

DISASTER MANAGEMENT IN INDIA

By
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CHAPTER I DISASTER MANAGEMENT: INDIA'S PREPAREDNESS

“Building culture of prevention is not easy. While the cost of prevention had to be paid in the present, its benefits lie in the distant future. Moreover, the benefits are not tangible, they are disasters that did not happen”.

Kofi Annan, UN Secretary General, 1999

INTRODUCTION

Background

Disaster is a sudden unexpected accident resulting from natural or man-made factors or a combination of both that takes a heavy toll on the community and the eco system in which it strikes. It has a major negative impact on the daily lives and living conditions of humans and flora/fauna. The United Nations defines disaster as a sudden or major misfortune which disrupts the basic fabric and normal functioning of society. The term disaster owes its origin to the French word DESASTRE, where DES means bad or evil and ASTRE means star – combined it implies “Bad or Evil Star”. Dictionary though defines disaster as a great or sudden misfortune.

Disasters can either be natural or man-made. Natural disasters include floods, droughts, earthquakes, cyclones, hurricanes, tornadoes, typhoons, landslides, volcanic eruptions, tsunamis etc. Man-made disasters can include chemical accidents, oil spills, radiological accidents, conflicts/wars, mass population

displacement, forest fires etc. Natural disasters have been a major concern of the global community since more than 203 million people are affected annually.¹ The intensity of natural disasters has been on the rise mainly due to reasons attributable to mankind in terms of wanton destruction and utilization of Earth's resources, thus leading to changes in the ecological balance of the earth as well as on overall global warming.

India with its geo climatic conditions being what they are, is prone to natural disasters. Disasters occur with unfailing regularity and despite better preparedness to meet all such conditions in recent years, the economic and social losses are heavy. Among all disasters afflicting the country, river floods are the most frequent and often the most devastating.² Earthquakes are considered amongst the most dangerous and hazardous, their impact being sudden with little or no warning. The Himalayan region, Northeast India, Myanmar, Andaman & Nicobar Islands region are a part of the global seismic belt running from the Mediterranean Sea, Turkey, Iran, Afghanistan, Himalayas, Myanmar, extending to Indonesia and thence to the Pacific region. The occurrence of earthquakes in this region is attributed to the north northeasterly movement of the Indian plate at the rate of 5 cm per year.³ Drought is a perennial feature in some states of India, 16% of the country's total area is drought prone and approximately 50 million people are affected annually by drought. Finally, India has a long coastline of 5700 kms, which is exposed to tropical cyclones and tsunamis arising in the Bay of Bengal and Arabian Sea.

The management of disasters due to natural hazards, capacity for effective response and ability to achieve unity of effort among governmental and non governmental organisations, is the main subject of analysis of this thesis. The diversity of knowledge areas and the vast number of agencies involved in Disaster Management (DM), which have to come together at the point of decision, is difficult to fathom. Rarely would there be a singular task which requires inputs from meteorologists, environmentalists, earthquake specialists, water resource managers, health and epidemic specialists, geographers, remote sensing agencies, road and railway experts, nuclear-biological & chemical specialists, vulnerability assessment specialists, public administration agencies, urban planners, civil defence, police, the military and para military agencies. Thus disaster management emerges as a complete multi disciplinary subject demanding careful orchestration to synergise the efforts of all agencies for a combined and cohesive approach.

Justification of Study

The dimensions of the threat are so varied that DM requires a holistic approach encompassing the facets of monitoring, forecasting capability, preventive measures, mitigation, quick response capability, recovery & reconstruction and integration between all agencies. India has taken a series of steps which include putting in place National Disaster Management Act in December 2005. Under this act, the National Disaster Management Authority (NDMA) has been constituted as the apex body for DM in India. The NDMA has issued a series of guidelines and instructions for integrated approach to DM with short-term as well as long-term goals. In view of the above it is envisaged that there is a requirement of examining the complete ambit of DM to arrive at the current level of DM and the timeframe by which India will be fully prepared to meet the challenges of DM. The study will also facilitate in arriving at any constructive suggestions as well as recommendations for consideration of mid-course corrections.

Aim

The aim of this dissertation is to consider the Disaster Management (DM) measures which have been put in place and which are expected to come up in future in India and assess the adequacy of the same to deal with disasters of the future efficiently and effectively as a national machinery.

Hypothesis

The hypothesis arrived at for this dissertation is “India’s preparedness to deal with Disaster Management in terms of forecasting, monitoring, prevention, mitigation, response and capability of recovery and reconstruction is inadequate. It requires to be enhanced and integrated”.

Scope

The field of DM being extremely vast, this dissertation has restricted itself to the disasters caused due to natural hazards to which India is vulnerable, namely floods, cyclones, earthquakes and droughts. The trend the world over has shifted from “Disaster Response” to “Disaster Management” encompassing all facets of DM. To this effect the dissertation will take into account the following :

- (a) The DM mechanism at the Central and state government level.
- (b) National Disaster Management Authority (NDMA).

- (c) Existing DM infrastructure.
- (d) Integration of DM process.
- (e) Future plans of DM.

The study will analyse the above to infer as to whether the entire machinery is geared to meet the future disaster management requirements. The dissertation will also include suitable recommendations.

Preview

The dissertation will be structured into the following chapters :

- (a) Chapter I - Introduction
- (b) Chapter II - India: Vulnerability to Natural Hazards
- (c) Chapter III - Institutional Disaster Management Structures
- (d) Chapter IV - Forecasting and Early Warning of Natural Disasters
- (e) Chapter V - Disaster Preparedness: Prevention, Mitigation, Response and Recovery
- (f) Chapter VI - Role of Armed Forces and Other Organisations
- (g) Chapter VII - Analysis, Recommendations and Conclusion

Method of Data Collection

The following sources will be used for data collection :

- (a) Books, periodicals and newspaper articles.
- (b) Material available in electronic format in terms of CDs, internet material including old presentations on the subject.
- (c) Interaction with National Disaster Management Institute.
- (d) Interaction with renowned officials / scholars dealing with DM.
- (e) Interaction with Army officials associated with DM after the 09 October 2005 earthquake in J&K.
- (f) Reports of national and international organisations.

CHAPTER II

INDIA : VULNERABILITY TO NATURAL HAZARDS

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomenon. As per the natural hazards map of India, 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought.⁴ In the decade of 1990-2000, an average of about 4344 people lost their lives and about a million people were affected by disasters each year. The loss in terms of private, community and public assets has been astronomical.

Almost 85% of the country is vulnerable to single or multiple disasters. Of the 35 states and union territories in the country, 27 are disaster prone. The multi-hazard map of India at Fig 1 depicts that 229 districts of India are prone to multiple hazards, West Bengal for example is prone to four types of hazards. Floods, droughts, earthquakes, cyclones, landslides and avalanches have taken a heavy toll of lives and have caused enormous damage to property. Tsunami is the latest addition to India's woes of natural disasters.

The Natural Disasters which affected India from 2000-2008 as per Emergency Events Database (EM-DAT) maintained by Centre for Research on the Epidemiology of Disasters (CRED), Brussels is attached as Appx 'A'.⁵

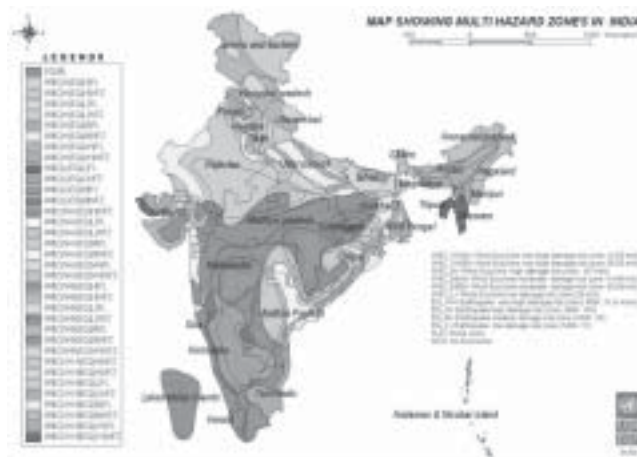


Fig 1. Multi-Hazard Zone Map

The details of major disasters are tabulated in Chart I.

Chart I

Ser No	Date	Type of Disaster	Location	Population	
				Killed	Affected(lacs)
(a)	Apr 2000	Drought	Gujarat, M P Rajasthan	-	500
(b)	Aug 2000	Floods	Gujarat & AP	867 7,	20
(c)	26 Jan 01	Earthquake	Gujarat	20,005	63.2
(d)	Jan 2002	Drought	UP, MP	-	3000
(e)	Jun-Aug 02	Floods	Assam, Gujarat & HP	544	420
(f)	26 Dec 04	Tsunami	TN, Kerala, Andaman & Nicobar	16,389	6.54
(g)	08 Oct 05	Earthquake	J & K	1309	1.56
(h)	Jul-Aug 05	Floods	Gujarat & MP	1200	200
(j)	Jul-Aug 06	Floods	AP & Gujarat	350	40
(k)	18 Sep 06	Storm	AP/WB	114	1.5
(l)	Jun-Jul 07	Floods	Orissa	900	330
(m)	Jul-Sep 07	Floods	Bihar, UP & Assam	1103	1.87
(n)	22 Sep 07	Cyclone	WB	80	72

Floods

The Indo-Ganga-Brahmaputra basin, stretching parallel to the Himalayan arc, carries water and silt from wide catchments through the longest alluvial plain in the world. About 12% of its geographical area (about 40 million hectares) is subject to riverine and flash floods of which about eight million hectares are susceptible to annual flooding.⁶

Among all the disasters afflicting the country, river floods are the most frequent and often the most devastating. Almost 85% of the annual average rainfall of 1200 mm is concentrated over a short monsoon season of four months from June to September. The average precipitation in the Indo-Gangetic plain is 1500mm while in upper Assam, it is over 2500mm. This factor combined with inflow of water from the northern rivers from Nepal results in the Ganga-Brahmaputra basin carrying 60% of the nation's total river flow and therefore is most prone to floods.⁷

The details of the flood prone areas as a percentage area of the states and as a percentage area of the total floods prone area of the country is as tabulated in Chart II.⁸

Chart II

State	Flood Prone area as % of total area of state	Flood Prone area of the state as % of the total flood prone area of the country
(a) Uttar Pradesh	32.61	19.4
(b) Bihar	55.22	13.0
(c) Assam	50.14	9.8
(d) West Bengal	37.42	8.1
(e) Orissa	10.34	4.0
(f) Other States	6.92	45.7
Total	12.17	100

Compared to the Ganga and Brahmaputra river regions, the flood problem in North West rivers region, Central India and Deccan region is relatively less, specially towards the southern part of the country where rivers have mostly well defined and stable courses.

India was subjected to 160 floods from 1900-2005 which killed 50,964 persons, left 9,034, 230 homeless and 625,262,850 affected. In 2004 alone, floods affected 8031 million hectares resulting in the loss of 1275 lives and an estimated infrastructural loss of Rs 1,896 crores.⁹The National Disaster Management Authority (NDMA) has stated that the annual damage to crops, houses and public utilities is

more than Rs 1,800 crores and it also finds that the monetary value of flood damage is showing an increasing trend with the average annual damage during last 50 years (1946-2005) being Rs 4,745 crores, as against the last 53 years average of Rs 1805 crores.¹⁰

Earthquakes

Earthquakes are considered to be one of the most dangerous and destructive natural hazards. The impact of the earthquake is sudden with little or no warning, making it just impossible to predict them. About 60% of the total area of India is vulnerable to earthquakes of varying intensities. Most of the vulnerable areas are located in the Himalayan / Sub Himalayan regions and in Andaman and Nicobar Islands. India falls quite prominently on the global seismic belt, which runs in east-west direction and is called the Alpine-Himalayan Belt.¹¹ This belt is the line along which the Indian plate meets the Eurasian plate. The Indian plate thrusts underneath the Eurasian plate at a speed of 5 cm per year, giving rise to tremendous stress which keeps accumulating in the rocks and is released from time to time in the form of earthquakes.

The Disaster Management Institution of Bhopal has identified seven seismic regions in India.¹² These are :

- (a) Kashmir & Western Himalayas
- (b) Central Himalayas
- (c) North East India
- (d) Indo – Gangetic Basin and Rajasthan
- (e) Cambay and Rann of Kutch
- (f) Peninsular India
- (g) Andaman and Nicobar Islands

More recently, based on the probable intensities and return periods, a seismic map of the country has been standardised in which the regions have been integrated into four seismic zones (zones II to V) of various intensities. The Vulnerability Atlas as prepared by Building Materials Technology Promotion Council (BMTPC) indicates that 229 districts from 21 states and UTs of the country fall within the seismic zones IV & V. The state-wise zones are as depicted in Chart III.¹³

Chart III

Classification of states according to seismic zones				
Seismic zone	Risk zone	Intensity		States
		MSK	Richter	
V	Very High Damage Risk Zone	IX	8+	Entire North East and parts of J&K, Himachal Pradesh, Uttarakhand, Gujarat, Bihar and Andaman & Nicobar
IV	High Damage Risk Zone	VIII	7 – 7.9	Parts of J&K, HP, Punjab, Haryana, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Gujarat and Maharashtra
III	Moderate Damage Risk Zone	VII	5 – 6.9	Parts of Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Orissa, Madhya Pradesh, Chhattisgarh, Rajasthan, Gujarat and Maharashtra, Andhra, Tamil Nadu, Karnataka, Kerala and Lakshadweep
II	Low Damage Risk Zone	VI	4 – 4.9	Parts of Rajasthan, MP, Chhattisgarh, Jharkhand, Orissa, Maharashtra, AP, TN, Karnataka and Kerala

The major earthquakes which have struck India from 1990 onwards and their intensity is seen in Chart IV.

Chart IV

(a)	Year	Location	Magnitude
(b)	1991	Uttarkashi	6.6
(c)	1993	Latur	6.3
(d)	1997	Jabalpur	6.0
(e)	1999	Chamoli	6.8
(f)	2001	Bhuj	6.9
(g)	2005	Jammu & Kashmir	7.6

Cyclones

The World Meteorological Organisation (WMO) uses the term “Tropical Cyclone” to cover weather systems in which winds exceed “gale force” of 34 knots or 63 kmph.

Cyclones are created by intense low pressure in the atmosphere, due to which very high wind velocities are achieved in circular motion over an area of 500 to 1000 km and vertically 12-14 km from the surface. Cyclones are characterised by destructive winds, storm surges and exceptional level of rainfall. Storm surges are defined by a rise in sea level leading to large scale coastal inundation and some of the world's highest rainfall spread over one or two hours occurs during tropical cyclones leading to extensive flooding.

India has a very long coastline of 5700 kms which is exposed to tropical cyclones arising in the Bay of Bengal and Arabian Sea.¹⁴ The Indian subcontinent is one of the six worst cyclone affected parts of the world, mainly due to low depth ocean bed topography and coastal configuration. In India, cyclones occur usually between April and May and also between October and December. The eastern coastline is more prone to cyclones as about 80% of total cyclones generated in the region hit the coastline. The following segments of the east coast of India are most vulnerable to high storm surges.

- (a) North Orissa and West Bengal coasts.
- (b) Andhra Pradesh coast between Ongole and Machilipatnam.
- (c) Tamil Nadu coast, south of Nagapatnam.¹⁵

The west coast of India is less vulnerable to storm surges than the east coast of India in terms of both the height of storm surge as well as frequency of occurrence. Severe cyclones which have struck the Indian coastline since 1990 are tabulated in Chart V.¹⁶

Chart V

	Period	Coastline	Damages
(a)	May 1990	Andhra	928 human casualties and 14000 houses damaged.
(b)	Nov 1991	Tamil Nadu	185 human & 540 cattle casualties. Property including roads worth 300 crores damaged.
(c)	April 1993	Bengal	100 human casualties, communication system including roads damaged.

(d)	Nov 1994	Bengal	1000 houses damaged, communication disrupted.
(e)	Oct 1996	Andhra	1057 human casualties, 6.47 lakh houses damaged, road network completely damaged.
(f)	Jun 1998	Gujarat	1261 human casualties, 2.57 lakh houses damaged.
(g)	Oct 1999	Orissa	10,086 human casualties and 21.6 lakh houses damaged.

Drought

In India, 16% of the country's total area and 68% of total sown area is drought prone, leading to approximately 50 million people being affected annually by droughts. The distribution of the sown area of the country under various ranges of rainfall is as under.¹⁷

- (a) 33% - Low Rainfall region - 750 mm.
- (b) 35% - Medium Rainfall region - 751-1125 mm.
- (c) 24% - High Rainfall region - 1125-2000 mm
- (d) 8% - Very High Rainfall region - > 2000 mm

Most of the drought prone areas identified by Government of India lie in arid, semi-arid and sub-humid areas of the country. The prominent drought affected areas include Gujarat, Rajasthan and adjoining parts of Punjab, Haryana, western Uttar Pradesh and western Madhya Pradesh, interior Karnataka Rayalseema, south Telangana, parts of Tamil Nadu, parts of Orissa, small portions of north west Bihar and adjoining Uttar Pradesh and south west Bihar.

CHAPTER III

INSTITUTIONAL DISASTER MANAGEMENT STRUCTURE

In the federal structure of Indian administration, the primary responsibility of disaster management is that of the states, with the national government laying down the policy and guidelines on the subject and also providing the necessary support in terms of supplementing the physical resources, financial resources and complementary measures in sectors such as warning, transport and interstate movement of staple foods.¹⁸ Disaster management was being handled by “Natural Disaster Management Division” of Ministry of Agriculture. A review of the DM was carried out by the Government of India after Bhuj earthquake and DM (excluding drought and epidemics) was transferred to the Ministry of Home Affairs (MHA). The actual transfer of work took place in June 2002.¹⁹

National Level

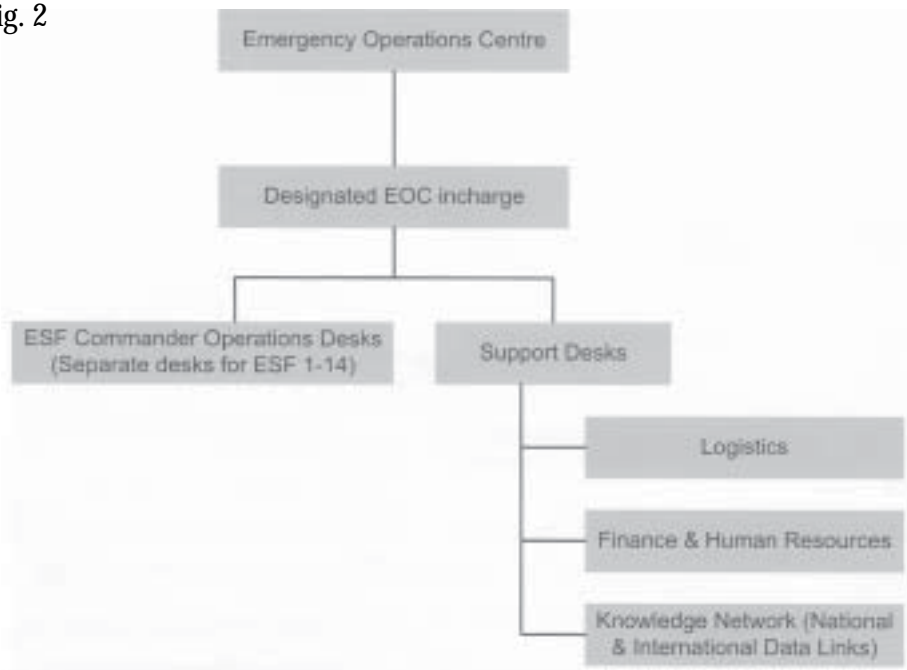
Cabinet Committee on Natural Calamities and National Crisis Management Committee. At the apex level is the Cabinet Committee on Natural Calamities which addresses the principal issues relating to natural disasters, primarily those pertaining to institutional and legislative measures needed to promote an effective strategy for natural disaster management. At the higher government level there is a National Crisis Management Committee (NCMC) headed by Cabinet Secretary with Secretaries of all relevant ministries as the members. The Home Secretary is responsible for updating the NCMC of all developments on any national crisis.

Nodal Ministry for DM. MHA is the nodal ministry for DM. The Central Relief Commissioner (CRC) in the MHA is the nodal officer who coordinates relief operations for natural disasters. A Crisis Management Group (CMG) with senior officers from concerned ministries is constituted under the chairmanship of CRC to review the contingency plans, devise measures for dealing with disasters and coordinate the activities of central ministries and state governments in relation to disaster preparedness and relief. In the event of a disaster, CMG meets frequently to review relief operations and extend all possible help to the states. The CRC receives information relating to forecast / warning of natural calamities from Indian Meteorological Department or from Central Water Commission on a regular basis. The nodal ministries managing different types of disaster are as follows²⁰ :

- (a) Natural & man made Disasters - Ministry of Home Affairs
- (b) Drought - Ministry of Agriculture
- (c) Air Accident - Ministry of Civil Aviation
- (d) Railway Accident - Ministry of Railways
- (e) Chemical Disasters - Ministry of Environment
- (f) Biological Disasters - Ministry of Health
- (g) Nuclear Disasters - Department of Atomic Energy

Emergency Operations Centre (EOC). A state-of-the-art EOC (Control Room) exists in the MHA, which functions round the clock, to assist the CRC in the discharge of these duties. The activities of the EOC include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected states, interaction with other Central Ministries / Departments / organisations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries and keeping up to date details of all concerned officers at the Central and State levels.²¹ The EOC is constituted as shown in Figure 2.

Fig. 2



A diagrammatic representation of the Disaster Management set-up at National level is attached as Appx 'B'.²²

Contingency Action Plan. A National Contingency Action Plan for dealing with contingencies arising in the wake of natural disasters formulated by the Government of India is periodically updated. It identifies the initiatives required to be taken by various Central Ministries / Departments, the procedures to be followed and the focal points in administrative machinery. It facilitates the launching of relief operations without delay.

Paradigm Shift. During the last 15 years the country has witnessed six major earthquakes and four severe cyclones. Floods and droughts occur almost every year. These disasters have underscored the need of a multi-dimensional, multi-disciplinary and multi-sectoral approach involving diverse scientific, engineering, social and financial processes.²³ The government has therefore brought about a change in orientation from a relief centric approach to a holistic approach covering the entire cycle of disaster management encompassing prevention, mitigation, preparedness, response, relief and rehabilitation.

National Disaster Management Framework. The shifting paradigm is currently being institutionalised through a National Disaster Management Framework which highlights the interdependence of economy, environment and developments and links the issues of poverty alleviation, capacity building and community empowerment as well as other structural and non structural issues of prevention and preparedness, response and recovery for effective disaster risk mitigation and management. The underlying premise of this framework is that, whereas hazards are inevitable, they need not become disasters every time. The framework proposes initiatives for prevention strategy, early warning systems, disaster mitigation, preparedness, response and human resource development. The National Disaster Management Framework is attached as Appx 'C'.²⁴

Disaster Management Act. The Disaster Management Act 2005 was enacted on 26 December 2005. The act provides for setting up of the National Disaster Management Authority (NDMA) chaired by the Prime Minister, State Disaster Management Authorities (SDMAs) under the chairmanship of Chief Ministers and District Disaster Management Authorities under the chairmanship of District Magistrates. The act also provides for the following :

- (a) Constitution of National Executive Committee (NEC), National Institute of Disaster Management (NIDM) and National Disaster Response Force (NDRF).

- (b) Drawing up department wise plans in accordance with National Disaster Management Plan.
- (c) Constitution of National Disaster Response Fund and National Disaster Mitigation Fund.
- (d) Allocation of specific role to local bodies including Panchayati Raj Institutions (PRIs) as well as Urban Local Bodies in DM.²⁵

NDMA. NDMA has been constituted in accordance with the provisions of the DM Act, 2005 on 27 September 2006 under the chairmanship of the Prime Minister with a Vice Chairman and eight members. The NDMA has the responsibility of laying down policies, plans and guidelines for DM and coordinating their enforcement and implementation for ensuring timely and effective response to disasters.²⁶

The NDMA has undertaken/is in the process of undertaking the following:

- (a) Draft National policy on DM and a Draft National DM Plan has been prepared and is pending approval of the government.
- (b) National guidelines for Management of following disasters have been prepared and issued :
 - (i) Management of Earthquakes.
 - (ii) Management of Chemical (Industrial) Disasters.
 - (iii) Medical Preparedness and Mass Casualty Management.
 - (iv) Preparation of State Management plans.
 - (v) Management of Floods.
 - (vi) Management of Cyclone.
 - (vii) Management of Biological Disasters.
- (c) National guidelines for Management of the following are under preparation:
 - (i) Management of Landslides.
 - (ii) Management of Nuclear and Radiological Emergencies.
 - (iii) Management of Urban Flooding.²⁷
- (d) Facilitating training of NDRE.

- (e) Overseeing the post-tsunami rehabilitation and reconstruction activities in Andaman and Nicobar Islands.
- (f) Planning national level mitigation projects related to cyclones, earthquakes and floods.
- (g) An awareness campaign to improve risk perception, preparedness and self-reliance.
- (h) Facilitating mock exercises in vulnerable states on various types of disasters to help states review adequacy and efficiency of these plans.

National Executive Committee (NEC). NEC is the executive committee of NDMA comprising 15 secretaries of relevant ministries, Chief of Integrated Defence Staff. NEC assists NDMA in the discharge of its functions, ensures compliance of the directions issued by Central Government and coordinates response in the event of any threatening disaster situation or a disaster.

State Disaster Management Authority (SDMA). At the state level, the SDMA, headed by the chief minister will lay down policies and plans for DM, approve the state plan in accordance with the guidelines laid down by NDMA, coordinate implementation of the state plan, recommend provision of funds for mitigation and preparedness measures, review developmental plans of different departments of the state to ensure integration of prevention, preparedness and mitigation measures and lay down guidelines for standards of relief provided to persons affected by disaster in the state.²⁸ As on date 20 states have established state Disaster Management Authorities under the Act.

State Executive Committees (SEC). The state governments are required to constitute SECs under the chairperson of the chief secretary and four secretaries from relevant departments. These committees are responsible to assist the SDMA in implementing the national and state plans and for coordinating, monitoring and evaluating management of disasters in the state. The state DM plan will be prepared by SEC in accordance with guidelines of NDMA and in consultation with state authorities and local bodies.

District Disaster Management Authorities (DDMA). Every state will constitute a DDMA for every district with the district magistrate as the Chairperson, elected representative of the local authority as co-chairperson and upto six other members. The DDMA will be responsible for preparation of District DM plan in consultation with local authorities and in accordance with the national and

state plan. It will act as the planning, coordination and monitoring agency for implementation of all policies and plans upto district level and to ensure that guidelines for prevention, mitigation, preparedness and response measures as laid down are followed. 17 States, UTs have constituted DDMA in their respective states as per the DM Act 2005. The details of states which have constituted SDMAs, SECs and DDMA are attached as Appx 'D'

Local Authorities. These include Panchayati Raj Institutions, Municipalities, District and Cantonment Boards and Town Planning Authorities for control and management of civic services. These bodies will ensure capacity building of their officers and employees in DM, carry out relief, rehabilitation and reconstruction activities in the affected areas and will prepare DM plans in consonance with guidelines of NDMA, SDMAs and DDMA.²⁹

National Institute of Disaster Management (NIDM)

In accordance with the act, NIDM was founded from the already functioning National Centre for DM since October 2003. The NIDM is to function within the broad policies and guidelines laid down by NDMA. NIDM is required to design, develop and implement training programmes, undertake research, implement HRD plan and assist other training institutes, state governments and organizations. It will develop educational materials for dissemination, promote awareness, document and develop national level information base relating to disaster management policies, prevention mechanisms and mitigation measures.

