
- G.S.R. 414(E), [30/05/2008] - Environment (Protection) Amendment Rules, 2008.(Sponge Iron Plant)
- G.S.R. 344(E), [07/05/2008] - Environment (Protection) Amendment Rules, 2008.(Sulphuric Acid Plant)
- G.S.R.280(E), [11/04/2008] - The Environment (Protection) Amendment Rules, Notification. (DG Sets).
- G.S.R. 186(E), [18/03/2008] - Environment (Protection) Amendment Rules, 2008.(Petroleum oil Refinery)
- G.S.R.566(E), [29/08/2007] - Environment (Protection) Amendment Rules, 2007.(DG Sets)
- G.S.R.640(E), [16/10/2006] - The Environment (Protection) Second Amendment Rules, 2006.
- G.S.R.520(E), [16/06/2006] - Environment (Protection) Second Amendment Rules, 2005.
- G.S.R.464(E), [7/08/2006] - Environment (Protection) Amendment Rules, 2006.(DG Sets)
- G.S.R.46(E), [3/02/2006] - Environment (Protection) Amendment, 2006.
- G.S.R.546(E), [30/08/2005] - Revised/New Environmental Standards for Pulp and Paper Industry, Guidelines for Disposal of Solid Waste, Drill Cuttings and Drilling Fluids for Offshore and Onshore Drilling Operation, Standards for Boilers using Agriculture Waste as Fuel and Guidelines for Pollution Control in Ginning Mills.
- G.S.R.272(E), [05/05/2005] - Environment (Protection) Amendment Rules, 2005. .
- Corrigenda G.S.R.520(E), [12/08/2004] - Environment (Protection) Second Amendment Rules, 2004.(DG Sets).
- G.S.R.448(E), [12/07/2004] - The Environment (Protection) Second Amendment Rules, 2004.(DG Sets).

- G.S.R.92(E), [29/01/2004] - The Environment (Protection) Amendment Rules, 2004.(DG Sets).
- G.S.R.520(E), [1/07/2003] - The Environment (Protection) Amendment Rules, 2003.(DG Sets).
- G.S.R.849(E), [30/12/2002] - The Environment (Protection) Fourth Amendment Rules, 2002.
- G.S.R.489(E), [9/7/2002] - The Environment (Protection) Third Amendment Rules, 2002.
- G.S.R.371(E), [17/5/2002] - The Environment (Protection) Second Amendment Rules, 2002.(DG Sets).
- G.S.R.628(E), [30/08/2001] - The Environment (Protection) Amendment, Rules, 2001.
- G.S.R.682(E), [5/10/1999] - The Environment (Protection) (Second Amendment) Rules, 1999.
- G.S.R.7, [22/12/1998] - The Environment (Protection) (Second Amendment) Rules, 1998.

b. **Loss of Ecology**

- S.O.1639(E), [29/09/2006] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).
- S.O.50(E), [17/01/2007] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).
- S.O.506(E), [31/03/2007] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).
- S.O.1007(E), [22/06/2007] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).
- S.O.1556(E), [17/09/2007] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).
- S.O.1677(E), [28/09/2007] - Amendments to S.O. 671(E),dated 30/09/1996 Loss of Ecology (Prevention and Payments of Compensation).

9. National Environment Appellate Authority

a. **Act**

- NO.22 of 1997, [26/3/1997] - The National Environment Appellate Authority Act, 1997.

10. National Environment Tribunal

a. **Act**

No.27 of 1995, [17/6/1995] - The National Environment Tribunal Act, 1995.

11. Animal Welfare

a. **Act**

- No.59 of 1960 - The Prevention of Cruelty to Animals Act, 1960.

b. **Rules**

- S.O.1818(E), [23/10/2006] - Breeding of and Experiments on Animals (Control and Supervision)Amendment Rules, 2006.
- S.O.1817(E), [19/10/2006] - Reconstitution of Committee for the Purpose of Control and Supervision of Experiments on Animals(CPCSEA).
- S.O.42(E), [14/01/2006] - Breeding of and Experiments on Animals (Control and Supervision)Amendment Rules, 2005.
- S.O.1256(E), [24/12/2001] - The Animal Birth Control (Dogs) Rules, 2001.
- S.O.267(E), [26/3/2001] - The Performing Animals (Registration) Rules, 2001.
- S.O.35(E), [8/1/2002] - The Performing Animals (Registration) Amendment Rules, 2001.
- S.O.271(E), [26/3/2001] - The Prevention of Cruelty to Animals (Establishment and Regulation of Societies for Prevention of Cruelty to Animals) Rules, 2001.
- S.O.270(E), [26/3/2001] - The Prevention of Cruelty to Animals (Slaughter House) Rules, 2001.
- S.O.268(E), [26/3/2001] - The Prevention of Cruelty to Animals (Transport of Animals on Foot) Rules, 2001.
- S.O.134(E), [15/2/2001] - The Breeding of and Experiments on animals (Control and Supervision) Amendment Rules, 2001.
- S.O.1074, [15/12/1998] - The Breeding of and Experiments on Animals (Control and Supervision) Rules, 1998.
- S.O.732(E), [26/8/1998] - The Experiments on Animals (controls and Supervision) (Amendment) Rules, 1998.
- S.O.No.1056, [13/3/1979] - The Prevention of Cruelty (Capture of Animals) Rules, 1972.
- No.14-20/76-LD.I, [30/11/1978] - The Prevention of Cruelty to Animals (Registration of Cattle Premises) Rules, 1978.
- No. 18-6/70-LDI, [23/3/1978] - The Transport of Animals Rules, 1978.
- S.O.269(E), [26/3/2001] - The Transport of Animals (Amendment) Rules, 2001.
- No.14-21/76-LD.I, [15/2/1978] - The Prevention of Cruelty to Animals (Application of Fines) Rules, 1978.
- No.35-4/72-LD.I, [22/5/1973] - The Performing Animals Rules, 1973.
- No.9-18/62-LD, [23/3/1965] - The Prevention of Cruelty to Animals (Licensing of Farriers) Rules, 1965.

- No.9-18/68-LD, [23/3/1965] - The Prevention of Cruelty to Draught and Pack Animals Rules, 1965, amended 1968.

c. **Notification**

- G.S.R.619(E), [14/10/1998] - The Prevention of Cruelty to Animals (Restricted to Exhibit on Trained as a Performing Animals).

12. Wildlife

a. **Act**

- No. 16 of 2003, [17/1/2003] - The Wild Life (Protection) Amendment Act, 2002.
- The Indian Wildlife (Protection) Act, 1972, amended 1993.

b. **Rules**

- S.O.1092(E), [22/9/2003] - The National Board for Wild Life Rules, 2003.
- S.O.445(E), [18/4/2003] - The Declaration of Wild Life Stock Rules, 2003.
- G.S.R.350(E), [18/4/1995] - The Wildlife (Specified Plant Stock Declaration) Central Rules, 1995.
- G.S.R.349(E), [18/4/1995] - The Wildlife (Specified Plants - Conditions for Possession by Licensee) Rules, 1995.
- G.S.R.348(E), [18/4/1995] - The Wildlife (Protection) Rules, 1995.
- Recognition of Zoo Rules, 1992.
- G.S.R.328(E), [13/4/1983] - The Wildlife (Protection) Licensing (Additional Matters for Consideration) Rules, 1983.
- G.S.R.29(E), [25/1/1973] - The Wildlife (Stock Declaration) Central Rules, 1973.
- G.S.R.198(E), [9/4/1973] - The Wildlife (Transaction and Taxidermy) Rules, 1973.

c. **Notifications**

- S.O.802(E), [16/05/2007] - The National Board for Wildlife Rules, 2007.
- S.O.1093(E), [22/9/2003] - Constitution of the National Board for Wildlife.
- S.O.1091(E), [22/9/2003] - Coming into force of section 6 of the Wildlife (Protection) Amendment Act, 2002 (16 of 2003).
- S.O.446(E), [18/4/2003] - Delegation of Powers of section 58E of the Wildlife (Protection) Act, 1972 (53 of 1972).
- S.O.447(E), [18/4/2003] - Delegation of Powers of section 54 of the Wildlife (Protection) Act, 1972 (53 of 1972).
- S.O.332(E), [28/3/2003] - Coming into force of all the provisions except section 6 of the Wildlife (Protection) Amendment Act, 2002 (16 of 2003).
- S.O.1085(E), [30/9/2002] - Amendments to Schedule I and Part II of Schedule II of the Wildlife (Protection) Act, 1972 (53 of 1972).
- S.O.1197(E), [5/12/2001] - Amendments to Schedule I and Schedule IV of the Wildlife (Protection) Act, 1972 (53 of 1972).