The institute has organized 45 training programmes, seven workshops and five online training programmes during the period April 2007 to December 2007. Of these 19 programmes have been held in state capitals.³⁰

National Disaster Response Forces and State Disaster Response Force

As per the provision of DM Act 2005, the National Disaster Response Force (NDRF) has been constituted by upgradation / conversion of eight standard battalions of Central Para Military Forces. The general superintendence, direction and control of NDRF is vested with NDMA and the command and supervision of the forces is vested with DG Civil Defence and NDRF.

The eight battalions of the NDRF consist of 144 specialised teams trained in various types of natural, man-made and non-natural disasters; 72 such teams are designed to cater to the nuclear, biological and chemical calamities besides natural

calamities³¹. Each NDRF battalion is organized into 18 teams of 45 personnel, who are being equipped and trained for rendering effective response to any threatening disaster situation or Disaster. Based on the vulnerability profile of different regions of the country, these specialist battalions have been located and area of responsibility allocated. The details are as at Appx 'E'. Procurement of 310 types of equipment at a cost of 180 crores is underway.

The states have been advised to set up their own specialist response forces namely State Disaster Response Forces (SDRF). The existing resources of the State Armed Police, Fire and Services, Home Guards Civil Defence and others will be the sources from which the SDRF will be constituted. This will also include women members to look after the needs of women and children.³² The NDMA has conceptualized setting up a three tier training infrastructure comprising a national level open training institute, four regional level training institutes and eight battalion level training institutes for imparting training to NDRF and SDRFs.³³

The Financial Mechanism

Calamity Relief Fund (CRF) and National Calamity Contingency Fund (NCCF). To ensure ready availability of funds with states a CRF has been constituted. The allocation is based on the recommendation of the Finance Commission. The CRF is contributed by the Government of India and the State Government in the ratio of 3:1. The Central Share is released in two equal installments, first in the month of June and second in the month of December. A state level committee headed by the chief secretary is fully authorised to decide on all matters relating to relief expenditure from the CRF in accordance with the norms approved by the government. An amount of Rs 21,333.33 crore has been allocated in the CRF for the period 2005-2010. The state wise allocation is as Appx 'F'.

National Calamity Contingency Fund (NCCF). In the event of a calamity of a severe nature, in which the requirement of funds for relief is beyond the funds available in the states CRF account, additional central assistance is provided from NCCF. The state government is required to submit a memorandum indicating the sector wise damage and requirement of funds. A High Level Committee of Agriculture Minister, the Home Minister, the Finance Minister and Deputy Chairman Planning Commission approves the assistance to be released from NCCF on the basis of state's request, on the spot assessment by central team and recommendations of Inter Ministries group headed by Home Secretary.³⁴

National Disaster Response Fund. In accordance with section 46 of DM Act, a National Disaster Response Fund has been constituted on 26 November 2007, to be made available to the National Executive Committee headed by Home Secretary for meeting expenditure for emergency response, relief and rehabilitation in the wake of disasters. The fund has a corpus of Rs 100 crores. The NCCF will be in parallel operation with this fund for the duration of the 12th Financial Plan i.e. upto 31 March 2010. Thereafter NCCF will merge with the National Disaster Response Fund.

National Disaster Mitigation Fund. The DM Act also provides vide Section 47 of the constitution of National Disaster Mitigation Fund for projects exclusively for the purpose of mitigation. This fund is yet to be constituted.

Section 48 of the DM Act 2005 also caters for the constitution of the following funds which are yet to be constituted :

- (a) State Disaster Response Fund
- (b) District Disaster Response Fund
- (c) State Disaster Mitigation Fund
- (d) District Disaster Mitigation Fund

The institution framework for DM in India is schematically depicted in Figure 3.

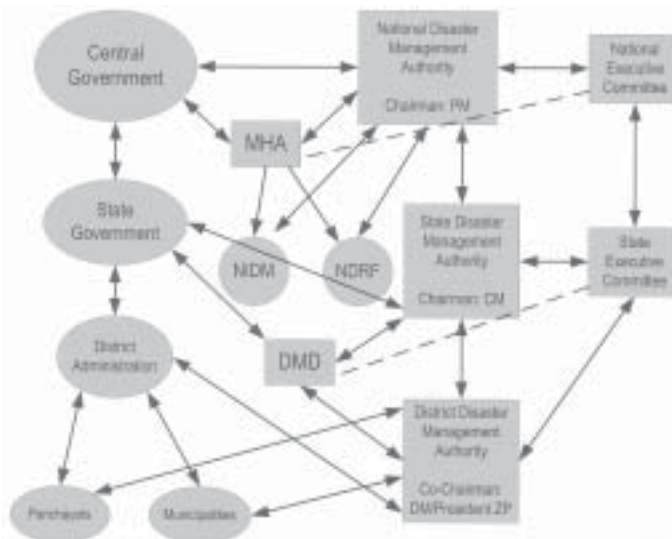


Fig 3. Source : Dhar Chakrabarti 2006

CHAPTER IV FORECASTING AND EARLY WARNING OF NATURAL DISASTER

Disaster Management Cycle. Traditionally people think of disaster management only in terms of the emergency relief period and post-disaster rehabilitation. Whilst emergency relief and rehabilitation are vital activities, successful disaster management planning must encompass the complete realm of activities and situations that occur before, during and after disasters. These phases can best be represented as a cycle or continuum, which, if circumstances allow, reduce the negative effects of future disasters. The different phases of disaster management can best be visualised as a disaster management cycle depicted in Figure 4.³⁵:



Fig 4. Disaster Management Cycle

The strategy of paradigm shift currently being institutionalised through NDM framework and DM Act 2005 is based on “Six Pillars” which are³⁶ :

(a) **Pre-Disaster Phase**

- (i) Prevention
- (ii) Mitigation and preparedness measures
- (iii) Community based disaster management
- (iv) Operationalisation of NDRF and Strengthening

(b) **Post-Disaster Phase**

- (i) Response (rescue, relief and rehabilitation)
- (ii) Reconstruction and recovery

Monitoring, forecasting and Early Warning are important pre-disaster phase measures for minimising loss of life and property on occurrence of any disaster. Natural hazards can be predicted up to considerable extent, predictability helps to understand the nature of a disaster, assess the probability of occurrence and the relative devastation which may follow. The forecasting process involves data collection, transmission of data to forecast centers, data processing, formulation of forecasts and dissemination of forecasts and warnings. The agencies responsible for monitoring, forecasting and issuing early warnings of natural disasters in India are :

- (a) Department of Science & Technology
- (b) Department of Space
- (c) Ministry of Water Resources
- (d) Department of Ocean Development

Disaster related warning could be area specific, time specific and user specific. However, a disaster warning will have no value unless it reaches the potential users in time, therefore clear wordedness and quick transmission of relevant information is unavoidable for a forecast to be effective in terms of DM.³⁷

Floods

A nation-wide flood forecasting and warning system covering major interstate river basins has been established by the Central Water Commission (CWC). The CWC is presently issuing flood forecasts for 175 stations of which 147 stations are for river stage forecast and 28 are for reservoir inflow forecasting.³⁸

River basin wise break up is given in Chart VI :

Chart VI

Ser No	River System	No of Flood Forecast Stations
1.	Ganga & its tributaries	87
2.	Brahmaputra & its tributaries	27
3.	Barak & its tributaries	05
4.	Eastern Rivers	09
5.	Mahanadi Basin	04
6.	Godavari Basin	18
7.	Krishna Basin	09
8.	West flowing rivers	15
9.	Pennar	01
	Total	175

The flood forecasting network covers 15 states and one UT in addition to NCT of Delhi. The state wise distribution of the forecasting stations is attached as Appx 'G'.

70 river basins in 17 states / UTs are covered by the flood forecasting network. Hydrological and hydro meteorological data from nearly 700 stations in these rivers catchment areas are collected, analysed and flood forecasting and warning messages issued generally 24 to 48 hours in advance.³⁹ In between 1991 to 2002, on an average about 6000 flood forecasts were issued every year. The accuracy of the forecasts range between 94.3% in 1991 to 97.9% in 2002, it has been above 97.8% for the last four years.⁴⁰ A computerized monitoring system has been developed for observation of daily water levels and transmission of forecasts issued by field units to CWC HQ in Delhi. Based on these inputs Flood Forecast Bulletins are issued. Special Yellow Bulletins and Red Bulletins are issued when the river stage attains a level within 0.50m and equals or exceeds previous Highest Flood level respectively.

Expansion and Modernisation of Flood Forecasting Services. Extension and modernization of flood forecasting in India has been recommended in December 2004 by the Task Force set up by Ministry of Water Resources on the initiative of the Prime Minister to look into problems of recurring floods in Assam, Bihar, West Bengal

and UP.⁴¹ CWC, IMD and The Ministry of Earth Sciences has undertaken various expansion and modernizing schemes to cover more areas and to make forecasting more efficient and reliable.

The NDMA in its guidelines of management of floods issued in January 2008 recommends specific measures for modernising and improving flood forecasting measures⁴². The guidelines issued by NDMA are to be implemented by 2011. The action plan for implementation of flood forecasting and early warning measures as per the NDMA guidelines is as at Appx 'H'.

Cyclones

Cyclones in the North Indian Ocean (NIO) basin are monitored with the help of land based, ocean based and space based observation systems which include conventional meteorological observations, reports from ships, observations from ocean data buoys, coastal radars (conventional and Doppler) and national / international satellites (geo-stationary and polar orbiting). IMD is mandated to monitor and provide warnings of Tropical Cyclones. Satellite integrated automated weather stations have been installed on islands, oil-rigs and exposed coastal sites. A set of 12 moored buoys have also been deployed in the NIO to provide data. In addition rawin sounds, Doppler Radar, wind profilers, mesosphere – stratosphere - troposphere radar at Thirupati, Aircraft Meteorological Data Relay System, a network of Cyclone Detection Radars and advanced meteorological satellites are being used by IMD to predict and analyse cyclones. The network of cyclone detection radars is as depicted in Figure 5.

A four stage warning system comprising Pre-cyclone Watch (monsoon depression & high velocity winds), Cyclone Alert (48 hours in advance), Cyclone Warning (24 hours in advance) and Post-landfall scenario stage (12 hours in advance) are provided by Area Cyclone Warning Centres at Calcutta, Chennai and Mumbai & Cyclone Warning Centres at Vishakapatnam, Bhubneshwar and Ahmedabad. There is a satellite based communication system called Cyclone Warning Dissemination System (CWDS) for transmission of warnings to communities and officials of affected areas. The cyclone warning bulletins are transmitted hourly to 252 CWDS stations, each with analog receivers in cyclone prone areas of east and west coast. The general public and coastal resident and fishermen are also warned through government machinery and broadcast of warnings through AIR and TV.⁴³



Fig 5. Cyclone Detection Radar Network

IMD is in the process of implementing its modernisation plan of the land based observational network to increase the density and improve the equipment profile. Meanwhile NDMA vide NDM guidelines on Management of Cyclones issued in April 2008 has directed additional augmentation of Automatic Weather Station, High wind recorders, surge recorders, Rain Gauges, radars and wind profilers. The details of present status of IMD modernisation plan and additional augmentation to be carried out by 2012 are given in Chart VII.⁴⁴

Chart VII

Ser No	Observation Type	Present Status	Proposed Enhancement	Additional Augmentation
(a)	Automatic Weather status	125	1000	3000
(b)	Rain gauge	2579 (Part time)	4000 (automatic)	Taluk level Network
(c)	Radar (SB and Doppler)	5	12	-
(d)	Radar (Storm detection X - Band)	21 (C Band Doppler)	26	-
(e)	Wind Profilers	01	45	84 (1 per district)

National guidelines for management of Cyclones issued by NDMA requires the following to be implemented.⁴⁵

- (a) Establishing a state-of-the-art cyclone early warning system involving observations, predictions, warnings and customized local scale advice for decision makers.
- (b) Commission of Aircraft Probing of Cyclone facility with a combination of manned aircraft and unmanned aircraft.
- (c) Commissioning of National Disaster Communication Infrastructure down to DDMA level of 84 coastal districts vulnerable to Cyclones.
- (d) Expanding the warning dissemination outreach by using services of Direct to Home transmission in remote and rural areas.

The time frame for implementation of all activities recommended in the NDM guidelines is 2008 to 2010-12.

Tsunami

Department of Ocean Development, the nodal agency for setting up Tsunami Early Warning System in the Indian Ocean has established and operationalised an Early Warning System for Mitigation of Oceanographic Disasters – Tsunami and Storm surges at the Indian National Centre for Ocean Information services, Hyderabad on 15 October 2007 at a cost of Rs 125 crores.⁴⁶ This system is one of the

best in the world. It can generate and issue Earthquake Information Bulletins within 20 minutes of occurrence and Tsunami Warning, Alert and watch within 30 minutes of occurrence of a Tsunamigenic earthquake with magnitude of more than 6.5 on the Richter Scale. The system has been effectively used on 12 September 2007 when a tsunamigenic earthquake occurred with its epicenter in Indonesia. A schematic representation of the Early Warning System is as at 'Figure 6'.

Earthquake

Earthquake is a sudden onset hazard, occurring at any time with sudden impact and without any warning signs. Despite extensive research in recent decades an accepted method for earthquake prediction has not been found till date.

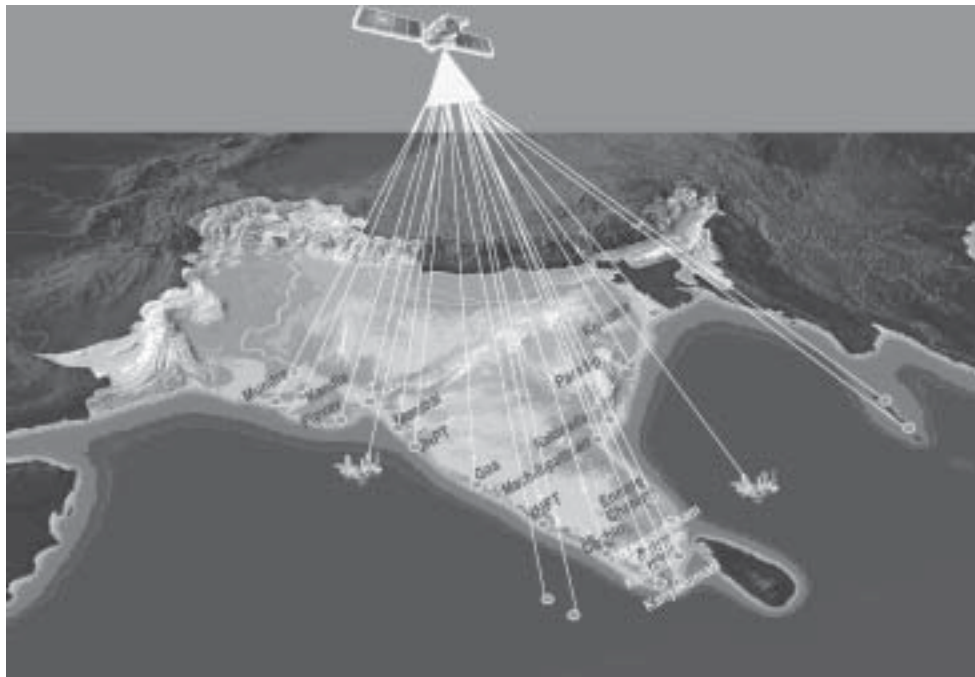


Fig. 6. Indian Ocean Tsunami Early Warning System

However, earthquakes can be monitored, IMD is the nodal agency responsible for monitoring seismic activity in and around the country. The department is required to estimate the earthquake source parameters immediately on occurrence and disseminate the information to all the user agencies.

Earthquakes are being monitored by IMD, National Geophysical Research Institute and Department of Earthquake Engineering, Roorkee. A countrywide

National Seismological Network consisting of 55 observatories, which include four observatories in Himachal Pradesh for dam related studies under Bhakra Management Board is in place. Of the others, 30 stations are equipped with state-of-the-art broadband sensors, high dynamic range (24 bit) digitisers, GPS time synchronisation and facility to access data remotely through satellite communication and telephone mode. The remaining 25 stations are equipped with analog Seismograph systems, proposed to be replaced by digital Seismograph system.⁴⁷ IMD is also maintaining a 16 station V-sat based digital seismic telemetry system around National Capital Territory of Delhi for monitoring of seismic activity in the region.

A national seismological Data Base Centre along with a Central Receiving station has been established at New Delhi to receive, quickly disseminate and archive seismic data.

Drought

Drought is a natural hazard which has slow onset, evolves over months or even years, affects a large spatial region and causes little structural damage. The occurrence of droughts on a sub-divisional basis (the country is divided into 36 Meteorological sub divisions) is determined on the basis of the inputs pertaining to monsoon forecast, actual rainfall, weekly aridity, anomaly maps and water levels in reservoirs. The data is considered by an institutional mechanism called Inter Ministerial Crop Weather Watch Group in the Ministry of Agriculture; which meets every Monday.⁴⁸ As and when symptoms arise, an early warning about impending droughts is issued and states are warned accordingly.

CHAPTER V **DISASTER MANAGEMENT : PREVENTION, MITIGATION, PREPAREDNESS, RESPONSE AND RECOVERY**

Disaster Preparedness minimises the adverse effects of hazard through effective preventive & mitigation actions, response, recovery and rehabilitation on ensuring timely, appropriate and effective organisation and delivery of relief and assistance following a disaster. Disaster preparedness has been defined by United Nations Disaster Relief Office (UNDRO) as “A series of measures designed to organise and facilitate timely and effective rescue, relief and rehabilitation operations in cases

of disaster Measures of preparedness include among others, setting up disaster relief machinery, formulation of emergency relief plans, training of specific groups and vulnerable communities to undertake rescue and relief, stockpiling supplies and earmarking funds for relief operations”.⁴⁹ Preparedness is related to the accepted risk facing an area or population due to a disaster and relates to activities aimed at an organized response. Preparedness plans are thus action plans for short-term response and can be divided into passive and active categories. The passive activities include preparing disaster manuals, stockpiling relief goods and generating lists of resources and personnel. The active measures include development of comprehensive response plans, monitoring of threatening hazards, training of emergency personnel and development of tools and methods of emergency response.⁵⁰

Mitigation in DM is defined as sustained action taken to reduce or eliminate longer-term risk to people and property from disasters and its consequences.⁵¹ The effectiveness of pre-disaster preventive measures in the mitigation of adverse effects of disasters is very high and is achieved at a much lesser cost as compared to post-disaster relief and rehabilitation.⁵² Disaster prevention comprises steps that are taken to fully protect lives and livelihood.

- (a) Early warning is specially important for short-term prevention.
- (b) Communication of information about hazard and risk to public.
- (c) Strict limiting of commercial and residential developments in hazard prone areas.
- (d) Sound environmental practices.
- (e) Integration with overall development policies.
- (f) Education of community and in schools.

This chapter first considers the DM measures taken at national level for prevention & mitigation, preparedness and response. This is followed by an examination of each type of natural hazard, with respect to DM measures which are existing and proposed to be built up.

Mitigation Measures

Building Bye-laws. The report of an expert committee constituted to formulate model building bye-laws and country planning legislation, zoning and building regulations for incorporating disaster resistant features with respect to each type of disaster have been shared with the state governments and a series of

seminars organised by BMTPC to facilitate adoption of disaster mitigation technologies under techno - legal regime.

Capacity Building Programme. Two national programmes for capacity building in earthquake risk management are training 20,000 engineers and architects; 856 engineers, 204 trainer engineers and 223 trainer architects have been trained so far at National Resources Institutes.⁵³

Disaster Risk Management Programme (DRMP). DRMP has been taken up in 169 most hazard prone districts of 17 states with assistance from United Nations Development Programme (UNDP) and United States Agency for International Development, European Union and some other agencies. The programme aims at putting in place sustainable initiatives with the involvement of local self-governing institutions and communities. The salient features are :⁵⁴

- (a) Assistance for drawing up state, district and block level DM Plans.
- (b) Village level DM Plans with PRIs.
- (c) DM Teams of village volunteers being trained for preparedness and response functions such as search & rescue, first aid relief, shelter management plans etc.
- (d) Setting up of state and district level EOCs with equipment.
- (e) Orientation training of engineers, architects and masons in disaster resistant technologies.

Progress of DRMP. The programme commenced in 2002 and is scheduled to finish in end 2008. The milestones achieved are :⁵⁵

- (a) DM Plans have been prepared for 1,14,085 villages, 22,478 Gram Panchayats, 1207 blocks and 166 districts.
- (b) 10.61 lakh members of DM committees at village level, 2.72 lakh at Gram Panchayat level, 46,273 at block level and 11,523 at district level have been trained.

Preparedness Measures

The institutional framework constituted at national level and down to district level has already been brought out in Chapter III. An annual conference of Relief commissioners, and Department of DM of states / UTs is held to review the status of preparedness.

Medical Preparedness and Mass Casualty Management. NDMA has released National Guidelines for Medical Preparedness and Mass Casualty Management. These guidelines pertain to measures to be implemented for development of National Emergency Plan, strengthening of existing framework of health management, development of integrated surveillance system, mechanism for emergency medical care at incident site, Trauma Centers, radiation injury treatment, equipping Quick Reaction Medical Teams and enhancing capacity to respond to mass casualty events. These measures are to be implemented in two phases terminating in 2012. The third phase will deal with areas identified from phases I & II and certain other issues. The third phase will be completed by 2016.⁵⁶

Communication Networks. Communication is normally the first casualty in case of a major calamity, since the traditional communication network systems normally break down in such situations. It has therefore been decided to put in place a multimode, multi-channel communication system with enough redundancy. Phase I of the National Emergency Communication plan has been implemented. It will provide satellite based mobile/voice/data/video communication between National Emergency Operation Centres (EOCs) and mobile EOCs at remote disaster / emergency sites. An instant alert messaging system has also been made operational in the National EOC which sends messages through SMS, email and e-fax.⁵⁷ A mirror back up of the communication links at the National EOC is also proposed to be provided at NIDM and NDMA. A schematic representation of the National Emergency Communication plan is shown in Figure 7.

Fig 7.



Response

NDRF. The constitution of NDRF for quick response has already been brought out in Chapter III.

The HPC in 2001-02 prepared a National Disaster Response Plan which amongst other issues recommends four levels of response; namely L0 – preparedness activities, L1 – an event that can be managed at district level, L2 – an event that requires assistance and active participation of resources to manage the disaster and L4 – a national level disaster affecting two or more states. The state governments have to be prepared for L3 level of disasters and closely monitor L2 and L1 disaster in their respective states.

National Disaster Mitigation Resources Centres (NDMRCs). The concept of NDMRCs has been evolved to help states in capacity development, running mock drills and facilitating the process of Central assistance to the states. These will be co-located with the NDRF battalions. A reserve relief stores for 3,25, 000 persons will be created at the national level and stored at these centres for augmenting state resources in the event of a disaster of a severe magnitude. These will include stores for 1,00,000 persons affected in high altitude areas.⁵⁸

Regional Response Centres (RRC). RRCs have been set up in 15 places located in different states and UTs. These RRCs are being equipped with a cache of essential equipment to facilitate quick movement of such equipment and relief material to the site of disaster to provide immediate response to the affected people. The details pertaining to locations of RRCs is attached as Appx 'J'.

India Disaster Resource Network. A Web-enabled, centralised inventory of resources has been established with www.idrn.gov.in as the site name. The records from all districts of 35 states/ union territories is being uploaded and updated regularly on this website to provide an overall visibility of resource inventory.

Emergency Operating Centre (EOC)/ Mobile EOCs. EOCs are nodal centres that are activated during disasters to organise coordinated response in terms of effective management of resources, disaster supplies and relief management by providing chain of command and direction. EOCs are being set up in the states and the states have been directed to set up EOCs at district level in the second phase. In the interim period, mobile EOCs are being set up to handle DM at forward localities.

Incident Command System (ICS)

To professionalise emergency response management by providing designated coordinating officers at various levels, a back-up of professional teams comprising trained members for performing specialised functions, ICS has been introduced. The system provides for specialist incident management teams with an Incident Commander and Officers trained in different aspects of incident management, logistics, operations, planning, safety, media management etc. The Lal Bahadur Shastri National Academy of Administration, NIDM and six Administrative Training Institutes have been identified for training personnel of ICSs. ICS has been tested in three districts of Gujarat as a pilot state. Two more pilot states have been identified for cementing the experiences before adoption of ICS for replication throughout India. A road map for institutionalising ICS in India has been approved by MHA.⁵⁹ The proposed organisation of an ICS is at Figure 8.

Establishment of Three Mobile Hospitals

The government had in February 2005 approved the establishment of three “Mobile Hospitals” at a cost of Rs 57 crores as part of specialised capabilities for rapid intervention in case of disaster. The mobile hospitals would be fully

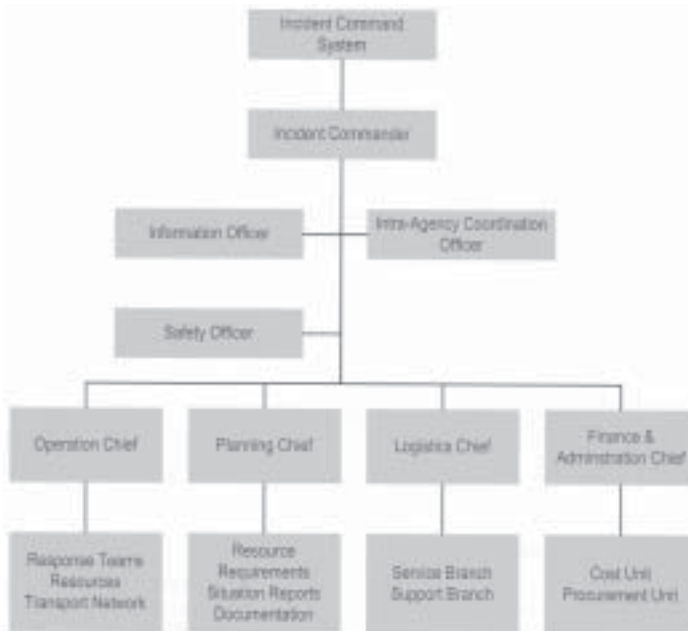


Fig 8. Incident Command System

containerised and could be flown to the site of a disaster quickly. Each of the mobile hospitals will be attached to a major hospital, which would be its mother hospital. The mother hospital as and when required will provide doctors, nurses, paramedics and other supporting and administrative staff, in addition to the staff specially approved for mobile hospitals and who would also be working with the mother hospitals during normal times. These mobile hospitals are to be attached with NIMHANS, Bangalore, CRPF Hospital, Guwahati and a hospital in western India which is yet to be identified.⁶⁰

Flood Management

Absolute flood control and protection to all flood prone areas for all magnitudes of floods is not possible. Flood management with a combination of structural and non structural measures is the most feasible solution.⁶¹

(a) Structural measures

(i) Long-term

(aa) Watershed Management

(ab) Raising flood control structures

(ac) Land use regulation

(ii) Medium-term

(aa) Bank protection

(ab) River training

(ac) Anti-erosion works

(iii) Short-term

(aa) Assessment of vulnerability of the flood control structures

(ab) Strengthening of existing embankments

(ac) Cleaning

(ad) Mapping

(b) Non Structural Measures

(i) Flood forecasting and warning

(ii) Flood plain zoning

- (iii) Flood proofing
- (iv) Building public awareness

Flood Control Measures Taken so Far

- (a) **Structural Measures.** Watershed management and flood control measures taken include the Hirakud Reservoir on river Mahanadi in Orissa; the Damodar Valley resources in Jharkhand and Ukai Dam in Tapi basin of Gujarat have provided a high degree of protection to chronically flood prone areas. In addition to the construction of 35,007 km of new embankments and 51,678 km of drainage channels; 2450 town protection works and 4721 villages have been raised above flood levels till March 2005.⁶² These schemes provide protection to about 17.77 million hectares, which is about 39% of the area prone to floods.
- (b) **Non Structural Measures**
 - (i) **Flood Hazard Mapping.** Flood Hazard Mapping covering both riverine flooding and coastal flooding has been done. Flood hazard map of India depicting the same including probable maximum surge height is at Figure 9.
 - (ii) **Flood Plain Zoning.** Due to the pressure of development activities flood plains zoning is very essential for minimising losses in floods. However, Rajasthan and Manipur are the only states which have passed a legislation on the issue, but even these states have not taken steps for its enforcement.⁶³
 - (iii) **Flood Forecasting & Early Warning.** The CWC has established an elaborate flood forecasting & early warning system comprising 175 stations on all major interstate rivers. This aspect has been dealt with in detail in the previous chapter.