- S.O.665(E), [11/7/2001] - Amendments to Schedule I and Schedule III of the Wildlife (Protection) Act, 1972 (53 of 1972).
- S.O.474(E), [28/5/2001] - Additions to Schedule I of the Wildlife (Protection) Act, 1972 (53 of 1972).

d. **Guideline**

1. Guidelines for Appointment of Honorary Wildlife Wardens.

13. Forest Conservation

a. **Acts**

- Forest (Conservation) Act, 1980, amended 1988.
- The Indian Forest Act, 1927.
- State/Union Territory Minor Forest Produce (Ownership of Forest Dependent Community) Act, 2005 - Draft.

b. **Rules**

- G.S.R.23(E) - Forest (Conservation) Rules, 2003.
- G.S.R.719 - Forest (Conservation) Rules, 1981, amended 1992.

c. **Guidelines**

- No.5-5/86-FC, [25/11/1994] - Guidelines for diversion of forest lands for non-forest purpose under the Forest (Conservation) Act, 1980.

14. Biodiversity

a. Act

- Biological Diversity Act, 2002.
- NO. 18 of 2003, [5/2/2003] - The Biological Diversity Act, 2002.
    - S.O.753(E), [01/07/2004]- Coming in to force of sections of the Biodiversity Act, 2002.
    - S.O.497 (E), [15/04/2004]- Appointment of non-official members on NBA from 1st October, 2003.
    - S.O.1147 (E)- Establishment of National Biodiversity Authority from 1st October, 2003.
    - S.O.1146 (E)- Bringing into force Sections 1 and 2; Sections 8 to 17; Sections 48,54,59,62,63,64 and 65 w.e.f. 1st October, 2003.
    - S.O.2708 (E)- Central Government authorizes the officers to file complaints with regards to offences punishable under the Biological Diversity Act, 2002, Notification.
    - S.O.120 (E)- Central Government authorizes the officers to file complaints with regards to offences punishable under the Biological Diversity Act, 2002,Amendment Notification.
    - Designation of repositories under the Biological Diversity Act, 2002.

b. **Rule**

1. G.S.R.261 (E), [15/04/2004] - Biological Diversity Rules, 2004.

15. IFS

a. **Rule**

- NO.17011/03/200-IFS-II, [10/2/2001] - Rules for a competitive examination to be held by the UPSC for the IFS.

b. **Notification**

- NO.A.12011/1/94-IFS-I, [14/12/2000] - Scheme for staffing posts included in the Central Deputation Reserve of the Indian Forest Service and other Forestry Posts similar in rank and status in certain other organizations under the Government of India.

16. Hazardous Substances Management

1. **Rules**

- S.O.432(E), [16/5/2001] - The Batteries (Management and Handling) Rules, 2001.
- S.O.908(E), [25/9/2000] - The Municipal Solid Wastes (Management and Handling) Rules, 2000.
    - S.O.705(E), [2/9/1999] - The Recycled Plastics Manufacture and Usage Rules, 1999.
    - S.O.698(E), [17/6/2003] - The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003.
- S.O.243(E), [26/3/1997] - Prohibition on the handling of Azodyes.
- G.S.R.347(E), [1/8/1996] - The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.
    - G.S.R.1037(E), [5/12/1989] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms Genetically engineered organisms or cells.
    - G.S.R. 616(E), [20/09/2006] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically-engineered organisms or cells (Amendment).
    - S.O.1519(E), [23/08/2007] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically-engineered organisms or cells (Amendment).
    - S.O.411(E), [25/02/2008] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically-engineered organisms or cells.
- S.O.966(E),[27/11/1989]- The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989.
- S.O.57(E), [19/1/2000] - The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000.

- S.O.2265(E), [24/09/2008] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, (in case the file does not open on clicking the link please right click on the link and select save target as and then open the file.)
- S.O.1799(E), [21/07/2009] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2009, Notification.
- S.O.2447(E), [23/09/2009] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2009, Notification
- S.O.630(E), [20/7/1998] - The Bio-Medical Waste (Management and Handling) Rules, 1998.
    - S.O.1069(E), [17/9/2003] - Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
    - S.O.253(E), [19/02/2007] - Amendments to S.O. 489(E), dated 30/04/2003 Taj Trapezium Zone Pollution (Prevention and Control) Authority.

Notifications

- S.O.513(E) Fly ash in construction activities, Responsibilities of Thermal Power Plants and Specifications for use of ash-based products/responsibility of other agencies, Notification, dated 03 April 2007.
- S.O.843(E), [7/7/2000] - Recognisation of the laboratories that are allowed to use of pathogenic micro-organisms or genetically-engineered organisms or cells for the purposes of research.
- S.O.763(E), [14/9/1999] - Dumping and disposal of fly ash discharged from coal or lignite based thermal power plants on land.
    - S.O.979(E), [27/8/2003] - Amendments to S.O.763(E) dated 14/9/1999
    - S.O.2623(E), [6/11/2008] - Draft Notification on Fly Ash
- G.S.R. 768(E), [4/11/2008] - Notification on Public Liability Insurance Act.

FOREST (CONSERVATION) ACT, 1980
(WITH AMENDMENTS MADE IN 1988)

An Act to provide for the conservation of forests and for matters connected therewith or ancillary or incidental thereto. Be it enacted by the Parliament in the Thirty-first Year of the Republic of India as follows :-

a. Section 1
    1. This Act may be called the Forest (Conservation) Act, 1980.
    2. It extends to the whole of India except the State of Jammu and Kashmir.
    3. It shall be deemed to have come into force on the 25th day of October, 1980.
        1. Notwithstanding anything contained in any other law for the time being in force in a State, no State Government or other authority shall make, except with the prior approval of the Central Government, any order directing -
            A. That any reserved forest (within the meaning of the expression " reserved forest " in any law of the time being in force in that State) or any portion thereof, shall cease to be reserved;
            B. That any forest land or any portion thereof may be used for any non-forest purpose;
            C. That any forest land or any portion thereof may be assigned by way of lease or otherwise to any private person or to any authority, corporation, agency or any other organisation not owned, managed or controlled by Government;
            D. That any forest land or any portion thereof may be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for reforestation.

Explanation - For the purpose of this section, "non-forest purpose" means the breaking up or clearing of any forest land or portion thereof for -

1. The cultivation of tea, coffee, spices, rubber, palms, oil-bearing plants, horticultural crops or medicinal plants;
2. Any purpose other than reforestation but does not include any work relating or ancillary to conservation, development and management of forests and wildlife, namely, the establishment of check-posts, fire lines, wireless communications and construction of fencing, bridges and culverts, dams, waterholes, trench marks, boundary marks, pipelines or other like purposes.
    a. The Central Government may constitute a committee of such number of persons as it may deem fit to advise that Government with regard to –
        1. The grant of approval under Section 2
        2. Any other matter connected with the conservation of forest which may be referred to it by the Central Government.
3. Whoever contravenes or abets the contravention of any of the provisions of Section 2, shall be punishable with simple imprisonment for a period which may extend to fifteen days.
    1. Where any offence under this act has been committed -

1. By any department of Government, the head of Department; or
2. By any authority, every person who, at the time the offence was committed, was directly in charge of, and was responsible to, the authority for the conduct of the business of the authority as well as the authority; shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render the head of the department or any person referred to in clause (b), liable to any punishment if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence.