A large number of committees and task forces have been appointed by the government over the years, however, their recommendations have not been implemented in most cases. The Ministry of Water Resources and the CWC have now been directed by NDMA to closely monitor in collaboration with the state governments, the implementation of the recommendations of the Experts Committee to review the implementation of the recommendations of Rashtriya Badh Ayog-2003 and the Task Forces on Flood Management / Erosion Control – 2004.



Fig 9. Flood Hazard Map

Guidelines by NDMA. NDMA has issued National Disaster Management guidelines on management of floods in January 2008. Important milestones in the Road Map for Implementation of the guidelines are in three phases with phase I commencing in 2008 and phase III terminating in 2025. The flood management measures to be undertaken are attached as Appx 'K'.⁶⁴

Cyclones

It is now well established that prevention of formation of tropical cyclones is not feasible, but taking adequate long and short-term cyclone disaster mitigation measures could minimise its adverse impacts. Structural & non structural measures for cyclone mitigation are :

(a) **Structural**

- (i) Construction of embankments or sea walls.
- (ii) Construction of cyclone shelters.
- (iii) Shelters for livestock.
- (iv) Houses to be constructed as per building codes.
- (v) Flood management measures.
- (vi) Improving vegetation cover

(b) **Non Structural**

- (i) Cyclone hazard mapping.
- (ii) Forecast & warning system.
- (iii) Evacuation to safe places.
- (iv) Public awareness.
- (v) Training & deployment of volunteers.
- (vi) Land use control.

Cyclone Mitigation Measures Taken so far. Cyclone hazard mapping of India has been carried out in six zones from very low damage risk zone to very high damage risk zone as shown in Figure 10. An effective cyclone forecast and warning system has been set up and has been brought out in the previous chapter. Most of the coastal states have implemented some aspects of cyclone distress mitigation measures like construction of cyclone shelters.

Two initiatives which have been taken are :

- (a) **National Core Group on Cyclone Monitoring.** This group is looking at protocols for cyclone warning and also the observation/monitoring platforms which need to be strengthened.

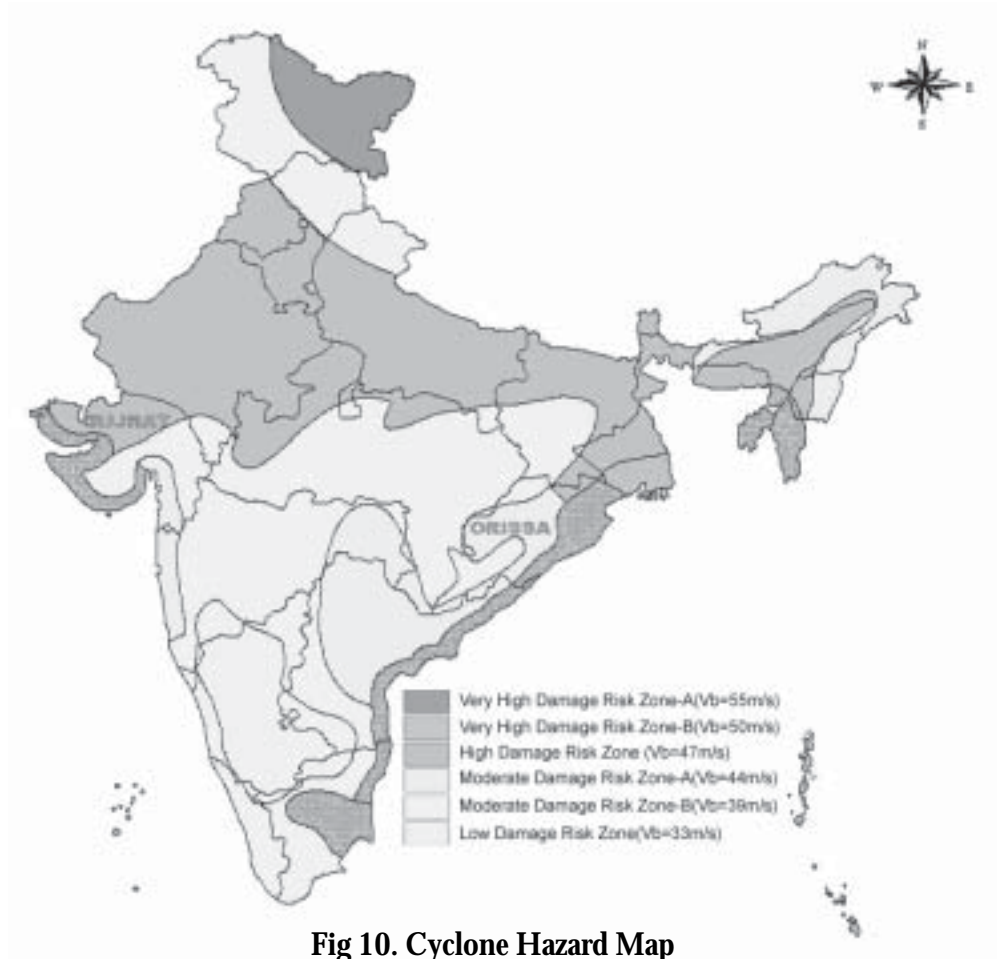


Fig 10. Cyclone Hazard Map

- (b) **National Cyclone Risk Mitigation Project.** This project covers all 13 cyclone prone coastal and Island states / UTs namely Andhra Pradesh, Gujarat, Orissa, West Bengal, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa, Daman & Diu, Pondicherry, Lakshadweep and Andaman & Nicobar Islands.⁶⁵ The project duration is from 2004 to 2010 and envisions the construction of cyclone shelters, forecasting and early warning arrangements, immediate alarm dissemination measures, shelter belt plantation, improvement of coastal roads in the identified areas for speedy evacuation of affected people and movement of responders. The project is pegged at Rs 2000 crores and is aided by World Bank. Even though only 84 coastal districts are threatened by cyclones, expected beneficiaries are almost 30 crores which is nearly one-third the population of India.⁶⁶

Guidelines by NDMA. NDMA has issued National Disaster Management guidelines on “Management of Cyclones” in April 2008. Implementation of the measures specified in the guidelines is required to be effected by the year 2012. The salient aspects of the guidelines are as follows.⁶⁷

	Timeline
(a) Establishing state-of-the-art Cyclone EWS	- 2008-2011
(b) Commissioning of the facility for Aircraft probing of Cyclone.	- 2008-2012
(c) Commissioning of National Disaster Communication Infrastructure.	- 2008-2010
(d) Expanding of Warning dissemination outreach	- 2008-2012
(e) Structural measures to include, robust systems of locating multi-purpose cyclone shelters, cyclone resistant design standards for housing, all weather road links to shelters and cattle mounds, saline embankments and maintaining the full designed carrying capacity of main drains and canals.	- 2008-2012
(f) Effective cyclone risk reduction through management of coastal zones to include ten activities such as mapping/ delineation of coastal wetlands, regulating infrastructure development, coastal bioshields spread and so on.	- 2008-2012
(g) Setting up ecosystem monitoring network	- 2008-2012
(h) Developing integrated hazard mitigation network	- 2008-2012
(i) Establishing comprehensive Cyclone Disaster MIS	- 2008-2012
(j) Launching community based DM activities.	- 2008-2012
(k) Establishing National Cyclone Disaster Management Institute.	- 2008-2010
(l) Institutionalising specific emergency response actions for cyclone DM.	- 2008-2012

Earthquakes

Earthquake hazard can neither be prevented from occurring nor predicted precisely. Vulnerability of human population in earthquakes arises due to location of settlements in earthquake prone area, weak buildings and non engineered

buildings. The famous bye-line of NDMA is “Earthquakes do not kill people, unsafe buildings do”. The structural and non structural measures for mitigation are :

(a) **Structural**

- (i) Engineered structures designed and built to resist earthquakes.
- (ii) Follow Indian standard codes for construction of buildings.
- (iii) Retrofitting of important life-line buildings.

(b) **Non structural**

- (i) Hazard mapping, monitoring, prediction and early warning. Earthquake hazard mapping has been carried out and is as shown at Figure 11. Early warning aspects of earthquakes have been brought out in the preceding chapter.

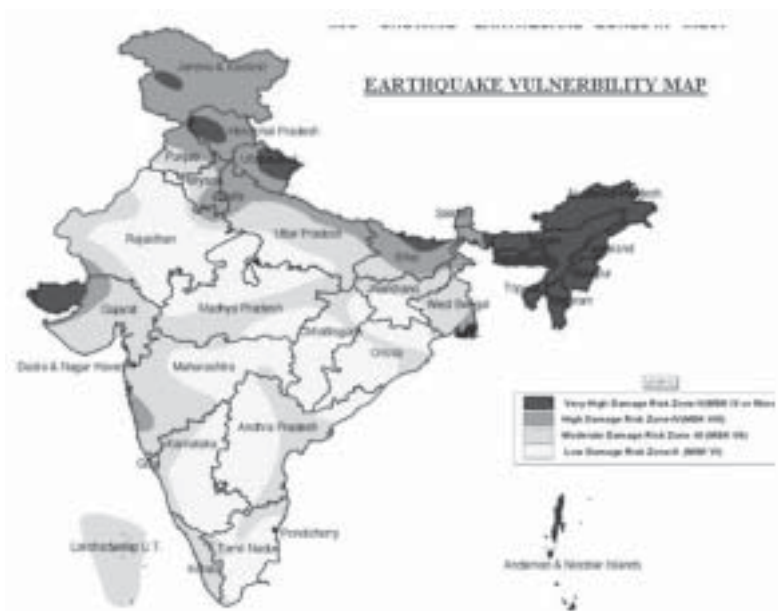


Fig 11. Earthquake Vulnerability Map

- (ii) Enforcement of bye-laws including land use control and other restrictions.
- (iii) Public awareness, sensitising training programmes.

Retrofitting of Life-Line Buildings. Retrofitting is required to be carried out on existing buildings to render them safe against earthquakes. As it is not feasible to

retrofit all buildings, the focus is on life-line buildings where people congregate such as hospitals, schools, cinema halls etc. A pilot project for detailed evaluation and retrofitting of five life-line buildings has been undertaken in Delhi. The key focus has been capacity building of engineers.

Awareness Generation for Safe Construction in Rural Areas. For the rural areas where people go for non-engineered construction, the strategy is of training masons and of awareness generation by distribution of pamphlets bringing out essential features, which need to be incorporated into the construction so that it is safe. Samples of pamphlets/posters which could be circulated have been compiled and have been made available to states for adoption/translation into local languages and distribution.⁶⁸

National Earthquake Risk Mitigation Project. This project planned for the period 2004-2010, aims at training 90,000 engineers, 24,000 architects, 2,25,000 building contractors, equal number of construction supervisors and 4,50,000 masons in first five years. This will include around five to ten percent of the total work force in various categories involved in the construction industry in India. Retrofitting of all 229 district hospitals in seismic zones IV and V will be carried out under this scheme.⁶⁹

Urban Earthquake Vulnerability Reduction. As part of the National Cyclone Risk Mitigation project, earthquake mitigation in 38 identified cities which are in seismic zones III, IV and V with a population of more than half a million is being carried out.

National Guidelines for Management of Earthquakes. The NDMA has brought out National Disaster Management Guidelines for Management of Earthquakes in April 2007. Given the high seismic risk and earthquake vulnerability in India, these guidelines require all stake holders to ensure that, earthquake management will be undertaken on the basis of the following six pillars of “Earthquake Management” identified by NDMA.

- (a) Ensure earthquake resistance design features for construction of new structures.
- (b) Facilitate selective strengthening and seismic retrofitting of existing priority and life-line structures in earthquake prone areas.
- (c) Improve compliance regime through appropriate regulation and enforcement.
- (d) Improve the awareness and preparedness of all stake holders.
- (e) Introduce appropriate capacity development interventions for effective earthquake management including education, training R & R and documentation.

- (f) Strengthen the emergency response capability in earthquake prone areas.

The guidelines are to be implemented in two phases, phase I is to be completed by 31 December 2008. This will followed by a review of phase I activities, revision, updating and identification of additional activities, from January 2009 to December 2009. The implementation of phase II will commence from 01 January 2010.

Drought

Drought is considered a “creeping” hazard because it develops over a period of months and has a prolonged life – sometimes several months or even years.⁷⁰ Drought though slow on the onset, it is extremely difficult to control as mankind is yet to acquire the ability of causing rainfall. Government initiatives taken are as follows :

- (a) On the basis of Moisture Index, the entire country has been mapped, into Arid, Semi-arid, Dry sub humid, Moist sub humid, humid and pre-humid areas.⁷¹
- (b) **Natural Watershed Development Project for Rainfed Areas (NWDPR).** The project launched in 1990-91 in 25 states and two Union Territories covered an area of 2.7 mln hectares at a cost of 1030 crores for conservation of natural resources and restoration of ecological balance.⁷² The NWDPR was subsumed into the “Macro Management of Agriculture” scheme.
- (c) **Watershed Development Fund.** This fund has been established at NABARD with the objective of integrated watershed development in 100 priority districts in 18 states through participatory approach with a corpus of Rs 200 crore.
- (d) **Drought Prone Areas Programme (DPAP).** The programme launched in 1995-96 covers 972 blocks of 193 districts in 16 states for drought proofing of affected areas.
- (e) **Desert Development Programme (DDP).** DDP started in 1977-78, in hot desert areas of Rajasthan, Gujarat and Haryana and the cold deserts of J&K and Himachal Pradesh implements long-term measures for restoration of ecological balance.
- (f) **Drinking Water.** In 2002-2003, 18 states reported severe drinking water shortages. A separate task force for drinking water was set up under chairmanship of Secretary, Ministry of Water Resources in December 2002.

The states deployed 40,000 tankers of 8000 litres capacity each and each doing average of four trips per day delivering 116 million kilolitres of water. Meanwhile the Central Ground Water Board constituted its own task force. It deployed 66 drilling rigs in the drought affected areas and dug 250 wells of which 216 were functional.⁷³ The railways carried 2.9 million kilolitres of water to Rajasthan and Gujarat in 12 rakes (40 wagons of 20,000 ltr capacity) every day.⁷⁴

Efficacy of Government Initiatives and What needs to be Done. Existing practices are essentially fire fighting models centered on relief, when efforts over the years should have been directed at drought proofing the country by involving community and PRI to build dams and irrigation systems with the revival and strengthening of traditional knowledge in water harvesting and conservation. The state's initiatives in drought proofing leave a lot to be desired. The government's development programmes – NWDPR, DPAP, DDP etc have little to show in terms of containing the adverse effect of drought despite crores of rupees having been sunk over the decades. The emphasis therefore, has to move towards simple technologies to harness rainwater. Community based rainwater harvesting has the potential to drought proof the entire country, just 100 mm of rain falling on one hectare land could yield up to one mln ltrs of water. Simpler, smaller rainwater harvesting measures can therefore change the very dynamics of a village.⁷⁵

National Rainfed Area Authority (NRAA). NRAA was set up in 2006 to give a special thrust to improvement of rural livelihoods through participatory watershed development and efficient water management which are the keys to sustainable development of rainfed areas. Out of the total geographic area of 329 mln hectares, 146 mln hectares is degraded and 85 mln hectares is rainfed arable land. The NRAA has brought out “Common Guidelines for Watershed Project” in 2008 indicating a fresh framework for next generation watershed programmes.⁷⁶

NDMA is yet to formulate and issue national guidelines for management of drought.

CHAPTER VI

ROLE OF ARMED FORCES AND OTHER ORGANISATIONS

Armed Forces

The Armed Forces have played and shall continue to play an important role during post-disaster scenarios. Within 45 minutes of the disaster, 14 and 6 columns were sent out from two military stations of Bhuj and Gandhidham respectively. On the first day the Army recovered 110 survivors and 116 dead from Bhuj and 108 survivors and 58 dead from Gandhidham. The Military Hospital being the only hospital in Bhuj and adjoining areas, with the general hospital having collapsed, treated upto 50,000 civilians that included performing 1500 operations.⁷⁷ This justifies the contention of Gen NC Vij, PVSM, UYSM, AVSM (Retd) that, despite the creation of NDRF, the Armed Forces form the core of government response capacity and have become the crucial immediate responders in all serious disaster situations.⁷⁸ Due to their vast potential to meet any adverse challenge, speed of operational response, the resources and capabilities at their disposal, the Armed Forces have historically played a major role in emergency support functions. These include communications, search and rescue operations, health & medical facilities and transportation, especially in the immediate aftermath of a disaster.

National Level. At the national level, the Chief of Integrated Defence Staff has been included in the NEC. Director General of Military Operations, Assistant Chief of Air Staff (Operations) and Assistant Chief of Naval Staff (Information Warfare & Operations) will also be invited to NEC deliberations as often as required. Deputy Chief of Integrated Defence Staff (Department of Training) has been included as a member of the Institute body of the NIDM. Members of the Armed Forces have also been included in the Advisory Committee of the NDMA and form a part of the consultative process.

Role of Armed Forces. The constitution and the legal framework provide for the Armed Forces to render assistance during disasters when the situation is beyond the capability of the local civil administration to handle. The Armed Forces normally render the following assistance :⁷⁹

- (a) **Command and Control.** Infrastructure for setting up command and control organisation for providing relief including provision of communication facilities (telephone & radio).

- (b) Medical Aid
- (c) Transportation of Relief Material
- (d) Establishment of Relief Camp
- (e) Construction & Repair of Roads and Bridges
- (f) Maintenance of essential services
- (g) Evacuation of people to safer places
- (h) Diving effort

Principles of Employment of Armed Forces. The guiding principles under which the Armed Forces operate whenever called upon to assist the civil authorities are :

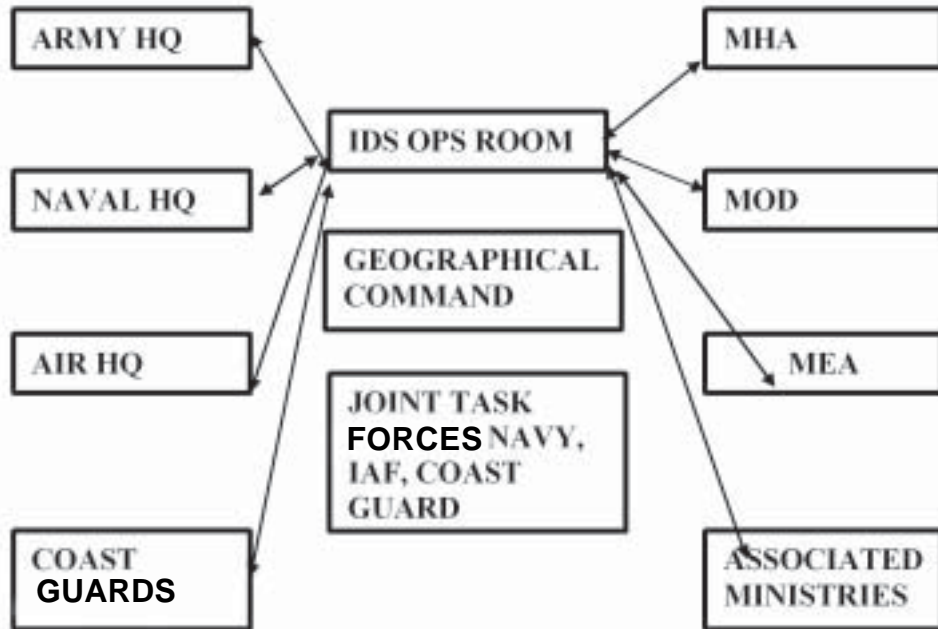
- (a) Judicious use of Armed Forces, implying that they should be called for only when the situation cannot be handled by civil administration.
- (b) Immediate response.
- (c) Command of troops will remain with the commanders of Defence Forces.
- (d) No menial tasks will be assigned to the troops. They will not be used for disposal of dead bodies.
- (e) Requisition of aid should be on tasks basis and the quantum of troops, equipment and methodology to tackle the situation should be left to the Armed Forces.
- (f) Regular liaison and coordination should be maintained.
- (g) All available resources should be integrated for achieving optimum results.
- (h) Armed Forces should be derequisitioned as soon as situation in the affected area has been brought under control of the civil administration.

Planning and Organisation. Planning is carried out by the Armed Forces at the National, State and Field level.

- (a) Joint Operation. HQ Integrated Defence Staff acts as the nodal agency of the Armed Forces for disaster relief. During planning stage tri service responsibility will be undertaken by DCIDS (Ops) / ACIDS (Jt Ops) to ensure expeditious results. Based on the type of relief requirements and core competencies of services, HQ IDS, on behalf of chairman COSC may task services HQ. Some tasks

would need the combined expertise of two or more services. The Integrated Armed Forces Organisation for emergency response is as shown in Figure 12.

Figure 12



- (b) At the state government level, the command/Area HQs of the services interact with local administration. Once contingency plans for DM has been prepared incorporating various agencies, regular rehearsals are carried out and the plans updated. These detailed contingency plans are also graded at different levels to cater for different types and intensity of disaster necessitating different approaches. With the formation of SDMAs, the local representatives of the Armed Forces will be included in their executive committees to ensure closer coordination and cooperation.

The Army was the first to respond in the aftermath of the J&K earthquake on 8 October 2005. The response from the local military commander at Uri, one of the worst districts of J&K is attached as Appx 'L'. It clearly brings out the effort put in by the Army, the drawbacks in the DM organisation at state level and what is required to be rectified.

Functional Difficulties. The most common difficulty faced by the Armed

Forces, many times is that because of local authorities or people themselves being a part of the disaster, there is a very often a problem of coordination, obtaining information pertaining to local area, info about specific requirements at specific places, mustering of local resources etc. Some other problems are :

- (a) Sometimes relief material is not available and Armed Forces are asked to procure and distribute the same.
- (b) After the paradigm shift a large number of organisations have come up at national level and local level. Coordination is yet to be established specially between the NDMA, Ministry of Home Affairs, other Ministries and services HQ. The NDMA's stand is that assistance must be coordinated through them, whereas there are instances where MOD has directly issued instructions to service HQs.

Role of Civil Defence

A committee was set up in February 2006 under the chairmanship of a member from NDMA to suggest ways and means of integrating Civil Defence in disaster management. The report of the committee submitted in December 2006 is under consideration in consultation with the state governments. An outlay of Rs 100 crore has been earmarked in the 11th Five Year Plan for revamping the civil defence set-up in the country. Against a target of enrolling 13.24 lakh civil volunteers, 6.87 lakh volunteers have already been raised and 5.15 lakh have been trained. Civil defence volunteers are to be deployed on a voluntary basis in the prevention / mitigation of natural /man-made disaster as well as in post-disaster response and relief operations.⁸⁰

The National Civil Defence College at Nagpur has been catalogued in the United Nations Department of Humanitarian Affairs Centres for Disaster Relief Training. It has also been identified as a premier training establishment on chemical disasters. The college has been selected as one of the advanced training centres in India on Search & Rescue by Office of Federal Disaster Agency of USA and Asian Disaster Preparedness Centre Bangkok. In 2007, the college has conducted 22 different courses pertaining to civil defence and DM based on the needs of the organisation and the training policies adopted by the government. The training programmes are at three levels for development of skills required at disaster site, building knowledge to organize, control and coordinate disaster operation and lastly, for generating awareness for senior managerial levels. The college in addition to the preceding, conducts courses in Amateur Radio Communications for Responders, Emergency Response to Rail Transport Accidents, Basic Life support, Emergency Operations Centre

management, Flood / Cyclone Disaster Response, Earthquake Disaster Response and Incident.

Role of Non Governmental Organisations

The role of Non-government Organisations (NGOs) by virtue of their proximity to the people and their comparative flexibility in operations can be very useful. A number of NGOs have initiated various activities in the field of DM. Some of the leading NGOs like OXFAM (India), Trust, CASA, CARE-India Ramakrishna Mission, DMI, Dasholi Gram Swarajya Mandal etc have been active in responding to almost every disaster with timely and effective relief operations. CARE India, CASA, DMI etc have developed an extensive network of community amateurs for disaster preparedness programmes. Some NGOs are promoting the building of food, water, shelter and work security with local community through action planning and participation methods.

The NGOs can be gainfully utilised for the following :

- (a) Assessment of risk vulnerability.
- (b) Identification of individuals and community resources.
- (c) Profiling a community and its neighbourhood.
- (d) Identification of gaps in knowledge or resources that will impede effective emergency resources.
- (e) Periodic mock drills to test plans and update the same.

As of today the NGOs have not been integrated into the DM process in an organised manner. As and when a disaster occurs, the NGOs approach the administration and offer to render assistance. In certain cases the NGOs have built up their own network, however it is not in conjunction with any DM plan. Many NGOs are capable of generating considerable quantum of funding and resources and as such there is a case for gainfully utilizing them. There is therefore a requirement of laying down guidelines specifying the areas in which NGOs can assist, procedure for rendering assistance and for integrating their manpower and resources into DM plan. This will ensure optimum utilization of this asset without leading to too many NGOs concentrating in one area or field neglecting other areas /fields. The NDMA is in the process of working out the guidelines on this aspect.

In the aftermath of the J&K earthquake of 8 October 2008, the Army authorities at Srinagar were given the responsibility for coordinating the aid provided by NGOs. Response received from the then brigadier who was responsible for the same is attached as Appx 'M'. It clearly brings out the actions which were taken and what is required to be done by the civil administration for the future.

CHAPTER VII

ANALYSIS, RECOMMENDATION AND CONCLUSION

On 18 August 2008, the Kosi river, known as the “sorrow of Bihar” breached its embankments, changed its course and devastated a large part of the state of Bihar. The response of the administration was slow to take off and was perceived as inadequate. As per reports the requisition of Armed Forces was also delayed. The blame game was in full swing between state, centre and other organizations. There is also the report that, there were indications of the impending breach as early as two years ago, which were ignored. Non cooperation of authorities in Nepal with respect to repair and maintenance of embankments on the river in Nepal has also been quoted. The disaster has once again exposed our inadequacy in DM albeit the magnitude of the current disaster and the large scale reforms which have been and are being put into place.

For the purposes of the study Mr P.G. Dhar Chakrabarti, Executive Director, NIDM and a number of other renowned persons dealing with DM were interacted with. The response received from Mr P.G. Dhar Chakrabarti to a questionnaire and a summary of response received during interaction with other persons referred above are attached as Appx 'N' & 'O'. These responses have been taken into account for, analysis and formulating recommendations.

ANALYSIS

The recommendation made by the High Powered Committee, on DM in 2001-2002, followed by the Gujarat and Orissa disasters and the Hyogo Framework for Action (2005-2015) arrived at the “World Conference on Disaster Reduction”, has

resulted in DM in the country undergoing a shift from a largely relief based process to a holistic approach concentrating on pre-disaster measures which could largely reduce the relief component in the long-term. The initiatives from national level to the PRI level have been broadly brought out in the preceding chapters.

NDMA and Institutional Mechanism

The recommendation of the high powered committee and the enactment of DM Act 2005 have definitely provided a major impetus to the DM process, necessary policy formulation, institutional mechanisms and financial mechanism at national, state and district level facilitating better DM. However, despite the enactment of the Act in 2005 approximately one-third of the states and UT are yet to constitute their SDMAs, DDMA and State Executive committees. Consequently these states, districts and lower levels would be without the envisaged DM plans. The government is yet to approve the National DM Policy and the National DM Plan.