1. Notwithstanding anything contained in sub-section (1), where an offence punishable under the Act has been committed by a department of Government or any authority referred to in clause (b) of sub-section (1) and it is proved that the offence has been committed with the consent or connivance of; or is attributable to any neglect on the part of any officer, other than the head of the department, or in the case of an authority , any person other than the persons referred to in clause (b) of the sub-section (1), such officer or persons shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

- Section 4
  - The Central Government may, by notification in the Official Gazette, makes rules for carrying out the provisions of this Act.
  - Every rule made under this Act shall be laid, as soon as may be after it is made, before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule or both houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that such modification or annulment shall be without prejudice to the validity of anything previously done under that rule.

Section 5

- The Forest (Conservation) ordinance, 1980 is hereby replaced.

Notwithstanding such repeal, anything done or any action taken under the provisions of the said Ordinance shall be deemed to have been done or taken under the corresponding provisions of this Act.

b. Related to pollution and waste

<u>Water Pollution</u>

I. **<u>Acts</u>**

1. No.36 of 1977, [7/12/1977] - The Water (Prevention and Control of Pollution) Cess Act, 1977, amended 1992

2. No. 19 of 2003, [17/3/2003] - The Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003.
3. No.6 of 1974, [23/3/1974] - The Water (Prevention and Control of Pollution) Act, 1974, amended 1988.

II. **Rules**

1. G.S.R.378(E), [24/7/1978] - The Water (Prevention and Control of Pollution) Cess Rules, 1978.
2. G.S.R.58(E), [27/2/1975] - The Water (Prevention and Control of Pollution) Rules, 1975.
3. Central Board for the Prevention and Control of Water Pollution (Procedure for Transaction of Business) Rules, 1975 amended 1976.

III. **Notifications**

1. S.O.1621(E), [27/9/2006] - Date on which the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 1974 (6 of 1974) came into force.
2. S.O.498(E), [6/5/2003] - Date on which the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003 (19 of 2003) came into force.
3. S.O.499(E), [6/5/2003] - Rate of Cess notified under the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 1977(36 of 1977.
4. S.O.862(E), [26/11/1992] - Central Pollution Control Board constituted the Pollution Control Committee in the UT of Damn, Diu, Dadra & Nagar Haveli.
   i. S.O.698(E), [3/7/1998] - Amendment to S.O.284(E) dated 19/2/1996.
5. S.O.787(E), [10/3/1992] - Delegation of Powers to the Union Territory of Pondicherry.
   i. S.O.777(E), [19/7/1995] - Amendment to S.O.787 dated 10/3/1992.
6. S.O.198(E), [15/3/1991] - Delegation of Powers to the Union Territory of Delhi.
7. S.O.199(E), [15/3/1991] - Delegation of Powers to the Union Territory of Chandigarh.
8. S.O.842(E), [31/8/1988] - Delegation of Powers to the Union Territory of Lakshadweep.
9. No.8/1/-UTF I(4)-88/4953, [11/4/1988] - Constitution of Appellate Authorities under the Water Act, 1974 for Chandigarh.
10. G.O. Ms. No. 48/88/F6, [5/4/1988] - Constitution of Appellate Authorities under the Water Act, 1974 for Pondicherry.
11. No.1/2(71)/87.Plg., [7/4/1988] - Standards to prevent & control water pollution for Small-scale Industries located in the Union Territories.
12. S.O.247(E), [8/3/1988] - Delhi Zonal Laboratory of NEERI, Nagpur as a Central Water Laboratory.
    i. S.O.787(E), [19/11/1991] - Central Pollution Control Board, New Delhi as Central Water Laboratory.

THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974

The Water Act was enacted by Parliament Act, 1974 purpose to provide for the prevention of control of water pollution and the maintaining or restoring of wholesomeness of water. As on day, it is applicable in all the states of India.

The relevant provisions of this and are given as below:

Under Section 19:

The entire National Capital Territory of Delhi has been declared as water pollution prevention control area.

Under Section 21:

Officials of DPCC can take samples of the water effluent from any industry stream or well or sewage sample for the purpose of analysis.

Under Section 23:

Officials of the state boards can enter any premises for the purpose of examining any plant, record, register etc. or any of the functions of the Board entrusted to him.

Under Section 24:

No person shall discharge any poisonous, noxious or any polluting matter into any stream, or well or sewer or on land.

Under Section 25:

No person shall without the previous consent to establish shall

a. Establish or take any step to establish any industry, operation or process or any treatment and disposal system for any extension or addition thereto, which is likely to discharge sewage or trade effluent into a stream or well or sewer or on land or
b. Bring into use any new or altered outlet for the discharge of sewage or
c. Begin to make any new discharge of sewage.

Under this section the state board may grant consent to the industry after satisfying itself on pollution control measures taken by the unit or refuse such consent for reasons to be recorded in writing.

Under Section 27:

A state board may from time to time review any condition imposed by it on the person under section 25 and 26 and may vary or revoke that condition.

Under Section 28:

Any person aggrieved by the order made by the State Board under Section 25, 26 or section 27 may within thirty days from the date on which the order is communicated to him, prefer an appeal to such authority (referred to as the appellate authority) as the State Govt. may think fit to constitute (in case of NCT of Delhi Appellate authority under this section is Financial Commissioner, Delhi Administration).

Under Section 33:

The State Board can direct any person who is likely to cause or has cause the pollution of water in street or well to desist from taking such action as is likely to cause its pollution or to remove such matters as specified by the Board through court.

Under Section 33A:

DPCC can issue any directions to any person, officer or authority, and such person, officer or authority shall be bound to comply with such directions. The directions includes the power to direct:-

i). The closure, prohibition of any industry.

ii). Stoppage or regulations of supply of electricity, water or any other services.

Under Section 43:

Whoever contravenes the provisions of Section 24 shall be punishable with imprisonment for a term which shall not be less than one year & six months but which may extend to six years with fine.

Under Section 45:

If any who has been convicted of any offence under section 24, or Section 25 or Section 26 is again found guilty of an offence involving a contravention of the same proviso shall be on the second and on every subsequent conviction be punishable with imprisonment for a term which shall not less than two years but which may extend to seven years with fine.

Under Section 45A:

Whoever contravenes any of the provisions of this Act or fails to comply with any order or direction given under this Act for which no penalty has been elsewhere provided in this Act, shall be punishable with imprisonment which may extend to three months or with fine which may extend to ten thousand rupees.

B. Air Pollution

I. **Act**

1. No.14 of 1981, [29/3/1981] - The Air (Prevention and Control of Pollution) Act 1981, amended 1987.

II. **Rules**

1. G.S.R.6(E), [21/12/1983] - The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983.
2. G.S.R.712(E), [18/11/1982] - The Air (Prevention and Control of Pollution) Rules, 1982.

III. **Notifications**

1. G.S.R.935(E), [14/10/1998] - Ambient Air Quality Standard for Ammonia (NH_3).
2. G.S.R.389(E), [23/9/1994] - CPCB reestablished labs in Delhi, Calcutta, Vadodara and Kanpur.
3. G.S.R.384(E), [11/4/1994] - National Ambient Air Quality Standards.
4. S.O.1032(E), [12/12/1989] - Constitution of the Appellate Authority for the Union Territories.
5. G.S.R.429(E), [10/2/1989] - Declaring the UT of Dadra and Nagar Haveli as air pollution control area.
6. G.S.R.382(E), [28/3/1988] - The Date on which the Air Amendment Act of 1987 came into force.
7. G.S.R.71(E), [1/2/1988] - Declaring the UT of Chandigarh as air pollution control area.

8. G.S.R.54(E), [25/1/1998] - Declaring the UT of Pondicherry as air pollution control area.
9. G.S.R.106(E), [20/2/1987] - Declaring the UT of Delhi as air pollution control area.
10. G.S.R.351(E), [15/5/1981] - The Date on which the Air Act of 1981 came into force.

THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

The Air (Prevention & Control of Pollution) Act was enacted by the Parliament in 1981 with an objective to prevent, control & abatement of air pollution. Under Section 19 of this Act the whole of National Capital Territory of Delhi has been declared as air pollution control area by the Central Government. Under this section the government approved fuels to be used in the air pollution control area.

The following are the important provisions of the Air (Prevention & Control of Pollution) Act:

Under Section 21(1):

People establish or operate any industrial unit in National Capital Territory of Delhi without obtaining prior consent of the DPCC.