In most cases government officials are members of SDMA and DDMA in addition to their duties. It remains to be seen whether they will be able to contribute the time and effort for discharge of duties as full-fledged members of DM Authority. Moreover, their expertise in the field is questionable.

Although the DM Act 2005 lays down the responsibilities of NDMA, as revealed from the recent Kosi Floods, coordination issues and issues pertaining to delineation of responsibilities between NDMA and other National Organisations/ Mechanisms in place are yet to be resolved.

DM is no longer restricted to knee jerk reactions of post-disaster relief only. The entire gamut of DM involves a very large range of functions, requiring coordination with a large number of ministries and other organisations. MHA the nodal agency for DM is handling this in addition to its other responsibilities. The MHA's responsibilities are very vast and some of its responsibilities like "Internal Security" have also grown manifold as compared to old times. The MHA therefore has its hands full and as such the requirement of creating a separate "Ministry of DM" needs consideration.

The National Institute of Disaster Management is the nodal training institute for DM. There is a requirement of standardizing and augmenting the facilities at least to states which have high multi hazard vulnerability, if not all states. This has

to be looked at in the light of continued training requirement once the World Bank and UNDP sponsored programmes are terminated, as also the requirement of training at ground level in local languages.

Clause 51 of the NDMA Act caters for dealing with offences & penalties. Amongst other issues, the clause caters for punishment for obstruction of authorized persons from discharging their duties and for refusing to comply with directions. There is a case for including cases of negligence or inaction. This stems from the recent claims with reference to the “Kosi Floods” wherein it was stated that satellite imagery of last year / two years ago had indicated the likely risk/weakness of the embankment which breached and no action having been taken ever since. Mr P.G. Dhar Chakrabarti, has stated that Kosi Flood was not a natural disaster as it was caused due to poor maintenance and human negligence. He highlights the following :

- (a) The Central Water Research Institute in Pune had indicated in their study report four years back that a possible breach of the embankment may take place, but no remedial measures were taken in time.
- (b) No early warning of this disaster was issued for the people to move to safer places even though a clear 6 days were available after the embankment breached in Nepal.
- (c) Despite the facilities of remote sensing and flood modeling available with our research and technical institutions flood forecasting advisories were not available.

Funding

The NDMA Act caters for the creation of Disaster Response Fund and Disaster Mitigation Fund at national and state levels. National Disaster Response Fund has been set up, however none of the other funds have been formed yet.

The time span taken for creation of facilities and procurement of equipment through normal government procedures is very long for example the procurement of equipment for NDRE, procurement of mobile hospitals etc. It is for consideration, as to the requirement of a “fast track” procedure, at least till the process of major revamping of DM is completed.

Disaster prone areas require compulsory insurance mechanism and micro financing mechanism to cater for post-disaster recovery and livelihood.

Preparedness and Mitigation

Resource Utilization, Food Security & Disaster Management

Analysis of Appx 'A' reveals that of the 113 disasters recorded by the international agency, 62 relate to floods. These have repeatedly affected maximum number of people and damaged large quantum of property. As such there is requirement of focusing on flood management to make a major difference in the DM profile of the country. There has been some study on the proposal for linking northern and southern rivers of the country, however there has been no further progress.

Data Base Creation – Hazard Mapping. Various studies and NIDM have brought out that while hazard mapping at broad national level is available, there is a requirement of detailed digitised mapping of specific areas.

Early Warning Mechanism. The early warning facility available in the country is elaborate and functional except for landslide disasters. There is, however, a requirement as brought out by NDMA to increase the coverage and to modernise the equipment as required. The 'Kosi Flood' has highlighted this issue.

Communication. This includes data, early warning as well as post-disaster communication. Notwithstanding the ongoing National Emergency Communication Plan, there is a requirement of creating redundancy of communication due to the likelihood of system failures during cyclone, earthquakes and large scale flooding.

DM Plans. DM plans down to PRI level are yet to be formulated in most parts of the country, except for the 169 districts under the UNDP programme and in certain states like Gujarat and Orissa. The NDMA directions on formulating the same alongwith detailed SOPs, manuals and checklists, needs to be implemented forthwith.

Inspection of Structural Measures. Various structural measures have been created over a period of time for mitigation of disasters. The inspection and maintenance of these structural measures does not appear to be carried out on a regular basis. These need to be enforced under an external body answerable to vice chairman NDMA.

Capacity Building. The DM process has taken off in a big way. At the district and lower levels, capacity building in civil administration to implement and oversee DM is of paramount importance. Moreover, once DM is fully implemented, the requirement of large scale manpower to man the facilities and execute various associated tasks would be large. Unless actions are initiated now, the country will be caught with an acute shortage of trained manpower.

Awareness. There are acute awareness deficiencies across the country. The programmes undertaken by UNDP and World Bank have revealed that enhancing awareness has made a difference even in day-to-day life. As such this aspect has to be taken up as a national priority.

Response and Recovery

All response mechanisms in terms of EOCs, ICS search & rescue teams, Disaster Medical Assistance Teams etc have not been constituted as per the guidelines of the NDMA. Moreover, periodic testing of their functional efficiency and ensuring operational readiness is not systemised.

NDRF. The NDRF has been constituted and located and partially trained. Their complete training and procurement of equipment and kits is still underway. The state governments are yet to designate their respective response forces.

Resource Centres. National Resource Centres are in the process of creation. However, these are not adequate, on the basis of hazard vulnerability there is a requirement of creating and locating more resources centres at state level.

Employment of Armed Forces. The NDMA, MHA and MOD have not yet ironed out the coordination problems related to the employment of Armed Forces. For early deployment as required, this aspect needs to be resolved.

Resources Brick for Armed Forces. The Armed Forces have to pick up relief material from the state government sources or from their own reserves located at different places and this does lead to delays. There is scope for providing relief material bricks to Armed Forces who will store, account, maintain and make available the same for immediate response.

Land Use Zoning. Land use zoning has not been carried out in most of the states and where it has been carried out, it is not being enforced. This significantly increases the likelihood of loss of life and property. In addition, it hampers prevention and mitigation work. A classic example is the case of “Mitti” river of Mumbai which was required to be desilted and cleared of plastic waste. This could not be affected due to slums having come up right upto the edge of the river resulting in the inability of access to any heavy / earth moving machinery or their use.

Building Bye-Laws, BIS standards. On similar lines, building bye-laws, BMTPC standards and BIS codes though laid down and directions to follow them have been issued, the same is not being adhered to.

NDMA guidelines issued so far, have specified timelines, for implementation of DM measures. A summary of the same is shown in Chart VIII.

Chart VIII

	Phase I	Phase II	Phase III
(a) Flood	2008-2010	2008-2012	2012-2025
(b) Earthquake	2008-2012	-	-
(c) Cyclone	2007-2007	2010 onwards	-
Despite the efficacy of check dams, ponds and other small measures in increasing the water table and controlling drought, an integrated approach is yet to take effect, although a beginning has been made with the creation of NRAA.			

Integration of NGOs requires specific guidelines and integration into the DM process.

Damage Assessment. Capacity building of professional damage assessment is lacking. This expertise is a key requirement for post-disaster DM.

It would be evident from the preceding paragraphs that the paradigm shift in DM from somewhere around 2003/2004 followed by the creation of NDMA has resulted in a large number of initiatives for DM. However, completion of the projects and implementation of guidelines issued by NDMA and other measures would start taking effect only by 2010 and a major portion of it would be completed by 2012. This is subject to strict compliance of timelines specified by NDMA. As such, 2012 would be the earliest by which we would achieve some acceptable degree of preparedness. As of now our levels of preparedness are low, a very rough approximation by Mr P.G. Dhar Chakrabarti, the Executive Director, renowned person in the field of DM puts the level of preparedness at 30% for Floods, 50% for Cyclones and as low as 5% for Earthquakes. The hypothesis of this study therefore stands validated. The implementation of phase III of guidelines pertaining to floods would be completed by 2025 only. Meanwhile, reviews and reduction in acceptable risk level will require additional measures to be taken up. Thus DM would be an ongoing process.

RECOMMENDATIONS

The following recommendations are made for improved DM :

- (a) A ministry of “Disaster Management” be created for exclusive handling of DM.
- (b) The SDMAs, DDMA, Executive committees as per DM Act 2005 be constituted without delay in a time bound manner. Defaulters should be proceeded against as per clause 51 of NDM Act 2005.
- (c) The National DM Policy and National DM Plan pending approval with the government be approved at the earliest so as to facilitate the states to base their plans on the National policy and plan.
- (d) The members of SDMA and DDMA should be on deputation to the authority and not taking it on as an additional charge. The services of experts be hired as required.
- (e) The delineation of responsibilities of NDMA, MHA & Ministries should be clearly spelt out and known to all concerned to facilitate smooth functioning and prompt response.
- (f) The entire DM machinery should have a special focus on flood management to effect maximum benefit to maximum population and drastic reduction in damage to property and infrastructure.
- (g) The proposal for linking northern and southern rivers of the country should be examined seriously. In case resources and funding are limiting factors, at least the feasibility of partial implementation upto Central India should be considered.
- (h) Scope of clause 51 of NDM Act be enlarged to include negligence and inaction by functionaries with respect to DM process.
- (i) National Disaster Response Fund at state level and National Disaster Mitigation Fund at national and state level be constituted at the earliest.
- (j) “Fast Track” procedure be instituted for sanctioning of projects and finance related to DM.
- (k) Collaboration with World Organisations for funding and technology for implementation should be maximised.

- (l) Insurance and Micro finance along with government support where required be instituted in all disaster prone areas.
- (m) Advanced Hazard Mapping as required be undertaken on priority.
- (n) Early Warning Mechanism and committed communication system be modernized.
- (o) DM plans, SOPs, handbooks, checklists, trained personnel etc to be put in place on priority.
- (p) Systematic periodic check of drills, equipment and procedure to ensure operational readiness be instituted.
- (q) Training facility for DM be created at state levels.
- (r) Community awareness programme to be implemented in a big way.
- (s) EOCs, ICS and all related teams at all levels to be constituted.
- (t) Response Force and Resource Centres be constituted and located at state level.
- (u) Resources bricks be provided to Armed Forces for immediate relief.
- (v) Professional Damage Assessment teams be constituted and trained.

CONCLUSION

Hazards cannot be avoided, however their disastrous consequences can be minimised through pro-active use of a variety of planning measures, support infrastructure and implementation of risk transfer mechanism. To this end India is going through a phase of intensified preparedness for all disasters. Concerted efforts have been and are being made to formulate appropriate policies and guidelines for ensuring effective and synergized DM at all levels. According to Vice Chairman NDMA, the biggest challenge will be to implement, monitor and coordinate multi sectoral efforts.

NDMA since its inception has been instrumental in taking remarkable initiatives in a short period as already brought out in chapter III. NDMA has also concluded Mitigation Projects in collaboration with National & International organisations. Under aegis of NDMA a large number of mock exercises have been conducted to

train and assess response of organisations. NDMA along with the National Disaster Management Division in the Ministry of Home Affairs has thus imparted a tremendous impetus to DM in a holistic manner.

The response from the states however, has been mixed, while some states have been proactive like Gujarat, Orissa and Tamil Nadu to name a few, other states have dithered. In the federal system of our country DM is a state subject and so each state responds in accordance with its priorities. So some states, specially those that face devastating disasters, have taken more initiatives than others and therefore the entire country is not together in terms of disaster prevention and mitigation. This has resulted in differential capacity development and progress among states.

The National Vision 2020 is of building a safer and disaster resilient India by developing zero tolerance to avoidable deaths and minimal loss to property through sustained collective effort, synergy of national capacities and peoples participation. The government has adopted a multidisciplinary and proactive approach of putting in place institutional and policy framework, disaster prevention, mitigation and preparedness. The community, civil society organisations and media have a key role to play in achieving the nation's goal of moving together towards a safer India. The task is not easy to achieve keeping in view the vast extent and population of the country, the multiple natural hazards vulnerability and functioning of the country's administrative set up.

The ongoing "Kosi Flood" disaster, though an unprecedented one, has again exposed our inadequacy in dealing with disaster in a comprehensive and immediate time frame. From the Tenth Five Year Plan the government has commenced the process of DM in a big way. What appears to be extremely unachievable today will be transformed into reality in the next decade. The DM planning process will be dynamic, and would be capable of changes as required in the future. We have taken our initial steps towards achieving the national objective, however, there is a long way to go and we have to learn a lot from countries like China, which got international acclaim for the rescue work done after the Sichuan earthquake.

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DATA OF NATURAL DISASTERS WHICH STRUCK INDIA BETWEEN PERIOD 2000 – 2008 AS PER THE INTERNATIONAL EMERGENCY DISASTER DATA BASE MAINTAINED BY CENTRE FOR RESEARCH ON THE EPIDEMIOLOGY OF DISASTERS (CRED)

Search Details

Country(ies): India;

2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008;

Disaster type(s): Drought; Earthquake (seismic activity); Flood; Storm;

There are 113 entries.

Ser no	date	Location	Type	Killed	Tot. Affected
1.	00/07/2002	Uttar Pradesh, Madhya Pra ...	Drought		300000000
2.	00/04/2000	Gujarat, Rajasthan, Madhy ...	Drought	20	50000000
3.	08/10/2005	Jammu and Kashmir	Earthquake (ground shaking)	1309	156622
4.	26/12/2004	Tamil Nadu state, Andaman ...	Tsunami	16389	654512
5.	14/09/2002	Andaman Isl. (GoIla du Be ...	Earthquake (ground shaking)	2	200
6.	26/01/2001	Kachch-Bhuj, Ahmedabad, R ...	Earthquake (ground shaking)	20005	6321812
7.	11/06/2008	West Bengal, Orissa, Lakh ...	Flash Flood	93	311420
8.	11/02/2007	Rajasthan, Uttar Pradesh, ...		40	8

9.	16/07/2007	Kerala state	General flood	44	35000
10.	12/07/2007	Assam, Arunochal Pradesh, ...	General flood	96	11100000
11.	03/08/2007	Cuttack, Puri, Khordha, J ...	General flood	15	500000
12.	27/10/2007	Andhra Pradesh, Tamil Nad ...	General flood	29	50000
13.	16/09/2007	Kurnool, Kadapa, Warangal ...	General flood	94	20000
14.	22/09/2007	Balasore, Kendrapara, May ...	Storm surge/coastal flood	80	7200000
15.	08/08/2007	Gujarat	General flood	16	
16.	12/08/2007	Himachal Pradesh	General flood	76	15000
17.	03/07/2007	Biher, Uttar Pradesh, Ass ...	General flood	1103	18700000
18.	21/07/2007	Udaipur, Amarpur, Sonamur ...	General flood		
19.	22/06/2007	Kurnool, Mahabubnagar, Gu ...	Flash flood	127	200000
20.	30/06/2007	Raipur, Bilaspur, Mahasam ...	General flood	29	50000
21.	01/07/2007	Amrawati district, Mumbai ...	General flood	62	10000
22.	01/07/2007	Saurashtra region (Gujara ...	General flood	225	63000
23.	18/06/2007	Lakhimpur, Dhemaj, Cacha ...	General flood	15	200000

24.	01/10/2006	Madhya Pradesh	Flash flood	39	
25.	09/03/2006	Madhya Pradesh, Maharash ...	General flood	61	113
26.	01/08/2006	Orissa, Andhra Pradesh, C ...	General flood	185	200000
27.	26/10/2006	Tamil Nadu, Andhra Prades ...	General flood	47	225000
28.	29/08/2006	Balrampur, Balraich, Lakh ...	General flood	42	100000
29.	31/08/2006	Jammu and Kashmir	Flash flood	19	15000
30.	18/08/2006	Barmer, Jaisalmer, Kota, ...	General flood	135	20000
31.	00/08/2006	Gujarat	General flood		50000
32.	28/07/2006	Andhra Pradesh, Gujarat, ...	General flood	350	4000065
33.	24/07/2006	Jammu and Kashmir	General flood	15	800
34.	03/07/2006	Gajapati, Rayagda, Jhingi ...	General flood	33	
35.	04/07/2006	Nasvani, Dangs districts ...	General flood	24	8400
36.	24/06/2006	Ballia, Chandauli distric ...	General flood	130	300000
37.	31/05/2006	Maharashtra, Gujarat	General flood	41	
38.	25/05/2006	Kerala state	General flood	32	10800

39.	31/05/2006	Assam, Tripura states	General flood	21	504000
40.	15/04/2006	Telangana region, Hyderab ...	Flash flood	20	
41.	05/07/2005	Himachal Pradesh, Punjab ...	General flood	10	2000
42.	02/12/2005	Tamil Nadu	General flood	30	200000
43.	23/10/2005	Salem, Namakkal, Karur, E ...	General flood	162	2000000
44.	22/09/2005	Surat, Vadodara, Bhavnaga ...	General flood	15	
45.	21/10/2005	East Midnapore, South 24 ...	General flood	19	2250000
46.	14/09/2005	Rajnandgaon, Durg distric ...	General flood	89	550000
47.	16/09/2005	Himachal Pradesh, Uttar P ...	General flood	23	2504
48.	23/07/2005	Karnataka, Andhra Pradesh	General flood	126	100000
49.	26/08/2005	Azamgarh area (Uttar Prad ...	Flash flood	27	800000
50.	24/07/2005	Gujarat, Madhya Pradesh, ...	General flood	1200	20000055
51.	10/07/2005	Telangana and coastal reg ...	General flood	12	10000
52.	02/07/2005	Sagar, Chattarpur, Damoh, ...	General flood	62	49000
53.	07/07/2005	Hajuli, Dibrugarh, Jorhat ...	General flood	70	1908000

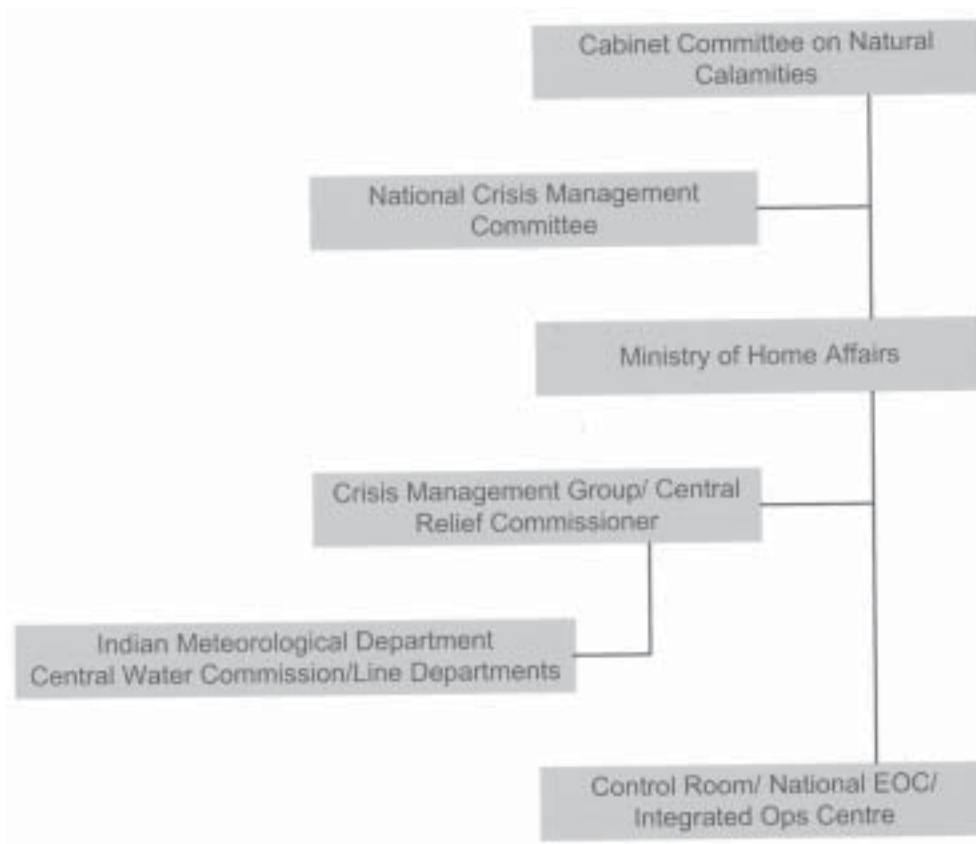
54.	26/06/2005	Rampur, Kinnaur region: S ...	General flood	6	5000
55.	09/07/2005	Digras, Nandgavan village ...	General flood	25	
56.	28/06/2005	Surat, Valsad, Navsari, B ...	General flood	239	405000
57.	27/05/2005	Mokokchung district (Naga ...	General flood	14	12
58.	01/05/2004	Uttaranchal, Gujarat, Mah ...	General flood	210	100000
59.	07/10/2004	Goalpara district (Assam) ...	Flash flood	160	100000
60.	20/09/2004	Uttar Pradesh, Himachal P ...	Flash flood	33	
61.	09/05/2004	Northern districts, Calc ...	General flood	45	1000
62.	20/06/2004	Darbhanga, Madhubani, Sit ...	General flood	900	33000000
63.	10/04/2004	Leimpokam Bazar, Khungham ...	General flood		5000
64.	10/09/2003	Uttar Pradesh	General flood	37	
65.	07/08/2003	Solang (near Kullu distri ...	Flash flood	43	15
66.	16/07/2003	Kulu (Himachal Pradesh)	Flash flood	150	30
67.	27/08/2003	Cuttack, Jagatsinghpur, K ...	General flood	67	3000000
68.	15/07/2003	Khavda, Barni, Nakharana ...	General flood	13	14500

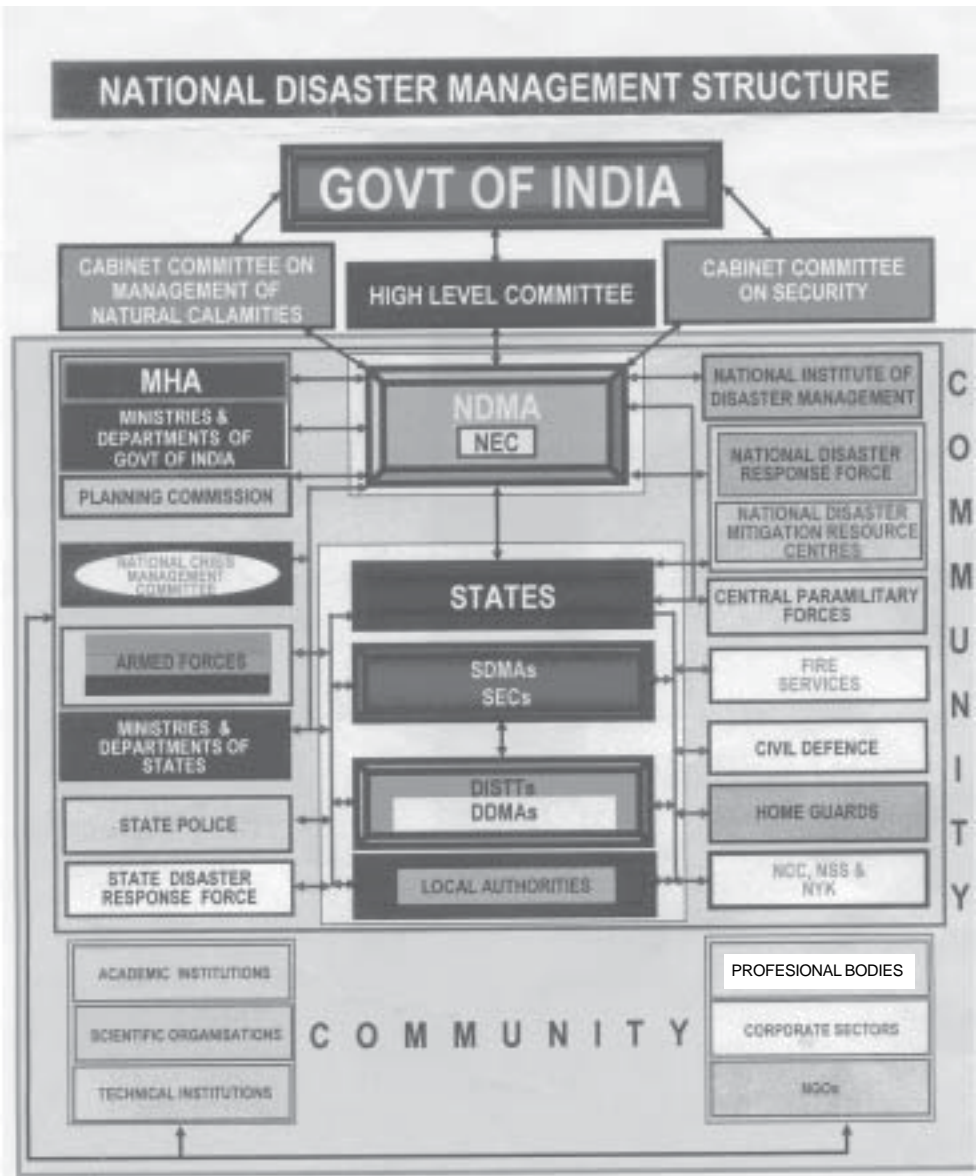
69.	11/06/2003	Assam, Bihar, Tripura, W ...	General flood	142	4550000
70.	01/10/2002	Tamil Nadu		20	200
71.	10/10/2002	districts of Kannur, Kasa ...	General flood	11	
72.	03/09/2002	Bharuch (Gujarat), Sadarp ...	General flood	22	5000
73.	20/08/2002	Belaghat (Madhya Pradesh) ...	General flood	100	3000
74.	11/08/2002	Tehri district (Uttaranch ...	General flood	33	50
75.	21/06/2002	Assam, Gujarat, Himachal ...	General flood	549	42000000
76.	07/09/2001	Bihar, Saran, Gopalganj]		146	
77.	00/09/2001	Saran, Gopalganj, East Ch ...	Flash flood	48	2800000
78.	20/08/2001	Gopalganj, East Champaran ...		150	7000000
79.	00/08/2001	New Delhi		10	35
80.	00/08/2001	Bihar state	General flood		400000
81.	04/07/2001	Idukki, Kottayam, Pathana ...	General flood	56	40000
82.	00/06/2001	Maharashtra, Kerala		28	4
83.	08/07/2001	Marshagal, Mahakalpada (K ...	General flood	100	9670000

84.	05/06/2001	Assam state, Tripura Stat ...	General flood	5	700000
85.	19/10/2000	Shevani union of Assasu ...		6	534035
86.	18/09/2000	Birbhum, Burdwan, Murshid ...	General flood	884	24600000
87.	23/08/2000	Hyberabad, Guntur, Medak, ...	Flash flood	179	252016
88.	02/08/2000	Gujarat, Andhra Pradesh, ...	General flood	867	22000000
89.	00/07/2000	Arunachal Pradesh	Flash flood	130	
90.	10/06/2000	Assam, Arunachal Pradesh	Flash flood	20	3000000
91.	15/11/2007	West Bengal, Orissa	Tropical cyclone		
92.	02/05/2006	Uttar Pradesh, Gujarat	Local storm	76	
93.	18/09/2006	Andhra Pradesh, West Beng ...	Tropical cyclone	114	150300
94.	20/09/2005	Andhra Pradesh, Orissa st ...		33	61000
95.	04/05/2005	Calcutta		11	20
96.	01/05/2005	Guntur, Krishna, Srikakul ...		20	20
97.	23/03/2005	Burdwan, Bay of Bengal (W ...		18	7550
98.	17/12/2003	Krishna, Guntur, West God ...	Tropical cyclone	50	40000

99.	12/04/2003	Mekhliganj, Haldibari, Fu ...	Tropical cyclone		460
100.	22/04/2003	Chirakhawa, Chirakhawa To ...	Tropical cyclone	45	4600
101.	12/03/2003	Bankura, Hooghly, Howrah ...	Local storm	30	485910
102.	18/02/2003	Dholatar (Gujarat state)	Tropical cyclone	5	140
103.	19/02/2003	Jammu and Kashmir, Punjab ...		14	4
104.	17/02/2003	Betul district (Madhya Pr ...		20	200
105.	13/11/2002	Bay of Bengal	Tropical cyclone	124	
106.	27/04/2002	Calcutta, Gobalpur, Jalpa ...	Local storm	11	
107.	11/04/2002	Orissa	Local storm		10200
108.	03/04/2002	West Bengal	Tropical cyclone	9	5050
109.	28/05/2001	Gujarat, Goa, Maharashtra ...	Tropical cyclone		
110.	00/10/2001	Andhra Pradesh	Tropical cyclone	78	27000
111.	24/05/2001	Uttar Pradesh	Local storm	21	
112.	29/11/2000	Nagappattinam, Thanjavur, ...	Tropical cyclone		30000
113.	17/10/2000	Andhra Pradesh	Tropical cyclone		

DISASTER MANAGEMENT : ORGANISATION AT NATIONAL LEVEL





**DETAILS OF STATE DISASTER MANAGEMENT AUTHORITIES,
DISTRICT DISASTER MANAGEMENT AUTHORITIES AND STATE
EXECUTIVE COMMITTEES ESTABLISHED IN THE COUNTRY**

Ser No	Name of State	Headed by	Date of Orders / Notification
1.	Andhra Pradesh	Chief Minister	14.11.2007
2.	Arunachal Pradesh	Chief Minister	31.08.2006
3.	Bihar	Chief Minister	06.11.2007
4.	Chhattisgarh	Chief Minister	01.08.2007
5.	Delhi	Lt Governor	19.03.2008
6.	Goa	Chief Minister	29.06.2006
7.	Gujarat @	Chief Minister	08.02.2001
8.	Haryana	Chief Minister	09.10.2007
9.	Himachal Pradesh	Chief Minister	01.06.2007
10.	Kerala	Chief Minister	04.05.2007
11.	Lakshadweep	Administrator	26.05.2006
12.	Meghalaya	Chief Minister	26.06.2008
13.	Mizoram	Chief Minister	23.05.2006
14.	Nagaland	Chief Minister	21.07.2008
15.	Pondichery	Lt Governor	01.08.2007
16.	Punjab	Chief Minister	22.02.2006
17.	Rajasthan	Chief Minister	06.09.2007
18.	Uttar Pradesh	Chief Minister	21.04.2008
19.	Uttarakhand	Chief Minister	10.10.2007
20.	West Bengal	Chief Minister	01.08.2007

State Executive Committees

Ser No	State	Date
1.	Andhra Pradesh	14.11.2007
2.	Chhatisgarh	01.08.2007
3.	Delhi	19.03.2008
4.	Haryana	19.05.2008
5.	Himachal Pradesh	01.06.2007
6.	Kerala	19.09.2007
7.	Lakshadweep	26.05.2006
8.	Meghalaya	26.06.2008
9.	Mizoram	23.05.2006
10.	Nagaland	21.07.2008
11.	Pondicherry	01.08.2007
12.	Punjab	22.02.2006
13.	Rajasthan	15.10.2007
14.	Uttar Pradesh	21.04.2008
15.	Uttarakhand	18.01.2008
16.	West Bengal	01.08.2007

District Disaster Management Authorities

Ser No	State	Date
1.	Andhra Pradesh	14.11.2007
2.	Chhatisgarh	01.08.2007
3.	Delhi	19.03.2008
4.	Goa	04.09.2006
5.	Haryana	09.10.2007
6.	Himachal Pradesh	01.06.2007
7.	Lakshadweep	26.05.2006
8.	Meghalaya	26.06.2008
9.	Mizoram	06.06.2006
10.	Nagaland	21.07.2008
11.	Punjab	22.02.2006
12.	Pondichery	01.08.2007
13.	Rajasthan	06.09.2007
14.	Tripura	27.12.2006
15.	Uttar Pradesh	21.04.2008
16.	Uttarakhand	04.12.2007
17.	West Bengal	01.08.2007

**LOCATION AND AREA OF RESPONSIBILITY OF
NATIONAL DISASTER RESPONSE FORCE**

Ser No	Type of Battalion	Location	Area of Responsibility
--------	-------------------	----------	------------------------

Natural Disasters

1.	CISF 4 th Reserve Bn	Mendali (Orissa)	Orissa & Chhatisgarh
2.	ITBP 3 rd Bn	Chandigarh	Punjab, HP and J&K
3.	BSF 128 th Bn	Guwahati	NE States & Sikkim
4.	CRPF 146 th Bn	Gandhinagar	Gujarat & Rajasthan

Biological & Chemical

5.	CISF 6 th Reserve Bn	Arakkonam (Chennai)	Tamilnadu, Kerala, AP and A & N Island
6.	ITBP 10 th Bn	Greater Noida	UP, Delhi, Haryana & Uttarakhand
7.	BSF 106 th Bn	Barasal	West Bengal, Jharkhand & Bihar
8.	CRPF 145 th Bn	Pune	Maharashtra, MP, Karnataka & Goa

STATEWISE ALLOCATION OF CALAMITY RELIEF FUND FOR THE PERIOD – 2005-2010

Sr. No.	State	2005-06	2006-07	2007-08	2008-09	2009-10	Total 2005-10
	1	2	3	4	5	6	7
1.	Andhra Pradesh	144.18	161.28	179.15	198.71	418.22	1501.54
2.	Assam/AR Pradesh	28.38	29.12	29.97	31.87	31.81	150.55
3.	Assam	189.86	198.62	204.48	210.82	217.86	1031.64
4.	Bihar	148.83	153.23	137.74	162.48	167.42	709.70
5.	Chhattisgarh	111.75	114.98	118.37	121.59	125.82	592.51
6.	Goa	2.11	2.21	2.32	2.44	2.58	11.66
7.	Gujarat	346.68	358.58	371.22	384.78	398.88	1759.14
8.	Haryana	134.38	138.88	143.13	147.99	151.18	624.56
9.	Himachal Pradesh	109.89	111.88	114.82	119.88	123.21	579.68
10.	Jharkhand	128.07	128.71	133.52	137.85	141.75	608.90
11.	J & K	86.86	88.96	91.58	94.35	97.31	459.06
12.	Karnataka	114.88	120.39	126.81	132.75	138.26	633.17
13.	Kerala	85.58	88.77	91.28	94.88	98.91	459.42
14.	Madhya Pradesh	234.11	261.38	289.29	317.18	345.88	1447.74
15.	Maharashtra	232.88	234.89	245.75	258.84	270.94	1343.30
16.	Manipur	5.56	5.72	5.89	6.06	6.23	29.46
17.	Mizoram	11.29	11.61	11.93	12.31	12.68	59.82
18.	Nagaland	6.38	6.77	6.97	7.18	7.48	34.81
19.	Nagaland	1.81	1.84	1.88	1.93	1.98	9.44
20.	Orissa	381.34	416.28	449.18	478.97	519.81	2245.58
21.	Punjab	146.83	137.32	148.89	168.84	177.49	689.37
22.	Rajasthan	411.64	434.82	458.73	481.14	508.21	2394.54
23.	Sikkim	17.73	18.88	18.57	19.13	19.78	94.16
24.	Tamil Nadu	384.88	418.53	448.31	482.83	514.13	2248.68
25.	Tripura	12.85	13.22	13.61	14.02	14.44	68.14
26.	Uttar Pradesh	291.94	304.48	313.45	322.87	331.75	1564.51
27.	Uttarakhand	94.89	98.59	98.58	100.67	101.88	494.61
28.	West Bengal	254.71	241.38	248.82	256.89	263.92	1265.82
	Total	3844.41	4097.78	4288.88	4427.97	4684.81	21343.85

ALLOCATION AND RELEASE OF FUNDS FROM CRF/NCCF DURING 2008-2009

As on 4.7.2009
(Rs. in crore)

Sl. No.	Name of the State	Allocation of CRF			Releases from CRF		Releases from NCCF
		Central Share	State Share	Total	1 st Instalment	2 nd Instalment	
1	2	3	4	5	6	7	8
1.	Andhra Pradesh	298.73	99.58	398.31	149.365	--	29.82
2.	Arunachal Pradesh	23.15	7.72	30.87	@	--	26.40
3.	Assam	157.97	52.66	210.63	@	--	--
4.	Bihar	121.86	40.62	162.48	@	--	--
5.	Chhattisgarh	91.43	30.48	121.91	@	--	--
6.	Goa	1.83	0.61	2.44	@	--	--
7.	Gujarat	213.58	71.19	284.77	208.495 *	--	--
8.	Haryana	107.99	36.00	143.99	@	--	--
9.	Himachal Pradesh	82.40	27.47	109.87	41.20	--	9.84
10.	Jammu & Kashmir	70.75	23.58	94.33	35.375	--	--
11.	Jharkhand	103.16	34.39	137.55	@	--	--
12.	Karnataka	99.55	33.18	132.73	49.775	--	109.91
13.	Kerala	74.23	24.75	98.98	37.115	--	--
14.	Madhya Pradesh	208.04	69.35	277.39	104.02	--	--
15.	Maharashtra	193.53	64.51	258.04	@	--	--
16.	Manipur	4.54	1.51	6.05	@	--	5.445
17.	Meghalaya	9.23	3.08	12.31	@	--	--
18.	Mizoram	5.39	1.80	7.19	@	--	49.60
19.	Nagaland	3.12	1.04	4.16	@	--	--
20.	Orissa	246.73	82.24	328.97	123.365	--	--
21.	Punjab	126.78	42.26	169.04	@	--	--
22.	Rajasthan	369.87	120.29	481.16	180.435	--	--
23.	Sikkim	14.35	4.78	19.13	@	--	8.36
24.	Tamil Nadu	181.52	60.51	242.03	90.76	--	72.46
25.	Tripura	10.52	3.51	14.03	@	--	--
26.	Uttar Pradesh	242.15	80.72	322.87	121.075	--	--
27.	Uttarakhand	75.50	25.17	100.67	74.715 *	--	--
28.	West Bengal	192.07	64.02	256.09	@	--	--

@ 1st instalment of Centre's share of CRF for the year of 2008-09 has not been released for want of information relating to crediting of earlier released funds and submission of utilisation certificate.

* Includes arrears of previous year.

STATEWISE DISTRIBUTION OF FLOOD FORECASTING STATIONS

Ser No	States	No of Flood Forecast Station
1.	Andhra Pradesh	16
2.	Assam	24
3.	Bihar	33
4.	Jharkhand	05
5.	Gujarat	11
6.	Haryana	01
7.	Karnataka	04
8.	Madhya Pradesh	03
9.	Chattisgarh	01
10.	Maharashtra	09
11.	Orissa	12
12.	Tripura	02
13.	Uttarakhand	03
14.	Uttar Pradesh	35
15.	West Bengal	14
16.	Dadra and Nagar Haveli	01
17.	NCT of Delhi	02
	Total	175

NDMA GUIDELINES : ACTION PLAN FOR IMPLEMENTATION OF FLOOD, FORECASTING AND WARNING MEASURES

S.No	Activity	Commencement	2008				2009	2010	2011	2012	
			M	J	S	D	M	M	M	M	
1	Mechanism for joint formulation of forecasts by CWC/IMD/NRSA/states	Immediate	Me- etings →								
2	Expansion and modernisation of FF and W network by CWC/IMD/NRSA/state governments	Immediate	Me- etings → Planning and approval →				Implement →				
3	Modernisation and strengthening of FF and W network in Nepal	Immediate	Me- etings → Implement →								
4	Modernisation and strengthening of FF and W network in Bhutan	Immediate	Me- etings → Implement →								
5	Modernisation and strengthening of FF and W network in China	Immediate	Meetings →				Implement →				

LOCATION OF REGIONAL RESPONSE CENTRES

For Floods and Cyclones

1. Guwahati
2. Bhubaneswar
3. Mokama
4. Hyderabad
5. Vishakhapatnam
6. Allahabad
7. Kolkata
8. Itanagar

For Hills and Mountainous Regions

9. Gaucher (Garwhal)
10. Matali (Garwhal)
11. Kulu (H.P)
12. Sarhan (H.P)
13. Reokong (H.P)
14. Pithoragarh (Kumaon)
15. Gangtok (Sikkim)
16. Car Nicobar

IMPORTANT MILESTONES OF NDMA GUIDELINES FOR MANAGEMENT OF FLOODS

Phase-I (2008-2010)

- (a) Making reassessment of the areas suffering from flooding erosion and drainage congestion and marking them on maps.
- (b) Finalisation of plans for expansion and modernization of flood forecasting and warning systems and their implementation.
- (c) Introduction of module on flood management in curricula of educational institutions.
- (d) Identification of reservoirs for reviewing and modifying the operation manuals / rule curves.
- (e) Amending building bye-laws to make future buildings in flood prone areas flood safe.
- (f) Preparation of detailed project report and approval of national flood relief mitigation project.
- (g) Establishing systems of monitoring of blockages in the rivers and alerts in case of collapse resulting in flash floods.
- (h) Establishing a mechanism for intra state coordination.
- (j) Preparation of Flood Management plans of central ministries and departments and state governments.
- (k) Preparation of close contour maps, digital elevation model and flood hazard maps.
- (l) Regulation for prohibiting reclamation of wetlands, lakes and natural depressions.
- (m) Implementation of priority flood protection and drainage improvement work.

- (n) Construction of flood shelters.
- (o) Establishing a mechanism for joint operation of reservoirs on inter state rivers.

Phase-II (2008-2012)

- (a) Institutionalising the role of community based organizations, non governmental organizations, women's groups, youth organizations, corporate houses and other stake holders in flood response.
- (b) Reorganisation / reorientation of fire and emergency services for prompt and effective response during floods.
- (c) Operationalising state disaster response force.
- (d) Enactment and enforcement of the flood plain zoning regulations.
- (e) Establishing system for forecasting of flash floods.
- (f) Modify operation manuals / rule curves of reservoirs and establish arrangements for inflow forecasts.
- (g) Implementation of national flood relief mitigation project.
- (h) Setting up of National Flood Management Institute.
- (j) Implementation of a pilot project for flood insurance.
- (k) Making public utility buildings/installations flood safe.
- (l) Preparation of detailed project reports for storage reservoirs in India and neighbouring countries.

Phase-III (2012-2025)

- (a) Watershed management catchment area treatment and afforestation schemes in critical areas.
- (b) Construction of storage reservoirs in India and neighbouring countries.

Recurring Activities. These activities are to be taken on a regular basis for ensuring the effectiveness of various structural measures.

- (a) Inspection of dams, embankments and other structural measures before monsoon and after monsoon.
- (b) Restoration / strengthening works.
- (c) Expansion and modernization of flood forecasting and warning network and decision support systems.

Appx 'L'
(Refers to Chapter VI)

RESPONSE FROM BRIG I HOODA, BRIGADE CDR AT URI J & K: J&K EARTHQUAKE 09 OCT 05

Q.1. Uri was one of the worst affected districts of J&K in the devastating earthquake which struck J & K on 09 Oct 05. What role did you play immediately after the earthquake and during the later period?

Ans.1. The Brigade and its troops provided immediate search and rescue effort, medical aid and relief and shelter. Subsequently, we rendered requisite assistance to civil administration, coordinated aid and assistance provided by NGOs as also assisted in the rehabilitation & reconstruction of the affected areas.

Q.2. When did the civil administration commence their rescue and relief operations? How effective was it and what were their handicaps?

Ans.2. Civil administration was largely ineffective during the initial 48 hours. Even when they did arrive they were restricted to the main roads which were open. The roads were blocked in many places due to landslides triggered by the earthquake. They did not have equipment for clearing roads or debris, medical facilities were rudimentary and there was lack of relief material particularly tentage or anything which could provide shelter. Being mountainous terrain large quantum of people were affected and houses damaged on the mountain slopes. These remained inaccessible to the civil administration.

Q.3. Are you aware of any preparatory work/ organization/ relief material reserve etc related to Disaster Management having been catered for by the civil administration prior to the earthquake?

Ans.3. No, I am not aware of, but I do not think there was any such effort prior to the earthquake. In case there was any in existence, it would have been visible after the earthquake.

Q.4. What was the immediate relief provided by the Army?

Ans.4. The Army itself was affected to a large extent due to collapsed buildings, bunkers etc and we had suffered over 200 casualties. Notwithstanding the same, the following actions were taken :

- (a) Clearance of roads blocked due to landslides triggered by earthquake.
- (b) Search and rescue missions involving clearance of debris using mechanical means where feasible & using manpower at other places and rescue of people trapped under debris.
- (c) Treatment of casualties was the first priority. Medical aid posts at numerous places and field hospitals at selected places were established. The field hospitals provided advanced treatment including surgery. Casualty evacuation was provided using Air Force and Army helicopters.
- (d) Large number of cook houses / food distribution points were set up.
- (e) The most important requirement was of providing shelter. The Army provided as many tents as were available with the Army units and their store depots.

Q.5. What assistance was rendered to civil administration once they swung into action?

Ans.5. The civil administration rushed in food and other essential supplies. However, other than in main Uri township and villages on the roadside, the administration had little idea as to what relief was required and at which location. The Army assisted the civil organisation in identifying the same. Assistance was also provided for ferrying relief material, pitching tents / shelters etc.

Q.6. What were the problems of the civil administration in rendering relief / aid and reconstruction once the immediate aid and rescue phase was over?

Ans.6. The problems of the civil administration in rendering relief / aid and reconstruction were :

- (a) Due to criticism in handling the relief operations, almost the entire administrative leadership of Uri and Baramulla was changed within one week. The new relief commissioner appointed was rushed in from Jammu, who was not familiar with the area and really had to start from scratch, which had its disadvantages.
- (b) The interference of some political leaders led to aid being sent to areas/constituencies of their interest which were not necessarily priority areas needing aid.
- (c) With the winter setting in the most immediate requirement was shelter, these were in acute short supply and those that were received came without the manpower for erecting them or constructing the plinths.

Q.7. Did the NGOs play an effective role? What were the major relief items contributed by them?

Ans.7. (a) The NGOs did play an effective role. The major contributions of the NGOs were as follows :

- (i) Immediate food and clothing.
 - (ii) Emergency shelters.
 - (iii) Medical aid.
- (b) The NGOs aid was to be coordinated by the civil administration and the Army initially stayed out of this sphere of activity. However, due to the intimate ground knowledge of what was required where, the responsibility for coordinating the same automatically came to the Army. An NGO coordination centre was set up at Uri where the NGOs were informed of the requirements at specific places and where necessary guides were provided.

Q.8. By the time you left Uri in January 2007, did any civil DM facility or organisation come up to manage disasters in future?

Ans.8. No.

Q.9. Do you have any suggestions or recommendations with respect to Disaster Management in the area, as J&K is in seismic belt and is prone to earthquakes and landslides?

Ans 9. There is a need to establish a disaster coordination cell at Srinagar. The need to co-opt the Army in this cell is evident as most of the type of equipment required for disaster management is available only with the Army. Essential relief

material should be readily available. There is also a need to carry out some essential training of civil administration officials in disaster management.

Appx 'M'
(Refers to Chapter VI)

RESPONSE FROM MAJ GEN SM MEHTA, SM, VSM, ON AID FROM NGOs IN THE AFTERMATH OF J & K EARTHQUAKE

Background

An earthquake of intensity of 8.2 on Richter Scale struck Muzaffarabad on 08 October 2005 leaving a trail of devastation in POK and border areas of J&K; Uri, Tangdhar & Rajouri areas. The damage on either side was so extensive that thousands of houses were flattened, over 1100 persons died and thousands were injured. It left a trail of lacs of people homeless on our side with no electricity and drinking water available and all other civil amenities disrupted. The magnitude of tragedy on the Pak side was many times higher.

Army moved in quickly to help in evacuation of dead and injured as well as to set up camps, langars and distribution points all over the affected areas. More than 300 sorties were launched in five days and foot patrols were sent to inaccessible areas for rescue and evacuation operations.

In the meantime, hundreds of NGOs responded by quickly dispatching aid to the affected areas little knowing the constraints of this treacherous and difficult terrain. After reaching the road head, these agencies were lost and did not have any means to distribute aid due to inaccessible and underdeveloped terrain. Thus a lot of requests were received from the NGOs by the army, especially at Srinagar, for assisting these agencies in distributing their aid to the victims of this gruesome tragedy.

Disaster Management Cell

A conscious decision was then taken to set up a Disaster Management Cell at Srinagar local military HQ to coordinate the NGOs activities as well as interact with the civil administration. The need to set up a disaster management cell was felt due to the following reasons :

- (a) Rush of NGOs both national and international organizations to Uri and Tangdhar.
- (b) Congestion near the road head.
- (c) Distribution to same populace over and over again.
- (d) No idea of geography and terrain and type of aid needed.
- (e) Lack of basic amenities in the forward locations.
- (f) NGOs all across the country were contacting the army to route their supplies to the affected areas.
- (g) Need to regulate their move to sensitive forward areas in consultation with civil administration.

The disaster management was headed by then Brig S M Mehta, SM, who was the Deputy Director Electrical and Mechanical Engineers at the local military HQ. The Disaster Management Cell was organised as shown at Fig 1.

Disaster Management Cell was established on 12 October 2008 with its advance detachments at Uri and Tangdhar to further coordinate the distribution and channelising the aid to the consignees. Two warehouses were established at Srinagar; one at Badami Bagh Cantonment and the other at the old airfield to receive the supplies coming by road and air respectively. Two more warehouses were set up at Delhi and Chandigarh to receive the supplies centrally coming from all over India and dispatch the supplies by road as well as by air to Srinagar. Sub Area at Delhi was made responsible for handling consignments received at Delhi warehouse and 'N' Area or Chandigarh warehouse. In a span of two months, supplies worth 25 crore were handled and distributed by the Disaster Management Cell dispatching almost 395 truck loads carrying CGI sheets, blankets, tents, supplies, woollens etc to the affected population.



Fig.1 Organisation of Disaster Management Cell

Appx 'N'
(Refers to Chapter VII)

RESPONSE FROM MR P G DHAR CHAKRABARTY, IAS, EXECUTIVE DIRECTOR, NATIONAL INSTITUTE OF DISASTER MANAGEMENT

Q.1 In accordance with the National Disaster Management Act 2005, all the states were required to constitute their respective State Disaster Management Authority, State Executive Committee and District Disaster Management Committees. However, as per information provided by the Ministry of Home Affairs only 20 states/ UTs have set up State Disaster Management Authority, 16 states have set up State Executive Committee and 17 states have set up District Disaster Management Authorities. In your opinion what is the cause for this delay? In what time frame do you visualize the balance of the states complying with this requirement?

Ans1. The Ministry of Home Affairs notified the relevant sections of the Act only in August 2007. It is now mandatory for the states to constitute the DDMA/SDMC/SEC. Ministry of Home Affairs is following up this matter with the states. It is difficult to make a commitment on behalf of the states. It may be expected that the state governments would constitute these bodies sooner than later.

Q.2 Are there any drawbacks in the manner in which the states have constituted the State Disaster Management Authority? Do you recommend any changes? Would the members be in a position to devote the requisite time and attention to Disaster Management?

Ans 2. Unlike in NDMA most of the members of the SDMAs are ex-officio senior officers of the government. They would require the services of experts. These experts may either be hired as consultants or be members of the Advisory Committees for which there is a provision in the Act.

Q.3 District Disaster Management Plans have been formulated primarily in 169 districts which are multi hazard prone and are part of the UNDP project, as also, in few other cases. What is the expected time frame in which District Disaster Management Plans are likely to be formulated in the remaining districts of the country or at least in the other hazard prone districts?

Ans 3. As per the Act there is no time frame for preparation of District Disaster Management Plans which have to be prepared in conformity with the National and State plans as also with the National Policy. The National and State plans are yet to be formulated and National Policy is yet to be approved. However, preparation and updation of DDMPs are continuous exercises which have been going on even before the promulgation of the Act. NIDM had developed a template on the basis of which such plans were being formulated. Therefore, the practice of formulating and updating the DDMPs shall continue irrespective of formulation of National and State plans.

Q.4 An analysis of the “Disasters” which have affected the country reveals that “Floods” are the most recurrent, most damaging and loss causing disaster affecting the country. The management of floods should be a primary focus in the Disaster Management process of our country. In your opinion are we doing enough in this direction, are the guidelines issued by NDMA, with respect to management of floods adequate? Is there a requirement for any additional measures?

Ans 4. The guidelines of the NDMA on flood risk mitigation are quite comprehensive. Challenge lies in implementation of the guidelines. Not much is being done on this. In fact, a large number of recommendations for mitigating the risks of flood have been made by a number of commissions and committees since independence. Most of these recommendations have remained unimplemented. The fundamental reasons for the non-implementation of the recommendations had been the inadequacy of resources. In order to address this gap the Ministry of Water Resources is preparing a Central Sector Plan Scheme on Flood Management. Separately NDMA is contemplating a national mitigation plan on flood management. In view of the recent damage of floods a national census and political commitment is developing for investment of adequate resources for management of floods, which is rather a complex issue. Therefore, the approach and strategy and the mix of structural and non-structural measures to be taken have to be carefully planned before such programmes are developed and implemented.

Q.5 During the management of current floods caused by the “Kosi” river breaching its banks, there have been allegations of delay in the reaction of the administration, deployment of armed forces etc, primarily due to lack of coordination between NDMA, the concerned ministries and other organizations. The creation of NDMA and revamping of Disaster Management at the governmental level was done with view of avoiding such delays. Is there a requirement of any organisational changes to streamline the Disaster Management process?

Ans 5. Kosi flood has exposed several weaknesses of the system :

- (a) No early warning of this disaster was issued for the people to move to safer places even though clear 6 days were available after the embankment breached in Nepal.
- (b) Despite the facilities of remote sensing and flood modeling available with our research and technical institutions flood forecasting advisories were not available.
- (c) The Central Water Research Institute in Pune had indicated in their study report four years back that a possible breach of the embankment may take place but no remedial measures have been taken in time.

Therefore the Kosi flood was not a natural disaster as it was not caused by any unusual rainfall or high discharge from the river, which was beyond the design calculations of the dam or its embankment. It happened due to breach of embankment due to poor maintenance. It was clearly a case of human negligence.

Q.6 A proposal with respect to linking of the northern & eastern rivers to the southern rivers, to reduce floods as well as to meet the irrigation requirements was talked about some time ago. Has any feasibility study been conducted on the proposal? If so what is the outcome, is it workable?

Ans 6. A proposal for river linking was prepared but there was no unanimity among the experts on the efficacy and cost effectiveness of the project. Many environmentalists have serious reservations about the project. For quite some time this proposal was not considered. This is likely to be revived as one of the possible options for mitigating the risks of flood.

Q.7 A large number of organisations in the country are involved in the early warning mechanism of disasters caused due to natural hazards. Are the existing facilities adequate? Is there a requirement of a review and if so, is there a feasibility of integrating the early warning mechanism under one agency?

Ans 7. Our early warning system of tsunami is excellent – possibly the best in the world. Our cyclone tracking system in the eastern coast is also good. The medium range forecast of rainfall for drought and agricultural operations is also good. However, we do not have an effective short-term and localized weather forecasting system. This is because we do not have adequate number of doplar radars and weather gauge stations. Indian Metrological Department has taken up a programme of massive modernization of the system which includes installation of about 50 doplar radars (against 5 at present) in various locations and thousands of automated weather monitoring stations for generating adequate data on the basis of which scientists will be able to do modeling and make weather forecast on a more scientific and accurate basis.

Q.8 What is the effectiveness of NGO's role in Disaster Management? What are specific areas in which their services can be best utilised in the disaster management process?

Ans 8. NGOs play an effective role in post-disaster relief and rehabilitation. They are also good in creating awareness among the people at the grassroot level. NGOs have better outreach than government in social sectors particularly for the vulnerable sections of the community. The services of the NGOs can be mobilized for these activities in a more systematic manner.