The consent application will be disposed of within 4 months of receipt of the consent application. However, DPCC may either grant consent or reject the application within 4 months for reasons to be recorded in writing. It may also revoke previous, consent to the industry before expiry of the same after giving a reasonable opportunity of being heard.

Any consent requires the compliance with the following conditions:-

i). Control equipment of such specification as the State Board may approve.

ii). Control equipment referred above shall be kept at all times in good running condition.

iii). Chimney, wherever necessary, of such specifications as state boards may approve.

iv). Any other such conditions as the state board may specify.

Under Section 22:

No person operating any industrial plant, in any air pollution control area shall discharge or cause or permit to be discharged the emission of any air pollution in excess of the standards laid down by the state board.

Under Section 22(A):

State Board can also approach the court to stop any person from doing air pollution.

Under Section 24(i), 26(i):

DPCC officers have powers to inspect any premises in performance of their duties, take samples, examine records, documents etc. or performing any other duty entrusted to them by the board. Every person operating any equipment is bound to provide all assistance to the person who is inspecting. When samples taken, officials can collect the samples after informing the person of the industry. Any analysis of the samples done in the air lab can be produced as evidence in a court.

Under Section 31:

Any person aggrieved by an order made by the state board under this act may, within 30 days from the date on which order is communication to him, prefer an appeal to the authorized authority who in the case of Delhi is the Joint Secretary, Ministry of Environment & Forest.

Under Section 31(A):

The state board can give directions to any person or office or authority in writing and such person or officer or authority is bound to comply with such directions which includes:

i) The closure, prohibition or regulation of any industry, operation or process or
ii) Stoppage or regulation of electricity, water or any other services.

Under Section 37:

Any person failing to comply with the provisions of Section 21 or Section 22 or directions issued under Section 31(A) can be imprisoned from 1-1/2 years to 6 years, with fine or with a fine up to Rs.5000/- per day.

If violation continues beyond one year imprisonment can be increased upto 7 years with fine.

Under Section 39 :

Whoever contravenes any of the provisions of this Act or any order or directions issued there under, for which no penalty has been elsewhere provided in this act, shall be punishable with imprisonment for a term which may extend to three months or with fine which may extend to ten thousand rupees or with both, and in case of continuing contravention with an additional fine which may extend to Rs.5000/- for every day during which such contravention continues after conviction for the first such contravention.

17. Hazardous Substances Management

2. **Rules**

1. S.O.432(E), [16/5/2001] - The Batteries (Management and Handling) Rules, 2001.
2. S.O.908(E), [25/9/2000] - The Municipal Solid Wastes (Management and Handling) Rules, 2000.
    - S.O.705(E), [2/9/1999] - The Recycled Plastics Manufacture and Usage Rules, 1999.
    - S.O.698(E), [17/6/2003] - The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003.
3. S.O.243(E), [26/3/1997] - Prohibition on the handling of Azodyes.
4. G.S.R.347(E), [1/8/1996] - The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.
    - G.S.R.1037(E), [5/12/1989] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms Genetically engineered organisms or cells.
    - G.S.R. 616(E), [20/09/2006] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms Genetically engineered organisms or cells(Amendment).

- S.O.1519(E), [23/08/2007] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms Genetically engineered organisms or cells(Amendment).
- S.O.411(E), [25/02/2008] - The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms Genetically engineered organisms or cells.

5. S.O.966(E), [27/11/1989] - The Manufacture, Storage and import of Hazardous Chemical Rules, 1989.
6. S.O.57(E), [19/1/2000] - The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000.
7. S.O.2265(E), [24/09/2008] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, (in case the file does not open on clicking the link please right click on the link and select save target as and then open the file.)
8. S.O.1799(E), [21/07/2009] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2009, Notification
9. S.O.2447(E), [23/09/2009] - The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2009, Notification
10. S.O.630(E), [20/7/1998] - The Bio-Medical Waste (Management and Handling) Rules, 1998.
    - S.O.1069(E), [17/9/2003] - Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
11. S.O.253(E), [19/02/2007] - Amendments to S.O. 489(E),dated 30/04/2003 Taj Trapezium Zone Pollution (Prevention and Control) Authority.