Q.9 In addition to the NIDM, the nodal disaster management institute of the country, there are institutes in roughly half the number of states in our country dealing with disaster management education in some form or the other. Do you

recommend setting up standardized disaster management institutes in all the states under the NIDM?

Ans9. NIDM is supporting 30 Disaster Management Centres in the State Administrative Training Institutes. All these centres require to be strengthened substantially to enable them to perform their roles in a more effective manner. NIDM and these centres should focus on training while disaster management education should better be left to the university system. However, NIDM can play a critical role in developing curriculum and standards for disaster management education in the country.

Q.10 What is the effectiveness of our disaster management at national level as on date in terms of a percentage or on a scale of 1-10, either collectively or separately for floods, cyclones, earthquakes, drought and landslides? What is the visualised effectiveness by 2015, by 2020 and by 2025?

Q.11 In case our levels of preparedness to deal with disasters cannot be quantified as requested for in the above question, would it be feasible to state descriptively what

	As on date	By 2015	By 2020	By 2025
Floods	-	-	-	-
Cyclones	-	-	-	-
Earthquake	-	-	-	-
Landslide	-	-	-	-

is our level of preparedness for dealing with disasters as of today and what would it be once the guidelines issued by NDMA for disaster management are implemented?

Ans 10. I would like to define disaster preparedness by the following equation:

Total risk - (prevention + mitigation) = Residual Risks = Expected level of Preparedness.

Ideally the level of disaster preparedness of the country should be equivalent to the total residual risks which are neither prevented nor mitigated. But actual level of preparedness is always less than what it should be. This unattended preparedness causes disasters.

In India the level of residual risks is very high. But our level of disaster preparedness is still very low and therefore the chances of disasters are high. The country has made

significant progress on preparedness in recent years. However, a lot remains to be done. The country has started realizing the importance of mitigation. National Cyclone Risk Mitigation Project is being launched shortly. This will be followed up by the projects on earthquake, landslide, school and hospital safety etc. It may be expected that all these projects which are in the pipeline would have the desired impacts on reducing the risk of disasters in the country.

I would not like to venture what would be the status in 2015, 2020 and 2025 although as an optimist I can see that the situation would be vastly improved than what it is today. At the risk of over simplification my guess is that our level of preparedness is:

- i) Cyclone - 50%
- ii) Flood - 30%
- iii) Major earthquake - 5%
- iv) Landslides - 10%

Appx 'O'
(Refers to Chapter VII)

SUMMARY OF RESPONSES DURING INTERACTION WITH REPUTED OFFICIALS / SCHOLARS DEALING WITH DISASTER MANAGEMENT

Q.12 In accordance with the National Disaster Management Act 2005, all the states were required to constitute their respective State Disaster Management Authority, State Executive Committee and District Disaster Management Committees. However, as per information provided by the Ministry of Home Affairs, only 20 states/ UTs have set up State Disaster Management Authority, 16 states have set up State Executive Committee and 17 states have set up District Disaster Management Authorities. In what time would the balance of the states comply with requirement of constituting these disaster management mechanisms?

Ans.1 The State and District Disaster Management Authorities are to be constituted in accordance with legislation on the subject, namely Disaster Management Act, 2005. The central government as well as NDMA is progressing the issue. Disaster
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Management is a state subject and as such the states have to act on the issue. Some of the states are taking time. The time frame by which the states will comply cannot be spelt out.

Q.13 Are there any drawbacks in the manner in which the states have constituted their respective State Disaster Management Authorities? Do you recommend any changes?

Ans.2 There are two main drawbacks in the manner in which the Disaster Management Authorities have been constituted:

- (a) The members are generally officials from the state government holding specific appointments, as such, it would be difficult for them to do justice to duties related to Disaster Management, specially during implementation stage of the guidelines issued by NDMA on various hazards, which requires considerable attention.
- (b) The organisation is like an inverted pyramid as far as knowledge and ability is concerned. At the level of district or the block, the personnel involved are the line functionaries of state government who do not have the necessary capability to implement what is required. As we move up the chain there are experts in each field of DM.

Q.14 District Disaster Management Plans have been formulated primarily in 169 districts which are multi hazard prone and are part of the UNDP project, as also, in few other cases. What is the expected time frame in which District Disaster Management Plans are likely to be formulated in the remaining districts of the country or at least in the other hazard prone districts?

Ans.3 In most of the districts some sort of plans are available with different departments dealing with different subjects, such as irrigation department, health department etc. There is a requirement of updating, compiling and coordinating them into one homogenous plan. This will be done gradually. The aspect of the capability of functionaries as mentioned in the previous answer is a limiting factor.

Q.15 Are the guidelines issued by NDMA, with respect to various disasters based on meeting certain levels of “Acceptable Risks”? If so what are the levels, either collectively or in the respect of floods, cyclones, earthquake and droughts.

Is the level of “Acceptable Risk” comparable with those of other countries?

Ans.4 A scientific evaluation for arriving at an acceptable risk after taking into account the total risk and the risk reduction facilities already in place/ are being put into place, has not been undertaken. However, the guidelines have been framed with the aim of providing the best level of Disaster Management.

Q.16 A proposal with respect to linking of the northern & eastern rivers to the southern rivers, to reduce the floods as well as to meet the irrigation requirements was talked about some time ago. Has any feasibility study been conducted on the proposal? If so what is the outcome, is it workable?

Ans.5 A number of academic studies have been carried out and some of them claim the feasibility of the project. However, practically on ground the feasibility of implementing the same is more or less non-existent because of the following reasons :

- (a) The land requirements would be very large leading to social and political fall-outs far beyond the proportions of Singur case in West Bengal.
- (b) The project involves inter state consensus which is very difficult to come by. The difficulty of implementing Sutlej Yamuna Link canal is a case in point.
- (c) The colossal requirement of financial, material and technological resources .
- (d) The time frame involved.
- (e) The changing course of certain rivers.

Q.17 In the guidelines issued by NDMA, time bound action plans have been formulated for implementation with respect to preventive measures, mitigation projects, preparedness actions and other activities for dealing with each type of hazard. Many of the activities are highly capital and technology intensive. Do you visualize the requirement of collaboration with international agencies for technology requirements as also for funding of the projects or can we meet the requirements domestically?

Ans.6 The financial, material and technological resources at the disposal of central government has to be allocated. However, that would be inadequate. A significant contribution should be sought from the corporate sector in India which has funds and should give something back to the society. In addition to this, there would be a requirement of seeking funding, technical assistance and collaboration from international organisations.

Q.18 Joint Ops in HQ IDS is the nodal agency of Armed Forces for disaster relief in the country. Inter-services organisation for the emergency responses come into play
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for the execution of disaster relief by Armed Forces. Is this arrangement adequate? Is there a need for any change for improved functional efficiency?

Ans.7 The following measures for improvement of functional efficiency in employment of Armed Forces require to be considered.

- (a) More and more field formations are being employed in the task. There is a requirement of incorporating static HQ in the chain.
- (b) Education of civil authorities with respect to the capability of the Armed Forces, removal of their reluctance of seeking assistance and the necessity of seeking assistance before situation results in loss of life and damage to property.

Q.19 In the article titled “Disaster Management at National and state levels” written by you in the *U.S.I Journal*, you have stated that despite the creation of NDRE, the Armed Forces form the core of government response capacity and have become the immediate responders in all serious disaster situations. Do you see a change in this situation with the passage of time and full implementation of national guidelines for disaster management issued by NDMA?

Ans.8 Even after the constitution of NDRE, the resources at the disposal of the civil administration are limited. It is only the Armed Forces which have the resources of aircrafts, helicopters, large quantities of boats, earth moving equipment and so on. As such the Armed Forces will remain the core of governmental response capacity. In the aftermath of “Hurricane Katrina” disaster in US, the lesson learnt report concluded that it was an error on the part of the administration to refrain from using the defence forces. They had used only National Guards. Therefore the richest and most advanced state also has concluded that Armed Forces have a part to play in DM.

Q.20 What is the effectiveness of NGO’s role in Disaster Management? What are the specific areas in which their services can be best utilised in the disaster management process? Is there a proposal to frame guidelines for the same?

Ans.9 The effectiveness of committed voluntary organisations is very good. They should be used in all fields of disaster management. However, as far as possible organisations which are aware of the culture, requirements of the affected people and sensitivities of the people should be utilised. The DM plans should cater for the co-ordination of aid from NGOs and for integrating them with the DM process. The NDMA is in the process of formulating guidelines for the integration of NGOs into disaster management.

Q.11 What is the effectiveness of disaster management at national level as on date in terms of a percentage or on a scale of 1-10, either collectively or separately for floods, cyclones, earthquakes and drought? What is the visualised effectiveness by 2015, by 2020 and by 2025 ?

Ans.10 This is a theoretical question, it would not be correct to place a figurative assessment. The NDMA is aware of the requirement, we have initiated steps in the right direction and in due course we are confident we would be able to achieve a high level Disaster Risk Management.

OPTIMAL UTILISATION OF WATER RESOURCES UNDER INDUS WATER TREATY & SECURITY IMPLICATIONS FOR INDIA

By
Brig Rakesh Bassi, SM

INTRODUCTION

“Fierce national competition over water resources has prompted fears that water issues contain the seeds of violent conflict.”

— Kofi Annan

Background to the Study

During the last century, the rate of water withdrawal has exceeded that of population growth by a factor of two and a half.¹ It is important to keep in mind that 90 percent of all growth in world population in the present century will concentrate in the most water deficient regions in the so called “Third World”². By the year 2025, 37 countries are likely to be without enough water for just household and agricultural needs, let alone water needed for fisheries and animal husbandry, industries, energy production, navigation, and other societal needs.³ Rivers currently provide human beings 80 percent of their freshwater needs;⁴ many other sources of freshwater – aquifers, lakes, wetlands and marshes – are also often linked to the catchments and drainage basins of rivers. While many river basins are fully contained within the borders of individual countries, more than 200 river basins worldwide are shared by two or more countries mostly without enforceable water sharing agreements between them.⁵ Indus Basin is one such basin which is shared by three countries – China, Pakistan and India. Growing competition for trans-boundary water resources is bound to greatly accentuate the potential for acute social upheaval and conflict in this region.

The Indus Basin

The Indus system of rivers comprises the Indus and its five main tributaries i.e. Jhelum, Chenab, Ravi, Beas and Sutlej. They all combine into one river near Mithank Kot in Pakistan and flow into the Arabian Sea, south of Karachi. The Indus river has its source (called Senge-Khambab meaning 'river issuing from the lion's mouth') in western Tibet in the Mount Kailas region at an altitude of 5500 m. The catchments contain some of the largest glaciers in the world outside the Polar regions.⁶ The western rivers are Kabul, main Indus, Jhelum and Chenab and the eastern rivers are Ravi, Beas and Sutlej.

In August 1947, when India and Pakistan were divided into two independent countries, the boundary line between the two countries being partitioned was drawn without any regard to the existing irrigation works leaving India upstream and Pakistan downstream. The important headworks at Madhopur and Hussainiwala were left with India which could regulate the waters flowing to Pakistan then, since its river linking canal system had yet to be constructed. The newly formed states were at odds over how to share and manage what was essentially a cohesive and unitary network of irrigation.⁷

It is on the intervention of World Bank in 1952 that the framework of the treaty was carved out and World Bank's proposal was put forward to both India and Pakistan in 1954.⁸ It principally involved the following :

- (a) Exclusive use of eastern rivers (Sutlej, Beas and Ravi) by India and similarly exclusive use of western rivers (Chenab, Jhelum and Indus) by Pakistan.
- (b) Construction of replacement canals in Pakistan to convey water from western rivers to areas earlier dependant on water from eastern rivers. For this India was to bear a financial burden of approximately 62 million pounds.
- (c) Till such period the infrastructure comes up in Pakistan, a transition period would exist.

Notwithstanding some of the troublesome issues, the treaty was finally signed in September 1960, a full 13 years after partition and an outcome of eight years negotiations between India and Pakistan under the aegis of the World Bank.

Forty seven years after signing of the treaty, India's population dependent on Indus Basin for their water needs has grown manifold. The states of Jammu & Kashmir, Haryana and Rajasthan whose dependency for water is on the Indus

Basin, are woefully short of water to meet their hydroelectric/ agricultural requirements. While Pakistan's perpetual objections to any infrastructure developed by India has been one of the reasons for the tardy pace of optimising the water resources of the western rivers, the non-optimal utilization of even the eastern rivers of the Indus Basin over whom India has full rights, is a cause of concern especially since as much as 4.85 MAF waters from Ravi and Sutlej rivers flows across the Indian borders.⁹

Justification for the Study

National security, the primary objective of any nation state comprises human, energy and strategic security.¹⁰ A deeper analysis of each sub-component of national security reveals that water security is linked to each one of them very closely. No new rivers are likely to be discovered in the world, but more efficient management of existing sources can add to supplies just as effectively. We need to therefore identify the areas where our utilization of water resources is not optimal and initiate steps to optimize them.

Both India and Pakistan share the water resources of the Indus Basin. In both countries aquifers are being depleted, water tables are falling, waterways are severely polluted, and soils are becoming acutely saline from the overuse of underground water supplies. Yet both countries must not only maintain a supply of food and potable water for their populations but also develop the hydroelectric potential of the river system that runs through the borderlands.¹¹ India's 1.1 billion population, represents one fifth of the humanity on planet earth. This coupled with the positive economic strides being taken by the nation have turned the world focus on India. Developed economies, international economic institutions like World Bank, IMF etc can no longer ignore India's market size and potential for international trade. It is therefore incumbent for the nation to ensure that firstly, its legitimate rights of optimal utilization of water resources under Indus Water Treaty 1960 are not interfered into by Pakistan and secondly, there is a need to identify areas where the existing treaty pinches our national interests. It is only if such areas are identified, can any strategic planning be initiated by our policy planners to ensure that our upper riparian status gives us strategic options.

The Indus Water Treaty gives India unrestricted usage of eastern rivers i.e. Beas, Sutlej and Ravi. It is therefore in our national interest and it should be our strategic goal not to allow any water of eastern rivers to flow into Pakistan. Our irrigational system and water management should be so structured that each drop of water is gainfully employed to increase our cultivation and power generation and prevent any

overflow from eastern rivers of Indus system to Pakistan. As of date, approximately 4.85 maf waters from rivers Ravi and Sutlej continue to flow into Pakistan.¹² It must be appreciated that what flows to Pakistan is sweet water in areas where it has brackish water sources. From the eastern rivers, there is water to be wasted across border but NO water is available to be given to Haryana. Non-resolution of the Sutlej Yamuna Link (SYL) Canal imbroglio to date is a case in point.¹³ There is a need to study these issues and draw the attention of the government so that this precious resource is not wasted to the nation's disadvantage.

From the economic angle, the most adversely affected state by the treaty has been Jammu and Kashmir due to restrictions placed by the treaty on the unhindered usage of its river waters of Jhelum, Chenab and Indus. The irony of the matter is that the state being rich in its hydel resources has been facing a perennial problem of shortage of hydro-electric power. Since the treaty has placed curbs on the construction of storage reservoirs which could ensure the provision of requisite water flow, all power projects in the state are to be run-of-the-river type.¹⁴ As such Jammu and Kashmir is unable to meet its demand of electricity, and has been importing power at high rates from the northern grid. The shortage of power in the state has not only been causing problems for domestic consumption, but has also been inhibiting the growth of industry and agriculture.¹⁵ We need to identify areas of unutilised irrigation and hydro potential to exploit within the ambit of the Indus treaty.

Since Indus Basin is divided between India and Pakistan by the treaty and both the countries have fought three wars till date and the relations between the two have at best been only functional, there is a requirement to understand the security implications which are likely to emerge while optimizing the potential of water resources of Indus Rivers. Such security implications may also arise due to internal security considerations since it would tread on inter - state and centre - state interests.

Hypothesis

The Indus Water Treaty 1960 has earmarked assured rights for utilization of water resources of Indus Basin to India and Pakistan. Even 48 years after the signing of the treaty, India has not been able to optimize the utilization of water resources allotted to it under the treaty.

Statement of Aim

The aim of the thesis is as follows :

- (a) To analyse the present status of utilization of Indus Basin waters as entitled to India under the Indus Water Treaty of 1960.
- (b) To identify shortfalls and inadequacies in exploiting the potential of the water resources covered by the treaty and identify scope for additional utilization.
- (c) Understand the national and internal security implications arising from optimal utilization of water resources of Indus Rivers.

Scope of the Study

The scope of the study will encompass the following :

- (a) Understand the importance and economics of water with specific reference to Indus Basin and the existing Pakistani water crisis.
- (b) Genesis, background and salient features of Indus Water Treaty.
- (c) Utilisation of potential of western rivers of Indus to include existing capacity utilization, Pakistan's sensitivity to Indian projects on western rivers, views of Jammu & Kashmir's population on the treaty and security implications arising out of optimal utilization.
- (d) Utilisation potential of the eastern rivers of Indus to include existing capacity utilization. Inter state dynamics between Jammu & Kashmir, Punjab, Haryana and Rajasthan leading to non optimal utilization of water resources of Indus Basin, losses of water across borders to Pakistan and security implications affecting both national and internal security.
- (e) Some views on review of treaty especially in context of western rivers flowing through Jammu & Kashmir.
- (f) Analysis, recommendations and suggestions.

Layout of the Study

The study has been laid out in six chapters as follows :

- (a) Chapter I. This chapter deals with the importance of freshwater to include economics of water and the water crisis in Pakistan which has a direct implication on sensitivity of Pakistan to even legitimate utilization of waters of western rivers of Indus by India.

- (b) Chapter II. This chapter deals with the Indus Water Treaty per se to include its genesis, pre-treaty negotiations and the salient features of the treaty.
- (c) Chapter III. This chapter deals with the western rivers i.e. Indus, Jhelum and Chenab. It discusses the existing capacity utilization of these rivers by India, the sensitivity of Pakistan to any infrastructure developments on these rivers which are hindrances to their optimal utilization by India. The chapter also lists out the views of the politicians and local population of Jammu & Kashmir on the treaty. The security implications arising out of optimal utilization have also been analysed.
- (d) Chapter IV. This chapter highlights the mismanagement of water resources of the eastern rivers of Indus especially when India has exclusive rights to their waters. The inter state issues on sharing of waters of Indus between Jammu and Kashmir, Haryana, Rajasthan and Punjab have been discussed and the areas of concern which have resulted in non optimal utilization of water resources have been highlighted. The chapter draws attention to the fact that we lose water of eastern rivers to Pakistan whereas we have water starved areas with necessary infrastructure in place to divert these waters but inter state interests overshadow the national interest.
- (e) Chapter V. The chapter discusses views on need for having a relook into the existing treaty especially to safeguard the interests of Jammu & Kashmir.
- (f) Chapter VI. The analysis, certain recommendations and suggestions have been listed.

CHAPTER I

IMPORTANCE OF WATER

“Water is the formless potential out of which creation emerged. It is the ocean of unconsciousness enveloping the islands of consciousness. Water bathes us at birth and again at death, and in between it washes away sin. It is by turns the elixir of life or the renewing rain or the devastating flood.”

- Scott Russell Sanders

Water Crisis

Fresh water is a prime natural resource, a basic human need and a precious national asset. Unfortunately this precious resource is under threat. It is assessed that 78 percent of the world's population will live in areas facing physical or economic water scarcity by 2025 and one-third of the population of the developing world will face severe water shortages.¹⁶ India is supposed to fall into the water stress category well before 2025.

It has been estimated that in order to meet the UN Millennium Development Goal, approximately 1.5 billion people will need to be given access to water over the next nine years. Little wonder the UN declared 2005-2015 the International Decade for Action, launching a *Water for Life* campaign in an effort to address the most detrimental humanitarian results of the current, and increasing, global water crisis.¹⁷

Economics of Water

The economics of water are mind-boggling. It would be appropriate to make an evaluation of the gross income per hectare with the amount of water used. 3.5 cusecs of water irrigates 1000 acres. The average income per acre, per year, is about Rs. 10,000. For every 1000 acres, this would amount to Rs 1,00 lakh. This means that every cusec of water generates 33 lakh rupees every year.¹⁸

Financial markets are beginning to take an interest in investing in water companies, recognising that if an estimated two billion people are expected to be short of water in 2050 the resource could become more valuable than oil.¹⁹

It is in this context that the relevance of understanding the importance and economic dimensions of water in context of the Indus Water Treaty cannot be over emphasized. This treaty placed tremendous responsibility on India since it was the upper riparian nation. It safeguarded Pakistan's water interests. Pakistan's agrarian economy is completely dependent on the rivers Indus, Jhelum and Chenab. Mismanagement of water resources and inter state dispute between Punjab and Sindh have only aggravated the water crisis in Pakistan. It is the water crisis in Pakistan which is the single most important hindrance to optimal utilization of the western river's potential by India even under the ambit of the treaty.

Pakistan's Water Crisis

Pakistan's annual per capita water availability has declined from 5,600 cubic metres at the time of independence to 1,200 cubic metres in 2005.²⁰ Both

groundwater tables and the capacity of the hopelessly silt-laden Indus to carry water to Pakistan's storage facilities are dropping alarmingly. About 50 percent of the water is expected to be lost by 2010.²¹ This will make it hard to support cotton sowing and wheat maturing. The active Indus delta has been reduced to about one-tenth of its original size. Dispossessed of land or livelihood, thousands of families living in and around the delta have migrated to Karachi when the sea began intruding and destroying fertile land.²²

New studies have indicated that growing population (300 million by 2020) in Pakistan will require additional 25 million acre feet (MAF) of water by 2020. New mega projects like Kalabagh and Basha Dams will partly relieve the shortage. Hence Pakistan, even after feverish water resources building activity in next 10 years, will be 10 MAF water short. If you take into account silting of the dam sites, which is a serious problem, the situation is likely to worsen further. Silting has depleted the storage capacity of Mangla Dam (built in 1967) and Tarbela Dam (built in 1975) by 20 percent already. By 2020, additional 30 percent of the storage capacity will be lost to silting. Taking these factors into account the net shortage in the next 15 years will be as much as 15 to 18 MAF even if the foregoing mega dams are built.²³

Effect on Sindh

Owing to depletion of water supply from eastern rivers, Pakistan had to construct canals to draw waters from Chenab and Indus into Ravi and Sutlej for Punjab. Consequently, the water that used to flow into Sindh is now being diverted into Punjab and this is a major source of unrest/discontent in the agrarian society of Sindh. Acute shortage of river water coupled with deficit rainfall has resulted in considerable fall of area under cultivation in Sindh province. While all the provinces are suffering from a shortage of water, there is a tendency to force Sindh to bear a disproportionately high share of the burden than Punjab. The Army leadership is keen on ensuring water supply to Punjab at the cost of Sindh. It adds that in 2004-05, Sindh's share in irrigation water was cut by 25-40 percent.²⁴ Insufficient flow in Indus in the lower reaches is unable to prevent sea intrusion in the Indus estuary. All these factors and related retardation in developmental activities have manifested into worst socio-economic impact on the Sindh province. Sindh has, as a result, launched massive agitations.²⁵

Desertification

Pakistan is facing desertification owing to water logging and soil salinity consequent to which its present day yields are one of the lowest in the world. Owing to leakage in canals and inappropriate irrigation practices there is a heavy loss of water available

through Indus Basin Irrigation system. The arid and semi-arid rangelands in Pakistan show signs of being strained. The threat of overgrazing, over-harvesting and overstocking of the natural vegetation is aggravating the situation. The change in grazing practices has virtually reduced some areas in the Cholistan desert to sand dunes. According to one estimate more than 60 percent of the natural grazing areas of the country have production levels lower than one-third of their biological potential. More than one-third of the country has been classified as under risk of desertification (45 million hectares).²⁶

In over 25 percent of the Indus Basin the water table has risen to 2 m of the soil surface, resulting in 40,000 hectares of land being lost to both these problems.²⁷ In some areas it has gone up to 1 m. Over 5.7 million hectares of land are salt affected and 2.4 million hectares is highly saline according to the Soil Survey of Pakistan. The soil of 13.6 million hectares within the Gross Command Area was surveyed, which revealed that 3.1 million hectares (23 percent) was saline; 23 percent of this was in Sindh and 13 percent in the Punjab. Waterlogging and salinity pose serious threats to the primarily agricultural economy.²⁸ This is the state of affairs when Pakistan is enjoying unrestricted use of western rivers (Chenab, Indus, Jhelum), Kabul river and overflow of eastern rivers.

India's Disadvantage

At the time of partition, out of 26 million acres of land irrigated annually by the Indus canals, 21 million acres lay in Pakistan and only 5 million acres in India.²⁹ As per the 1941 census, the population dependent on the Indus system waters was 25 million in Pakistan and 21 million in India.³⁰ Besides, India had "another 35 million acres of lands crying out for irrigation from the Indus basin sources".³¹ Thus the partition gave independent India much less undeveloped area in spite of the fact that it was an upstream country with control over Ravi, Beas, Sutlej, Jhelum and Chenab. India had not only to cater to the food requirements of 21 million people, but also those millions who migrated from irrigated areas in West Punjab and Bahawalpur, now in Pakistan, all of whom were dependent on the Indus waters.³²

On our side Jammu and Kashmir loses to the assessed tune of approx 65000 crore a year for not being able to tap the hydro electric potential of Jhelum and Chenab due to provisions of the treaty.³³ Such is the money power of water.

CHAPTER II

INDUS WATER TREATY

Next to blood relationships, come water relationships.

- Stanley Crawford, Mayordomo

Genesis of the Treaty

In August 1947, when India and Pakistan were divided into two independent countries, the important headworks at Madhopur and Hussainiwala were left with India which could regulate the waters flowing to Pakistan. Eighty percent of Pakistan's agricultural output comes from the Indus Basin and so it felt its livelihood threatened by the prospect of Indian control over the tributaries that fed water into the Pakistani portion of the basin.³⁴ Where India certainly had its own ambitions for the profitable development of the basin, Pakistan felt acutely threatened by a conflict over the main source of water for its cultivable land.

On 1 April 1948, India stopped the supply of water to Pakistan from every canal flowing from India to Pakistan. Pakistan protested and India finally agreed on an interim agreement on 4 May 1948.³⁵

Pre-Treaty Negotiations

This accord required India to release sufficient waters to the Pakistani regions of the basin in return for annual payments from Pakistan. The accord was meant to meet immediate requirements and was followed by negotiations for a more permanent solution.

By 1951, despite the unwillingness to compromise, both nations were anxious to find a solution, fully aware that the Indus conflict could lead to overt hostilities if unresolved.³⁶ In this same year, David Lilienthal, formerly the Chairman of the Tennessee Valley Authority proposed that India and Pakistan work out a programme jointly to develop and jointly to operate the Indus Basin river system, upon which both nations were dependent for irrigation water. With new dams and irrigation canals, the Indus and its tributaries could be made to yield the additional water each country needed for increased food production. He suggested that the World Bank might use its good offices to bring the parties to agreement, and help in the financing of an Indus Development Program.³⁷ Lilienthal's idea was well

received by officials at the World Bank, and, subsequently, by the Indian and Pakistani governments.

In 1954, after nearly two years of negotiation, the World Bank proposal offered India the three eastern tributaries of the basin and Pakistan the three western tributaries.³⁸ Canals and storage dams were to be constructed to divert waters from the western rivers and replace the eastern river supply lost by Pakistan. This transfer was necessary to make up for the water Pakistan was giving up by ceding its rights to the eastern tributaries.³⁹ The World Bank initially planned for India to pay for these works, but India refused. The Bank responded with a plan for external financing mainly by the United States and the United Kingdom. India paid 62 million pounds to Pakistan as compensation for cost of works.⁴⁰ This solution cleared the remaining stumbling blocks to agreement and the treaty was signed by the prime ministers of both countries in 1960.

Salient Features of the Indus Water Treaty⁴¹

The main features of the treaty relevant to the study are as follows :

- (a) The waters of the three eastern rivers - the Ravi, the Beas and the Sutlej - would be available for unrestricted use by India, after a transition period.
- (b) The waters of the three western rivers—the Indus, the Jhelum and the Chenab - would be allowed to flow for unrestricted use by Pakistan except for some limited use such as (i) domestic use, (ii) non-consumptive use, (iii) agricultural use, (iv) generation of hydro-electric power run of river plants in Kashmir.
- (c) Non-consumptive use, domestic use etc. would be permitted in all the rivers by both the countries, but such use should not in any way affect the flow of rivers and channels, to be used by the other party.
- (d) Both countries have recognised their common interest in the optimum development of the rivers, and declared their intention to cooperate by mutual agreement to the fullest possible extent.
- (e) Except for domestic and non-consumptive uses, Pakistan shall be under an obligation to let flow, and shall not permit any interference with, the waters of Sutlej Main and the Ravi Main in the reaches where these rivers flow in Pakistan and have not yet finally crossed into Pakistan.
- (f) Pakistan would build works in the transition period to replace, from the western rivers and other sources, waters she used to get in her canals from the eastern rivers. India would contribute in ten equal annual instalments the

fixed sum of Pounds Sterling 62,060,000 to the Indus Basin Development Fund towards the cost of replacement works in Pakistan.

- (g) The two countries would regularly exchange data regarding the flow in and utilisation of waters of the rivers.
- (h) A Permanent Indus Commission would be constituted with the Commissioners for Indus Waters of the two countries. If the Indus Commission fails to reach agreement on any matter pertaining to the treaty it would be referred to a neutral expert.
- (i) There is no exit clause in the treaty. Article XII of the treaty however provides for a modification of the treaty with bilateral understanding.

CHAPTER III

WESTERN RIVERS

“Thousands have lived without love, not one without water”

— W.H. Auden

The Indus treaty allows India to build storages on the three western rivers aggregating 3.60 million acre feet (MAF) in Jammu and Kashmir: 1.60 MAF for hydro-power, 0.75 MAF for flood moderation and 1.25 MAF for general storage for non-consumptive uses, including power generation as per details in chart 1.⁴²

Chart 1.

	River System (1)	Conservation Storage Capacity (MAF)		Flood Storage Capacity (MAF) (4)
		General Storage Capacity(2)	Power Storage Capacity (3)	
(a)	The Indus	0.25	0.15	Nil
(b)	The Jhelum (excluding the Jhelum Main)	0.50	0.25	0.75
(c)	The Jhelum Main	Nil	Nil	As provided in Paragraph 9 of Annexure E to the
(d)	The Chenab (excluding the Chenab Main)	0.50	0.00	Nil
(e)	The Chenab Main	Nil	0.00	Nil

From the western rivers, the treaty allowed India to irrigate 13, 43,477 acres of land. As against that up till 2006, there was still about five lakh acres of land that we are entitled to irrigate. This additional five lakh acres is to be backed by storages on the western rivers.⁴³ India has also not been able to harness 3.60 MAF of storage on the western rivers as provided for in the treaty for uses in Jammu and Kashmir including regulating flows to moderate floods, facilitate navigation and generate power in the face of Pakistani objections at every stage.⁴⁴

How the Treaty has Affected Jammu and Kashmir

The treaty limits Jammu and Kashmir's right to use the waters of the Indus, Jhelum and the Chenab, in particular its ability to build storage reservoirs on the river systems. This, the state argues, has meant that it has had to sacrifice an estimated potential power generation of 15,000 MW.⁴⁵ Thus far, no storage has been constructed on any of the western rivers which collectively have an assessed hydro-electric potential of 8825 MW at 60 percent load factor.⁴⁶ As on date however, less than 1400 MW has been harnessed, only 4 MW of this on the Indus.⁴⁷ Projects having installed capacity of about 1,300 MW are in different stages of construction. Altogether, J&K has as yet much unutilised irrigation and hydro potential to exploit within the ambit of the Indus Treaty.⁴⁸ These statistics by themselves speak of the underutilised potential of even what has been authorized to India under the provisions of the treaty.

Hydropower generation of Ravi - Beas project, under which, power production cost for Punjab is 8 paise per unit; Jammu and Kashmir purchases same power from national grid at 3.60 Rs per unit.⁴⁹ On the contrary, Jammu and Kashmir has the capability of generating close to 15,000 MW of hydroelectric power and could have easily become an exporter of power,⁵⁰ but Indus Treaty does not allow them to utilize this capability. Only run off of the river projects are permitted and such projects suffer during lean period in summers. Jammu and Kashmir believes that it should have received compensatory access to power and water generated on the Ravi, Sutlej and Beas systems.⁵¹

The people of Jammu and Kashmir feel that at the time of negotiation of the treaty their case was not pleaded well as their leader and representative Sheikh Abdullah was in jail and many concessions have been given to Pakistan at the expense of Jammu and Kashmir's interests.⁵² At the time when the treaty was being negotiated and signed, nobody visualised the future needs of the Jammu and Kashmir State in terms of hydro-electricity, irrigation and drinking water.⁵³ The treaty primarily focused on allocating water for irrigation and did not seek to

optimise benefits from the system as a whole.⁵⁴ With the increase in the population of the state, the needs of the state in terms of water resources have also increased four-fold, but the state is helpless to carry on her development works because of the restrictions imposed under the Indus Water Treaty.

Hindrances to Optimal Utilisation

The primary reason for non optimal utilization of western river resources is due to the fact that the treaty gave Pakistan the power to veto Indian projects on the river systems it was allotted and it has exploited this clause of the treaty unabashedly. The major projects to which Pakistan has objected and which have significantly affected optimal utilization by India have been discussed in subsequent paragraphs.

Tulbul Navigation Project

The Jhelum was traditionally used for navigation and floating timber but the river has silted. The Tulbul project was accordingly designed to retard the Jhelum flood within the banks of the Wular Lake through which the river passes.⁵⁵ Instead of emptying rapidly with the recession of the floods, a control structure at the lake's exit would retard depletion of a natural pondage of some 300,000 acre feet of water through October to May.⁵⁶ This would reduce silt flows downstream to the benefit of both the Uri and Mangla Projects in India and Pakistan and augment their power output.⁵⁷ It would keep the river Jhelum navigable for a considerable stretch thereby bringing economic benefits to the people in the valley.⁵⁸ This project could provide a cheap mode of transport to the fruit growers in north Kashmir and thus transform the region's economy.⁵⁹ However, Pakistan believes it could be used by India to control the flow of the river and can be used as a geo-strategic weapon.⁶⁰ Pakistan argues that Tulbul would be a "storage dam" and is therefore barred by the treaty.⁶¹ Work on the construction of Tulbul navigation project started by the Jammu and Kashmir government in 1984, was stopped in 1988 after India accepted Benazir Bhutto's demands.⁶² Despite several rounds of talks held with Pakistan during the past 17 years, the issue remains unresolved. Before Pakistan moved International Arbitration Court, India stopped construction.⁶³

Salal Project

In the case of the Salal Project, Pakistan objected to plans to build anti-siltation sluices.⁶⁴ Salal Project over the years has been receiving earth and boulders and

consequently its bed level has been raised. The existing dam is full of silt unto three fourths of its 400 feet height thus curtailing the generation capacity drastically to the order of 50 percent.⁶⁵ Desilting is possible by opening the gates of the dam, but India is not allowed to open the gates under this treaty as there is every apprehension that such action could devastate the low lying areas of Pakistan.

Baglihar Dam Controversy

Chenab River originates in the Indian province of Himachal Pradesh and enters Kashmir at its eastern end. In its 150 km journey before it reaches Kashmir it has already collected 60 percent of its total water flow and dropped in elevation from about 13000 feet to about 9,000 feet.⁶⁶ In Kashmir, this river in its other 220 km journey collects the remaining 40 percent water and drops other 7,000 feet elevation before it enters Pakistan near Akhnur.⁶⁷ The above elevation drop, which the river undergoes in Kashmir, is of greatest importance to India. This together with volume of water is a huge energy reserve, which needs to be tapped. Hence India has planned no less than twenty small and large projects of which Balighar, Dulhasti, Salal etc. are the big ones. Baglihar is being constructed as a 308 metres high dam with a storage capacity of 321,000 acre-feet. Of this, live storage (pondage) is 30,400 acre-feet.⁶⁸ This pondage is meant to supplement the discharge during low flow period. This hydel project which is designed to produce 900 megawatt (MW) power⁶⁹ on completion of Phase II will go a long way in alleviating the problem of power shortage in Jammu and Kashmir.

Though the Baglihar Project is “run-of-the river project as provided under the Indus Waters Treaty, Pakistan sought to scuttle this project by creating a controversy over its design, pondage, height of the dam and spillways.”⁷⁰ Pakistan’s stance is that the Baglihar Dam involves the creation of storage beyond what is legitimately allowed to India under the terms of the Indus Water Treaty.⁷¹ Pakistan fears that the dam will cause it a loss of 6,000 to 7,000 cusecs of water every day, equivalent to 27 percent water loss in the Jhelum River⁷² and potentially India could temporarily deplete the vital water flow in the river during the sowing season in Pakistani Punjab.⁷³

According to Government of India the Treaty clearly states that power generation projects can be built on any of the three western rivers of the Indus river system, as long as they benefit the local people and generally not interrupt the flow of the river. Balighar fulfills both of these conditions.⁷⁴

Professor Raymond Lafille, the Neutral Expert has given his verdict on the project and has endorsed that the project is not an infringement of the treaty.⁷⁵ He

has however said that the freeboard height of the dam should be brought from 4.5 to 3 metres to which India has agreed. This will not affect the power generation capacity.⁷⁶ A Pakistani delegation visited the dam site on 1 August 2008 to satisfy themselves that India has abided with the Neutral Expert's decision on lowering of freeboard height.

Kishanganga Project

Kishanganga/ Neelum, a tributary of the Jhelum flows through J&K and then crosses the LOC to enter Pakistan Occupied Kashmir (POK) as the Neelum before falling into the Jhelum near Muzaffarabad. The Indian project envisages a 75 m high concrete dam at Gurez at about 8000 feet to store water and divert some flows southwards through a 23 km tunnel into the Madmati Nala, which empties into the Wulur Lake through which the Jhelum flows.⁷⁷ Given a head of about 600 m, an installed capacity of 330 MW is planned.⁷⁸ Pakistan has three objections to this project.⁷⁹ The first is that inter-tributary diversions are barred and that water drawn from a given tributary must be returned to that same river.⁸⁰ The second is that Project will deprive it of 27 percent of the river's natural flows, thereby affect its existing 133,000 hectares of irrigation in the Neelum Valley and a 900 MW Neelum-Jhelum hydro station on which construction is in progress at Nowshera.⁸¹ The third objection relates to certain design features.⁸²

Attempts to solve the dispute bilaterally have failed to allay Pakistan's concerns with regard to the design of the project. In a major concession to Islamabad, India has dropped the proposed dam and diversion of Kishanganga River by deciding to reconfigure its controversial hydro-electric project⁸³ under dispute since its inception in 1994. The revised project will generate the same 330 megawatts of electricity from running water without the need of any storage.⁸⁴ It will be now a "run of the river" project. It is yet one more concession by India to Pakistan's demands.⁸⁵

Strategic Security Implications of Utilisation of Western Rivers

It may not be out of context to assume that Pakistan's interest in Jammu and Kashmir is not land, but water of the western rivers.⁸⁶ During summer, Indus is almost dry on entering Sindh. As a result, there is massive sea intrusion destroying farm lands. On top of it, the Pakistan Government plans to build the Kalabagh Dam and Thal canal which, the Sindhis say, will further reduce the water flow to their province. In order to avoid a conflict with Sindh, according to the book *The Final Settlement: Restructuring India-Pakistan Relations* published by *Resource Utilization, Food Security & Disaster Management*

International Centre for Peace Initiatives, Pakistan may feel it needs physical control over the Chenab catchment region in Jammu and Kashmir.⁸⁷ “It needs sites to build dams, to store, divert and regulate water flows,” it says. During this time a suggestion was floated that the Chenab River should become the border between the two countries. This is the so called Chenab Formula in Track II circuit. Pakistan wants water security beyond the 1960 Indus Water Treaty.⁸⁸

To meet Punjab’s water needs, Pakistan has been using Kashmiri youth to secure its water interests.⁸⁹ Syed Salahuddin, chairman of the PoK-based United Jihad Council has often said the Kashmiri youths are actually fighting for Pakistan to gain control over Kashmir’s rivers.⁹⁰ PoK President Mohammad Anwar Khan told Urdu newspapers in October 2002, “Kashmiris are fighting for the security, strength and prosperity of Pakistan ...Even peace between Punjab and Sindh depends on water, and, therefore, on Kashmir”. POK Prime Minister Sikandar Hayat told a seminar on 6 March 2003 “The freedom fighters of Kashmir are in reality fighting for Pakistan’s water security and have prevented India from constructing a dam on the Wular Barrage”.⁹¹

While it shall always be the endeavour of water starved Pakistan to cry hoarse over any infrastructure developments over western rivers, it is imperative that India must identify options which would empower her with leverages in national interest. In this context Baglihar is a viable option. It can prove to be insurance for the natural gas Iran – India pipeline, which India needs to feed its growing industry and domestic usage and if built, this will always be under the thumb of Pakistan. Completion of Balighar Dam to generate power is one such counterbalance.⁹² It permits India to retaliate, should Pakistan interfere with the gas flow.⁹³

Balighar, which is located on the western side of the Seoj Dhar Mountain Range also gives an alternate option for utilisation. The city of Jammu and its agricultural plains are located on the southeastern side of the same range. A tunnel through this range can take away water from Chenab to Jammu, leaving Pakistani Sialkote completely dry.⁹⁴ India has a full right to undertake this as one of the provisions of the Indus Water Treaty states that water could be used for the welfare of people of Jammu and Kashmir.⁹⁵ By punching a tunnel, India is simply acting for the interest of people of Jammu and Kashmir.⁹⁶

All in all India does not have to undertake this venture. But a possibility like this has to be kept on the cards to knock some sense in the Pakistani mindset. For Pakistan, loss of Chenab water cannot be replaced by diverting the Jhelum river water from the Mangla reservoir without upsetting the Sindhi interests.⁹⁷

Security Implications vis-a-vis China

India's concern also lies in the fact that China was not made a party to the Indus Water Treaty between India and Pakistan. The vast arid and population free areas through which the Indus flows in Tibet lends it to large-scale dams and large hydro-projects. Given China's penchant for mega-projects and their large requirement of water, it could be a long-term plan for China to divert the water of Indus through tunnels and canals to the thirsty North.⁹⁸ Although India is not using the water of the Indus except for some local irrigation in Ladakh, any future diversion of the Indus water by China will have a major impact on the Indus water sharing between India and Pakistan.⁹⁹ Strategic planners and security advisers must take this important factor into their appreciation and ensure that our lower riparian rights over Sutlej and Indus Rivers vis-à-vis China are not compromised.

CHAPTER IV OPTIMAL UTILISATION EASTERN RIVERS¹⁰⁰

Availability and Utilization of Waters of Eastern Rivers

The eastern rivers of the Indus i.e. Ravi, Beas and Sutlej have been allocated to India for total use less certain allowances from Ravi. These three river systems have been interlinked through the Ravi-Beas link and then at the Harike headworks where Beas joins with Sutlej.

Non Optimal Utilisation Of River Ravi. Tributaries of Ravi River that originate on our side of the international border that join the river after Madhopur headworks and before it finally enters Pakistan are Basantar, Bein, Tarnah and Ujh. These tributaries flow from India to Pakistan in the Shakargarh "Bulge" (Pakistan territory protruding into India); where after river Ravi crosses back into Indian territory. The Indus Waters Treaty provides for specified withdrawals by Pakistan from these tributaries, as may be available and as may be necessary for irrigation upto the following limits¹⁰¹ :

Chart II

Name of Tributary	Maximum Annual Cultivation by Pakistan [Annexure B to the Treaty] (Acres)	
	Paragraph 2	Paragraph 3 (Cultivation in Sailab)
Basantar	100	14,000
Bein	-	26,600
Tarnah	-	1,800
Ujh	-	3,000

Further, assuming 100 acres could be cultivated utilizing a discharge of one cusec, in respect of Paragraph 3 (cultivation on Sailab), the estimated discharges from Bein, Tarnah and Ujh shall work out as 266 cusecs, 18 cusecs and 30 cusecs respectively.¹⁰² It may therefore be necessary to plan and implement schemes on Basantar (India), Bein, Ujh, Tarnah and Devak, so that at least the waters available after allowing for Pakistan's customary uses over the years, are fully exploited.¹⁰³ The Indus Waters Treaty also provides for irrigation by India upto 6000 acres in areas west of Devak by utilizing upto 120 cusecs of Chenab waters.¹⁰⁴ Presently no planned utilization of these tributaries is being done by India. Only five check dam projects have been initiated on these tributaries under the Border Area Development Programme, which are woefully inadequate for the purpose.

Non Optimal Utilization From Existing Headworks At Madhopur, Harike and Hussainiwala

Madhopur Headworks. Approximately 200 cusecs of water flows across the border as a result of poor state of maintenance, heavy silting and leakage of water through the gates of these headworks.¹⁰⁵ There is need for repairs to the gates and rehabilitation of the structure and desilting in the immediate vicinity of the gates.¹⁰⁶

Harike Headworks This structure is vital for diversion of Sutlej waters to South-West Punjab and Rajasthan through Ferozpur Feeder, Sirhind Feeder and Indira Gandhi Canal.¹⁰⁷ Waters not diverted flow across the border in the Sehjra Bulge in Pakistan and re-enters India at the Hussainiwala headworks.¹⁰⁸ The headwork is reported to be heavily silted up, with a reduction in its live storage capacity from the

designed 67,900 acre feet to about 9300 acre feet.¹⁰⁹ The gates are not working properly and due to non-functioning of some gates, especially during floods, it has not been possible to implement the release of waters according to regulation rules.¹¹⁰ Punjab and Rajasthan government officials have assessed quantity of leakage downstream of barrage as about 1000 cusecs for want of rehabilitation and repairs.¹¹¹

Hussainiwala Headworks This is the last headworks on the river Sutlej after which the river crosses the border. The gates are not operating properly and are leaking profusely.¹¹² The headworks is also heavily silted up. As reported by government of Punjab, its present capacity is about 5,922 acre feet as against its designed capacity of 25,000 acre feet.¹¹³ Approximately 200 cusecs of leakage through the headworks occurs.¹¹⁴ Surplus waters during monsoon from Hussainiwala headworks, which would otherwise flow across the border, could be diverted to various existing canal systems¹¹⁵ and feed the water starved areas of Rajasthan.

Non Optimal Utilization from Existing Canal Systems

Ravi Tawi Uplift Canal (RTUC) in Jammu and Kashmir. Pending completion of the Shahpurkandi Dam in Punjab, which would provide Jammu and Kashmir's share of Ravi waters by gravity,¹¹⁶ the Govt of Jammu and Kashmir is presently using an arrangement of lift pumps for feeding the RTUC for irrigation purposes in Kathua Samba belt.¹¹⁷ The Govt. of Jammu and Kashmir has also indicated that by desilting and modernization of canals/ lift irrigation stations at Basantpur, Lakhanpur and canal downstream of Ujh barrage, about 500 cusecs of additional water can be used for irrigation purposes.¹¹⁸ Since RTUC system is a provisional system for utilization of Jammu and Kashmir's share of Ravi waters till the Shahpurkandi Dam comes up, it could be stated that this quantity of water i.e 500 cusecs is unutilized for want of completion of Shahpurkandi Dam also.¹¹⁹

Indira Gandhi Canal/Nahar in Rajasthan. This canal receives its supplies from the Harike headworks for use in Rajasthan. In Punjab territory, the canal is called as the Rajasthan Feeder/Indira Gandhi Feeder and the extension of the same canal in Rajasthan is called as Indira Gandhi Canal/Nahar. It is reported that though designed for a capacity of 18,500 cusecs, the canal is presently utilized for 11,700 cusecs only.¹²⁰ The limited capacity of 15,000 cusecs of the head regulator at Harike is the limiting factor for delivering its designed capacity of 18,500 cusecs.¹²¹

Bhakra Main Line (BML) and Narwana Branch The Bhakra Main Line(BML) is the main canal for providing Sutlej waters for Haryana and Rajasthan and part of Ravi-Beas waters for Haryana, Delhi and Rajasthan.¹²² As against a

combined design discharge capacity of 10,794 cusecs, these canals are presently discharging only about 10,000 cusecs due to silting.¹²³ The restoration of the capacities is already a matter between the Governments of Punjab and Haryana. Haryana has requested that Punjab should complete the intended work against the funds already released by Haryana¹²⁴ but Punjab has not complied with the same till date. The restoration is also important for the Delhi Water Supply as one of the sources of drinking water supply to Delhi is the water delivered through Narwana Branch.¹²⁵

Non Optimal Utilization from Completion of Pending Projects

Shahpurkandi Dam Completion of Shahpurkandi Dam which is on the Jammu and Punjab border would put the waters of river Ravi to consumptive uses and effectively check water flow downstream in river Ravi across the borders. This project envisages an allocation of about 6.538 MAF of waters to Punjab and 0.65 MAF to Jammu and Kashmir.¹²⁶ It would benefit Jammu and Kashmir as about 32,173 hectares of fallow land in Kathua-Samba region would come under irrigation.¹²⁷ The irrigation benefit to Punjab is stated to be about 3.48 lakh hectares.¹²⁸ This dam would act as a balancing reservoir to absorb the fluctuations of discharges due to peaking power generation in the Ranjit Sagar Dam upstream.¹²⁹ Since the Madhopur barrage downstream of Shahpurkandi Dam does not have required storage capacity nor can this be increased by remodeling, the Shahpurkandi Dam is required to meet the near constant supply of water to the Upper Bari Doab Canal (UBDC).¹³⁰ The present arrangements of using lift pumps for feeding the RTUC would also become redundant as water would be fed by gravity for Jammu and Kashmir once the reservoir storage of Shahpurkandi comes up.¹³¹ The project files had been gathering dust for years and it is only in 2007 that the project has received a boost in the arm.

Indira Gandhi Nahar/Canal Project (IGNP) The Central Ground Water Board (CGWB) has come up with a proposal to utilize a part of waters flowing across border from Harike Headworks (especially during monsoon) by releasing them into the Indira Gandhi Feeder for ground water recharging.¹³² Therefore, the above enhancement of capacity could also cater to ground water recharging at such times when lesser supplies are actually needed in the canal for irrigation purposes.

Sutlej Yamuna Link (SYL) Canal Project This project envisages a carrying capacity of about 6,500 cusecs as Haryana's share and about 3,650 cusecs as Punjab's share.¹³³ The project is proposed to convey 3.45 MAF of surplus Ravi-Beas waters to Haryana.¹³⁴ Haryana portion of the SYL Canal is complete. Though a major portion of the canal in Punjab territory was also completed, the works came to a halt in July

1990 following the killings of some officials of the project. Haryana approached the Honorable Supreme Court for early resumption and completion of these works. The apex court in its judgment dated 15 January 2002 directed the government of Punjab to complete the canal in its territory within one year. Failing this, the Central government was also directed to complete the canal as expeditiously as possible through its own agencies.¹³⁵ This has yet to materialize. Thus, the completion of the SYL Canal in Punjab portion would depend upon the outcome of these legal processes. This is yet another example of mismanagement of water resources.

Automation of Water Management A World Bank project on Data Decision Support System has been initiated for Bhakra Beas Management Board¹³⁶. This would provide for optimized management of water resources through on-line network system. There is a need to give top priority to this project implementation so that more efficient and objective management of water resources takes place.

India's Concern for Sutlej – Lower Riparian to China

Implications of China's Plans to Re-route/ Block River Sutlej¹³⁷ In 2004, China informed India that approximately 35 km from the Himachal Pradesh border, an artificial lake measuring about 230 hectares had been formed on the Parechu River – a tributary of the Sutlej River. The lake had been formed due to landslides in the area. This information caused panic as flash floods in the river Sutlej had caused massive damage in 2000. Also, the incident led to a debate whether the formation of the lake was due to natural or man made causes. It emerged that formation of such a lake was a “liquid bomb” in the hands of the Chinese that could devastate lower reaches in India at will. It also envisaged that China may have resorted to directional blasting to cause a landslide that made a dam across the river. China did not permit a fact finding team from India to visit the spot of the lake formation further giving rise to speculation that the lake had not been formed due to natural causes. Moreover, it also emerged that no maps or satellite imagery of the area were available to the Ministry of Water Resources to make a correct assessment, despite repeated requests for the same. India must ensure that its water requirements and rights with reference to Sutlej are safeguarded.

CHAPTER V

RELOOK AT THE TREATY

*David Lilienthal the chief interlocutor and the architect of Indus Water Treaty, 1960 reflected on the Indian action of stopping flow of water from all canals to Pakistan in April 1948 as “NO armies with bombs and shellfire could devastate a land so thoroughly as Pakistan could be devastated by the simple expedient of India’s permanently shutting of the source water that keep the fields and people of Pakistan green.”*¹³⁸

Views on Review of Treaty

The Indus Water Treaty, 1960 ought to have brought peace and amity between the neighbours, for great concessions were granted to Pakistan through this treaty. India sought to improve relations with Pakistan by agreeing to substantially pay for the cost of irrigation programme in Pakistan, besides surrendering the use of three western rivers. Nehru’s efforts of creating goodwill and understanding with Pakistan by giving concessions through the Indus Water Treaty, did not bear fruit.¹³⁹ That Nehru himself had realised this soon after, is confirmed by N.D. Gulhati, who led the Indian delegation during the negotiations over Indus. Gulhati recalls: “When I called on the Prime Minister on 28th February 1961, he said in a sad tone, ‘Gulhati, I had hoped that this agreement would open the way to settlement on other problems, but we are where we were’.”¹⁴⁰

If we consider the internationally accepted Helsinki Rules framed by the International Law Association which postulate the equitable utilisation of waters of an international drainage basin taking into consideration various factors such as the extent of the drainage area, hydrology of the basin, economic and social needs of each basin state, population dependent on the waters of the basin, then India did not get a fair deal.¹⁴¹ According to S.K. Garg, who has computed the respective entitlement of India and Pakistan on the basis of the population, drainage areas, length of rivers and cultable area, India should have been given 42.8 percent share in the waters of the Indus Basin, as against the actual allocation of 20 to 25 percent, flowing in the three eastern rivers.¹⁴² Ashok Mehta, leader of the PSP in the Lok Sabha described it as a “peculiar treaty under which Pakistan, already a surplus area, would be unable to make full use of her share of the Indus Water and would have to allow it to flow into the sea. On the contrary, India after the fullest development of the water resources would still be short of supplies”.¹⁴³

In May 2002 the Jammu and Kashmir Assembly unanimously passed a resolution seeking a review of the treaty.¹⁴⁴ The Kashmir valley's developmental needs demand a far greater access to the waters of the Jhelum and those of Jammu region to the waters of the Chenab. The restrictions on consumption and storage of the waters of these two rivers of Jammu and Kashmir now need an urgent and across the board review. It has unfortunately been one of the underlying causes for her lack of matching development.

Farmers in Jammu and Kashmir have been pushing politicians to take an aggressive stand on the treaty. In 1960 much of Jammu was barren, but water-intensive paddy cultivation has now spread as far south as Samba. Farmers of new lands from Reasi to Sunderbani have also been asking for water from the Salal Dam. As such there is justifiable ground for reviewing the Indus treaty, so that it is turned into a resilient one after making necessary modifications and adjustments, which can take care of the substantial changes in the ground situation in Jammu and Kashmir.