2. **Notifications**

2. S.O.513(E) Fly ash in construction activities, Responsibilities of Thermal Power Plants and Specifications for use of ash-based products/responsibility of other agencies ,Notification, dated 03 April 2007.
3. S.O.843(E), [7/7/2000] - Recognisation of the laboratories that are allowed to use of pathogenic micro-organisms or genetically-engineered organisms or cells for the purposes of research.
4. S.O.763(E), [14/9/1999] - Dumping and disposal of fly ash discharged from coal or lignite based thermal power plants on land.
    - S.O.979(E), [27/8/2003] - Amendments to S.O.763(E) dated 14/9/1999
    - S.O.2623(E), [6/11/2008] - Draft Notification on Fly Ash
5. G.S.R. 768(E), [4/11/2008] - Notification on Public Liability Insurance Act.

Noise Pollution

Rules

S.O.123(E), [14/2/2000] - Noise Pollution (Regulation and Control) Rules, 2000.

- S.O.1088(E), [11/10/2002] - The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
- S.O.1088(E), [13/07/2006] - The Noise Pollution (Regulation and Control) (Amendment) Rules,2006.
- S.O.1046(E), [22/11/2000] - The Noise Pollution (Regulation and Control) (Amendment) Rules, 2000.
- S.O.1569(E), [19/09/2006] - The Noise Pollution (Regulation and Control) (Amendment) Rules, 2006.

Draft Notification

G.S.R. 158(E), [09/03/2009] - Environment (Protection) Amendment Rules, 2009, Draft Notification.

Ozone Layer Depletion

Rule

- S.O.670(E), [19/7/2000] - The Ozone Depleting Substances (Regulation and Control) Rules, 2000.

Water Pollution

Notifications

- S.O.521(E), [20/02/2009] - Effective abatement of pollution and conservation of the river Ganga, Notification.
- S.O.583(E) Water Quality Assessment Authority, Order, dated 29 May 2001.
- S.O.2151 Water Quality Monitoring Order 2005, Notification, dated 17 June 2005.

2-T Oil

- G.S.R.778(E), [31/12/1998] - The 2-T Oil (Regulation of Supply and Distribution) Order, 1998.
- G.S.R.714(E), [17/11/2006] - The 2-T Oil (Regulation of Supply and Distribution) Order, 2006.

Public Liability Insurance

1. **Act**
    1. No.6 of 1991, [22/1/1991] - The Public Liability Insurance Act, 1991, amended 1992.
2. **Rule**
    1. S.O.330(E), [15/5/l991] - The Public Liability Insurance Rules, 1991, amended 1993.
3. **Notifications**

1. G.S.R.253, [27/3/1991] - Date on which the Public Liability Insurance Act, 1991 came into force.
    i. S.O.282, [19/3/1993] - List of Officers delegated powers of section 13 & 18 of PLI Act.
    ii. S.O.779(E), [15/11/1991] - Delegation of powers to the State Governments.
    iii. S.O.780(E), [15/11/1991] - Delegation of powers to the State Governments.
    iv. S.O.227(E), [24/3/1992] - Hazardous substances and quantities to which PLI is applicable.

c. Related to safety and emergency

Public Liability Insurance

2. **Act**
    1. No.6 of 1991, [22/1/1991] - The Public Liability Insurance Act, 1991, amended 1992.
2. **Rule**
    2. S.O.330(E), [15/5/l991] - The Public Liability Insurance Rules, 1991, amended 1993.
3. **Notifications**
    1. G.S.R.253, [27/3/1991] - Date on which the Public Liability Insurance Act, 1991 came into force.
    v. S.O.282, [19/3/1993] - List of Officers delegated powers of section 13 & 18 of PLI Act.
    vi. S.O.779(E), [15/11/1991] - Delegation of powers to the State Governments.
    vii. S.O.780(E), [15/11/1991] - Delegation of powers to the State Governments.
    viii. S.O.227(E), [24/3/1992] - Hazardous substances and quantities to which PLI is applicable.