Views on Abrogation

A former High Commissioner of India to Pakistan said “Should we not consider measures to deprive the Pakistanis of the water they need to quench their thirst and grow their crops? Should we not seriously consider whether it is necessary for us to adhere to the provisions of the Indus Waters Treaty... extraordinary circumstances demand extraordinary responses” (*The Hindustan Times*, December 23).¹⁴⁵ A debating viewpoint on this statement is that while the sentiments expressed by the former High Commissioner might be more out of patriotic taste, abrogation would be indefensible on any understanding of international water law, international humanitarian law and the rules of war. Further, it would lend credence to Pakistan's claim to Jammu and Kashmir as its jugular vein.¹⁴⁶ What does that mean? It means that the Indus water is their lifeline and the western rivers run through Jammu and Kashmir and partly Pakistan Occupied Kashmir. Therefore, their logic is that inherently the logic of partition makes Jammu and Kashmir a part of Pakistan because the headwaters which are its lifeline are in Jammu and Kashmir. Once you abrogate the treaty, we are pleading Pakistan's case for Jammu and Kashmir.¹⁴⁷

From the technical angle, operationalising “abrogation” would be a long-gestation engineering feat. Apart from being construed as a hostile act, it would greatly strain the Indian economy. The proposition is a dangerous fantasy that would legitimise

counter-calls for the bombing or sabotage of Bhakra-Pong and other major Indian dams and water supply lifelines.¹⁴⁸

If we analyse it from a legal angle, the treaty was not “brokered” by the U.N., but by a more potent body - the World Bank.¹⁴⁹ Article 54 of Protocol I (1977) to the Geneva Conventions of 1949 says: “Starvation of civilians as a method of warfare is prohibited.” It specifically mentions “drinking water installations and supplies and irrigation works.”¹⁵⁰ Article 8(b) (xxv) of the Rome Statute of the International Criminal Court lists as a war crime “intentionally using starvation of civilians as a method of warfare by depriving them (people) of objects indispensable to their survival, including willfully impeding relief supplies...” Forbidden even during armed conflict, use of water as a weapon in diplomacy is a far graver offence.¹⁵¹ “The treaty can be terminated only by another treaty concluded for that purpose between the two governments”¹⁵² (Article XII (4)). Can India denounce the treaty in exercise of its sovereign rights? Such rights as formerly existed are now restricted under Article 42 (2) of the Vienna Convention on the Law of Treaties (1969): “The termination of a treaty, its denunciation or the withdrawal of a party, may take place only as a result of the application of the provisions of the treaty or of the present convention. The same rule applies to the suspension of the operation of a treaty.” Even after a valid denunciation, obligations under international law continue (Article 43). India will, thus, have to withdraw from this Convention in order to withdraw from the Indus treaty.¹⁵³

Article XII of the treaty provides that its provisions “may from time to time be modified by a duly ratified Treaty concluded for that purpose between the two Governments”. Thus an Indus II could be constructed on the foundations of Indus I. When the original treaty was being negotiated, India suggested 2.5 MAF storage on the Chenab at Dhiangarh with a tunnel at Mahru to divert waters to the Ravi and Beas for delivery to Pakistan below Ferozepur in lieu of some other replacement works. The proposal was supported by a feasibility report based on a photographic survey conducted by a German team. This changed the attitude of the Pakistan team and made possible the treaty as it exists in the present form. That was totally unacceptable to Pakistan at the time¹⁵⁴. Would it still be feasible and acceptable to Pakistan and India today were it to offer promise of adding to net water availability on both sides? The Chenab could perhaps store more water in its upper reaches and the Indus has not really been surveyed from the point of view of storage. There may be little or nothing there. Do we know for certain? That both sides could benefit from Indus II is certain. What is not known for sure is the quantum of those benefits and the costs involved.¹⁵⁵

Most important of all, with Baglihar behind us, India should boldly propose a meaningful step under the terms of Chapter VII of the Indus treaty that enjoins “Future Cooperation” to optimise the Indus system’s potential in the “common interest.”¹⁵⁶ Both countries are confronting the early effects of climate change, with glacier melt and aberrant weather, and need to insure against growing water stress and looming hydrological uncertainties.¹⁵⁷ The 1960 Treaty merely partitioned the waters of the Indus and left optimisation for future cooperation. That time has come.

CHAPTER VI

ANALYSIS AND RECOMMENDATIONS

Water flows humbly to the lowest level. Nothing is weaker than water, Yet for overcoming what is hard and strong, Nothing surpasses it.

Lao Tzu, Tao Te Ching

Analysis

It is quite intriguing as to why the Indian government delegation involved in the prolonged negotiations over Indus waters, agreed to much lower share of water available in the eastern rivers and no share from western rivers, particularly when the concerned officials were in know of the facts that India after the fullest development of water resources would be still short of water, whereas Pakistan would be unable to consume the full use of her share of Indus waters and the supplies would flow to the sea. In retrospect, it can be stated that India was too generous to Pakistan, both in terms of allowing exclusive use of waters of western rivers and by making payment of more than 62 million Pounds Sterling i.e. about 430 crores of rupees in current value to Pakistan for developing infrastructure for transfer of water from western rivers to the eastern canals.

India treated the Indus Waters issue as a technical and engineering problem and this is reflective in the chief representative of India in negotiating the treaty was Mr Niranjana D Gulati, the then Chief Engineer of irrigation. On the other hand, Pakistan exploited it as a political weapon in her cold war against India,

while at the same time it succeeded in extracting huge financial assistance from World Bank and other western nations using the geopolitical environment in the region to its advantage. Concessions made to Pakistan on the western rivers coupled with *NO EXIT* clause in the treaty have left no leverage avenues to India so as to exploit the treaty to its favour in any situation.

The treaty has worked because the performance has to be by India since it is the upper riparian state and also because in spite of the concerns of the population of Jammu and Kashmir who consider the treaty heavily tilted against them, the government has ensured its commitment to the treaty. There is nothing that Pakistan has to do except to make complaints, launch protests and raise questions since it is the lower riparian. It is to our credit that when they have played dirty by raising non issues and trying to use that to steer up opinion against India we have continued with our obligations to the treaty. Whether we must continue to follow this policy inspite of the proxy war of terror from across the borders, is a moot question.

Fresh water scarcity shall be one of the primary drivers of future conflicts. The granaries of both India and Pakistan are dependent and fed by the waters of the Indus Basin. As no new rivers are likely to be found and the melting of the Himalayan glaciers due to global warming occurs, the problem of water availability will keep accentuating with increasing population and industrialization on both sides of the border.

There is a need to redefine what constitutes an equitable share. Water is becoming a critical resource and we must seriously reconsider the Indus Water Treaty, to assert our rights and to leverage the critical resource of water to serve and further our national interests.

The future requirements of water of Jammu and Kashmir in terms of consumptive use and storages for hydro power use were not visualized by the Indian negotiators and the treaty has been unfair to the interests of the people of Jammu and Kashmir. The state is purchasing power at exorbitant rates from the national grid when it has itself the potential to export power if it is not restrained by the treaty.

The deepening rift between the Pakistan Punjab and Sind provinces over water sharing will greatly influence the attitude of Pakistan over utilization of waters of western rivers. Any water storage projects by India are bound to attract violent objections from Pakistan even if the projects are well within the ambit of the existing treaty. Punjab and Sindh dominate the internal and external politics of Pakistan immensely.

Pakistan's fears for the Indian project at Baglihar are bizarre. Baglihar is 110 kms from the international boundary and any sudden release of waters as feared by Pakistan, would first hurt the Indian villages and infrastructure downstream and shut down Salal.¹⁵⁸ Should these stored waters then be suddenly emptied, Salal would absorb some of the flood, or might well break, while the Indian villages downstream would be overwhelmed. Pakistan would be far less affected, if at all, because the geometry of the valley would cause progressive dissipation and attenuation of the flood.¹⁵⁹

The implications of the verdict by the neutral expert of the World Bank on the protest of Pakistan on the Baglihar issue are tremendous for the larger issue of sharing of the rivers of the Indus basin. A number of projects currently being undertaken by India on the 'western rivers' will certainly receive a fillip. Pakistan might not be as keen to approach a neutral expert for any of these (as it had been threatening to do in the past) in the near future. One might also see a number of new projects being undertaken. Pakistan has to change its mindset.

Pakistan's strategy of referring each and every issue to the World Bank needs a stronger response by India than hithertofore. The trap we fell into at the time of Salal was to make compromises. For Tulbul we thought that if we stop work within three months the matter would be resolved. But once you stop, it is very difficult to restart because then you have to justify as to why you started. Therefore, for Baglihar we have wisely said that the work will continue and Pakistan can continue with their argument. If later the neutral expert says that there is a dispute and that dispute goes to an arbitration tribunal and the tribunal awards in the favour of Pakistan then we will examine the situation at a later date. I think it is a wise course and Pakistan must live with and understand that.

For India to initiate any steps towards Indus II, it should have optimized what has been permitted to it under the existing treaty provisions. On western rivers we have not utilized the storage capacity for various reasons ranging from difficult terrain to soft pedaling by the government over decision making process. As regards the irrigation of 13.43 lac acres allowed as per the treaty, only a meager approximately 6.5 lac acres has been exploited till date. Even if the decision is taken by the government today, it would be 10 years before the storages can fructify on ground to be able to fully optimize our rightful share of water storage for irrigation purposes. This is a dismal record considering the fact that the treaty was signed in 1960.

While on western rivers it is the lack of infrastructure, on the eastern rivers it is the mismanagement of water resources which is inhibiting the optimal utilization of the Indus Basin allotted to India under the treaty. The poor state of maintenance of ~~reservoirs at Madhopur, Hanikera and Jaganm~~ are a cause of concern

they not only affect inter state water sharing between Punjab and Rajasthan, but also allow water to flow across the borders to Pakistan to India's disadvantage.

Forty eight years after signing of the treaty, India has not built any redundancy in its inter basin water transfer infrastructure. It is not possible for any headwork to be closed for major repairs or if it is damaged since water availability to lower states will come to a grinding halt. This has resulted in non closure of existing headworks for maintenance and desilting. Leakages of substantial amount of water take place across the border because of this.

India loses the waters of the important tributaries of Ravi since no infrastructure is in place to store these waters especially during monsoons. These flows are into the strategically important area of Shakargarh Bulge in Pakistan. Surprisingly, the same waters are used by Pakistan to fill up the obstacle systems like ditch cum bunds ahead of its defences. The Indian Army on the other hand spends a colossal amount of money on purchase of equipment to negotiate these wet obstacles. As per the lie of the ground, Pakistan has no other source to bring water into this bulge from the rivers allotted to it.

China today faces an acute water scarcity due to its burgeoning population, increased industrial development and water intensive agriculture practices. China does not want its aspirations to attain superpower status thwarted by a major water crisis. Recent Chinese activities aimed at exploiting the potential of the Tibetan rivers provide a strong reason to believe that this could be a flashpoint of future conflict with China. The treaty has been negotiated by India with a myopic vision. It did not take China on board to which both India and Pakistan are the lower riparian, we should have secured our rights to Indus and Sutlej from China.

Inter state interests have overshadowed the national interests on water sharing issues. There is scope for utilization of the water of the eastern rivers which is presently lost across the border due to following reasons :

- (a) Non-utilization of waters available in the tributaries viz. Basantar, Bein, Ujh, Tarnah and Devak of river Ravi. The quantities are substantive during the monsoons.
- (b) Leakage and loss of capacity in Harike, Madhopur and Hussainiwala headworks.

- (c) Loss of capacity and scope of improvement in capacity in various canal systems viz. Ravi Tawi Uplift Canal in Jammu and Kashmir and Indira Gandhi Nahar in Rajasthan.
- (d) Non completion of important infrastructure projects like the Sutlej Yamuna Link Canal and Shahpurkandi Dam.

Recommendations

The Indian government must deliberate over the unfavourable clauses of the treaty, especially for Jammu and Kashmir. There is a need for dovetailing these gradually in our peace process with Pakistan. The general public, intellectuals and especially the masses of Jammu and Kashmir should be educated through print and electronic media about the government's efforts in raising these issues with the Pakistan government. They should also be sensitized to the link between proxy war in Jammu and Kashmir and the water resources of the region.

The underutilized capacities of both storage and hydro power electricity generation must be addressed on top priority. These projects should be taken up as Central projects with a monitoring mechanism under the Ministry of water resources and the Commissioner Indus to oversee their implementation in a time bound manner.

A team should be constituted under the National Security Council for analyzing the security implications arising out of trans border water sharing, global warming and its impact on water resources emanating from the Himalayas, safeguarding of our interests as lower riparian with respect to China, Nepal and Bhutan and as upper riparian with respect to Pakistan and Bangladesh.

Detailed survey of the water course of western rivers should be undertaken by specialist agencies like ISRO, Geological Survey department, geologists, Central Ground Water Board, Ministry of environment and Ministry of water resources so as to produce space maps, cost benefit analyses and identify the potential of further utilization of these rivers for non consumptive uses in the future.

The proposal for Marhu tunnel chalked out by a German firm for transfer of waters from Chenab to Ravi while the negotiations for the treaty were underway needs to be revived. Only if such proposals are kept alive can India use leverages in our talks with Pakistan over peace processes and proxy war.

The quantities of waters available on the tributaries of river Ravi viz. Basantar, Bein, Ujh, Tarnah and Devak need to be fully harnessed for irrigation purposes in the Samba-Kathua belt.

Repair and rehabilitation of Madhopur, Harike and Hussainiwala headworks and its allied works should be implemented on priority. This should simultaneously be supplemented by a study which should come up with proposals for bringing in redundancy to the existing headworks so that the existing headworks can be desilted and gates and associated ancillaries repaired/overhauled or replaced.

The present capacity of Harike Head regulator should be enhanced to release the designed discharge of 18,500 cusecs as against the existing 15,000 cusecs for meeting the requirements of Indira Gandhi Canal on top priority.

Completion of the Shahpurkandi Dam and Sutlej Yamuna Link Canal must be given priority.

Government must establish a network of Gauge & Discharge stations including installation of automatic gauge recorders for monitoring discharges downstream of Madhopur headworks in Punjab, in close proximity of international border on rivers Basantar, Bein, Tarnah, Ujh and Devak in Jammu and Kashmir, up and downstream of Harike headworks in Punjab and downstream of Hussainiwala headworks in Punjab. This would give a correct assessment of what actually flows across the border from eastern rivers NOT UTILISED by India.

The automation of water resource management through the World Bank project on Decision Support System should be given priority for its completion and implementation.

Feasible long-term proposals for additional release of surplus waters during monsoon which would otherwise flow across border from Harike headworks, to the Indira Gandhi Canal/Nahar/Feeder for recharging the ground aquifers, should be formulated by the government.

Article XII of the treaty provides that its provisions “may from time to time be modified by a duly ratified Treaty concluded for that purpose between the two Governments”. Thus an Indus II could be constructed on the foundations of Indus I. Indus II needs to be fed into the current peace process.

India needs to have at least an understanding with China to pass on regular information with regard to the river Sutlej. Moreover, regular satellite coverage of the area over which our water sources of Indus and Sutlej originate should be ensured so as to safeguard against any unfavourable developments which come as a surprise at a later date with respect to activities to either block or re-route any rivers flowing into India.

There is an urgent need to review our water management policy at the national level. Presently this is a state subject and it is due to this reason we are unable to optimize our water resources optimally at national level. State's own interests overshadow national advantages which would accrue if the subject is handled by the Centre. There is a need to transfer water management from state to Centre.

CONCLUSION

When the well is dry, we know the worth of water

- Benjamin Franklin

Water scarcity is bound to result in water stress and become a primary driver for future conflicts. India and Pakistan are both heavily dependent on the Indus Basin for their irrigation and hydropower needs and as such, sharing of Indus waters can result in a flashpoint of conflict between the two nations.

The Indus Water Treaty has survived 48 years of good and bad times between the two nations. India had made substantial concessions to Pakistan at the time of finalizing the treaty and the consequences of those concessions are now appearing as dissension amongst the people of Jammu and Kashmir, since the unfavourable clauses of the treaty are impinging on the agricultural growth, irrigation and hydroelectric power generation capacity of the state.

While India has yet to develop infrastructure on the western rivers to optimally utilize, what is allowed to it under the provisions of the treaty, it is quite surprising that we lose water across our borders from eastern rivers purely due to inter state rivalries and mismanagement of water resources. Incomplete projects, poor maintenance of headworks and non optimal utilization of existing canals are the primary reasons. One hardly ever hears debates in the Parliament on these issues. With water becoming a precious and scarce resource each passing day, the government needs to take the water resources and their management under its wings at the Centre rather than leave it to deteriorate further being a state subject as of date. These glaring inadequacies in our management of water resources need to be addressed on top priority.

It is in India's strategic interest to ensure that management of water resources is taken up by the Centre very seriously, especially which are trans-border in nature. The security implications of such water resources should be analysed in detail and fed into our talks with these neighbours, so that our rights as lower and upper riparian are safeguarded.

The government must diplomatically manoeuvre its stand in such a manner that its position as upper riparian with respect to Pakistan, offers it the leverages during peace talks or talks on proxy war. A graduated action plan to make Pakistan realize the resolve of India towards this end is the need of the hour and plans must be put into action immediately.

In the light of the above, there is a pressing need to have a re-look of our water management at national level, with a view to optimise its usage within our country within the ambit of the Indus Water Treaty and beyond.

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FOOD SECURITY OF INDIA : CONTEMPORARY CHALLENGES AND EFFECTIVENESS OF GOVERNMENT'S POLICIES

By

Air Cmde AP Garud, VM

“A nation is its people and our motherland is the abode of nearly one-sixth of all humanity. Securing a better life for our citizens where each one of us, can lead lives of dignity and fulfilment therefore merits undivided attention in our development strategy. A natural corollary to this is the attainment of the goal of food security for all.”

Smt. Pratibha Devisingh Patil,
Hon'ble President of India

INTRODUCTION

Background

In the pre-20th century era, approach to national security was mostly a military centric approach. Revolution in Military Affairs especially those of the 20th century, profoundly influenced concept of national security. Airpower, submarines and Nuclear-Biological-Chemical weapons threatened to destroy everything, making war truly global. Space age led to total transparency with lethally accurate energy weapons. Developments in Information Communication Technology and Information Warfare then made physical destruction of population and / or infrastructure passé. In the cyber age, control over information has been used to

create paralysis in almost every field e.g. decision-making, financial networks, etc. Oil crisis of the new millennium, global inequity of development, climate change, scarce resources (water, arable land), pandemics and food scarcity are posing hitherto unknown security challenges.

Thus, the concept of national security has expanded to include areas such as energy, knowledge, water, health, climate, food, etc. Further, internal threats have now emerged as a major challenge to national security. These internal threats arise from a number of factors like non-inclusive growth, rural-urban divide, etc. Therefore, approach to national security has acquired both the dimensions i.e. internal and global, requiring a multi-disciplinary approach. 'Agriculture-Manufacture-Service' now forms the basic triad of all economies and in turn national sovereignty. It is in this context, study of agriculture with special reference to 'food security' and its influence on national security assumes importance. This relation between national security and food security becomes a crucial issue especially in the Indian scenario, as food sufficiency is linked to development.

Statement of the Problem / Aim

The aim of this paper is to identify and analyse major contemporary challenges which impinge on India's 'Food Security' and carry out an objective appraisal of the policies of the Government of India (GoI) in ameliorating these challenges.

Hypothesis

In the globalised world, global food trade, diversion of land to biofuels, climate change, small farm holdings and slow adaptation to agri-technology are the most important challenges to food security of India. The GoI through timely and effective policy interventions has been able to mitigate these challenges and ensure food security.

Scope

Challenges to India's food security emanate from internal and external sources. Amongst the many internal factors, the three prominent factors are sub-optimal agriculture production, attention deficit experienced by agri-sector due to emergence of manufacturing and services sectors and slow adaptation to modern agri-technology. Similarly, the three most important external factors are World Trade Organisation (WTO) regime, diversion of land to biofuels on international scale and the climate change. The only common denominator that can reign in these

challenges is the policies of the GoI. In this thesis, extent of influence of only the above mentioned six factors has been discussed against the backdrop of GoI policies.

Current Status. 'Food Security' being one of the most debated international and national topics, efforts have been made to include latest information and conclusions have been drawn from such information e.g. failure of WTO talks on 29 July 2008 due to firm stand taken by India and China on Special Safeguards Mechanism (SSM).

Justification

Pandit Jawaharlal Nehru understood the importance of agriculture as primary contributor to the economy and remarked that 'everything else can wait but, agriculture cannot'. The Green Revolution made India a food surplus agro-power, thereby elevating her status in the international comity of nations. In the post-liberalisation period i.e. from 1991 onwards, agriculture stagnated and this affected every aspect of food security. The economic growth in the present decade has been continuing, with stagnant agriculture sector and sans inclusive development.

India with its population of about 1.14 billion and agriculture employing 58.2 %¹ of the total work force, faces huge challenges to her food security. Neglect of agri-sector has threatened the very fabric of nationalism. The food crisis of 2008 has led to increase of domestic food prices and therefore, inflation. Yet, India did not have to import food and had no food riots. However, hunger and nutrition have not been eliminated. Therefore, study of challenges to India's food security and the policies of the GoI in mitigating these challenges merit an in-depth study.

Preview

The thesis is covered under the chapters as given in the succeeding paragraphs:

Chapter I. Concept of Food Security, an Overview of Indian agriculture. Progress of agri-sector in relevant aspects like production, yield, Net Sown Area (NSA), Gross Sown Area (GSA), irrigation, etc has been covered.

Chapter II. World Trade Organization (WTO) and India's Stance on Food Security. A detailed analysis of WTO regime has been done elucidating unethical practices followed by the developed world and opposition by developing nations to ensure their food security.

Chapter III. Global Warming and Climate Change : Implication for India's
Resource Utilization, Food Security & Disaster Management

Food Security. Impact of climate change on global food production with special reference to India's food security has been discussed in detail.

Chapter IV. Biofuels, Organic Agriculture, Biotechnology and Implications for Food Security of India. These three issues are the most controversial issues, which have national and international dimensions. These are discussed bringing out divergent viewpoints and their impact on food security.

Chapter V. Public Distribution System (PDS) and Food Security of India. This is the most important scheme of the GoI to ensure food security at micro-level; hence, an entire chapter has been devoted to this scheme.

Chapter VI. Policies, Schemes and Budgetary Support of the GoI for Food Security. This chapter covers effectiveness of important schemes of the GoI in ameliorating the above mentioned challenges.

Chapter VII. Prognosis and Recommendations.

Sources of Data

The data for this thesis has been collected from various books, lectures delivered by scholars at NDC, reports published by the GoI, periodicals, internet, visits to Ministry of Agriculture, newspapers & periodicals and internet articles. Bibliography is placed at Appendix A.

CHAPTER I

CONCEPT OF FOOD SECURITY AND AN OVERVIEW OF INDIAN AGRICULTURE

“Agriculture in developing countries will be confronted with three major challenges in the decades to come - to increase the availability of nutritious food to an increasing population, to use natural ecosystems more efficiently and to make a contribution to economic development.

President of the Novartis Foundation for Sustainable Development and Special Advisor to the UNO Secretary General.

Resource Utilization, Food Security & Disaster Management

Definition of Food Security

The Food and Agriculture Organisation (FAO) of the UNO in 2002, defined food security as “**a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.**” This definition of food security would be used throughout this thesis.

Concept of Food Security

The above definition clearly brings out that food security has much more than simple food sufficiency, which though is the fundamental premise for achieving food security. It is therefore the duty of every government to ensure that all ingredients of the above definition are met while pursuing food security. The key words in respect of India are – economic access to sufficient and nutritious food.

Overview of World Agriculture

Population vs. Food Production. The FAO has estimated the following:²

- (a) The world population would increase from 5.9 billion in 2000 to 7.21 billion in 2015 and 8.27 billion in 2030. However, the percentage growth of population has been declining and is expected to reduce from 1.7 in 1980 to 0.9 in 2030.
- (b) The world cereal production increased from 1573.2 million Tonnes (mT) in 1980 to 2277.4 mT in 2004; similar trend would continue till 2030 i.e. the production would continue to increase and rate of increment is expected to be maintained at about 1.4 %.

However, aberrations would continue to occur i.e. in 2006, both agricultural production and food production rose by less than one percent. This may be one of the reasons of the food crisis of 2007-08. It is therefore important that food production stays ahead of population increase and even more important is that the production and access is spread uniformly throughout the world to avoid simultaneous occurrence of wastages due to surpluses and food riots due to acute deficiencies. It is in this regard that the developed nations have to encourage inclusive growth of agriculture on global scale and ensure food security.

Overview of Indian Agriculture

In India, agriculture is not a mere industry or a contributory sector towards GDP. It is the lifeline of a mainly agrarian society and the very basis of its socio-economic well-being. Agricultural growth has cascading impact on other sectors and it is the only sector that can ensure 'inclusive growth', as it employs 58.2 % of the total work force.³ **All relevant statistical data adapted from various sources is placed at appropriate appendices**; however, a few figures indicating the present status are given below for emphasizing primacy of agri-sector in India's economy and food security.

Area. India's total geographical area is 328.7 million hectares (mHa), of which 141.9 million hectares is the Net Sown Area (NSA) for 2007-08; this represents an increase of about 12 % from the First Plan period. Gross Sown Area (GSA) is 190.2 mHa. The net irrigated area is 60.2 mHa, the gross irrigated area is 77.9 mHa and cropping intensity is 136 %.⁴ In each of these areas, there has been a substantial increase (Appendices B to D).

Foodgrain Production. India produces a variety of food and cash crops. The cereals are the mainstay of Indian agriculture; both on production and supply side. Pulses, sugarcane, fruits and other horticulture products also form an important part of agri-produce and food security. The latest figures available on the official website of the Ministry of Agriculture, GoI indicate that a total of 227.32 mT of foodgrains were produced in 2007-08, which is an all time record; of this, rice was 95.68 mT and wheat 76.78 mT.⁵ The average production for the first plan period was only 50.26 mT,⁶ thus indicating more than 900 % increase. It is therefore evident that the rate of growth of foodgrain (cereals) production has been higher than population (Appendix E). India therefore, did not have to import any wheat since April 2008, once again achieving status of a food sufficient nation. The yield too increased from 522 kg / hectare in 1951 to 1707 kg / hectare in 2004.⁷ In addition, India is one of the largest producers of cotton (23.38 million bales for 2007-08)⁸ and rubber. In brief, India is ranked second in the world in terms of agricultural output, yet yield in India is generally 30% to 50% of the average yield in the world.⁹ (Appendix F).

Agri-sector and GDP. In the Xth Plan agriculture contributed about 22.1% to the GDP, while its own growth was only 2.3 %.¹⁰ Thus, it lags behind sectoral growth of manufacturing and services sectors which were 8.3 % and 9.0 % respectively.¹¹ A composite graph depicting sectoral contribution of agriculture to

the GDP is placed at Appendix G¹². Agriculture contributed 10.7 % of total exports in 2006-07 and India generally has a trade surplus in agri-sector.¹³

Conclusion

Notwithstanding the bumper foodgrain production of 2007-08, agriculture has been a neglected sector of the Indian economy, affecting food security of the nation. The dismal growth in the post-reform period has been a cause of serious concern for all governments and many progressive policies have been adopted to invigorate agri-sector. Indian agri-sector faces many challenges from the external and the internal environment; these have been enumerated in the Introduction. The following chapters have been arranged to elucidate external challenges like global food trade, followed by internal challenges like biotechnology, functioning of the Public Distribution System (PDS), etc. The progress made by the agri-sector through the Xth Plan and in the first year of the XIth Plan would be evident through the thesis. Fructification of the pragmatic policies of the GoI and tenacity of the Indian farmers have been responsible for this progress.

CHAPTER II

WORLD TRADE ORGANIZATION (WTO) AND INDIA'S STANCE ON FOOD SECURITY

“For millions of India’s farmers, it is a question of subsistence, not a subsidy. And subsistence can never be put on the table for negotiation. Subsidies should be discussed and negotiated and even phased out, but not when it involves the basic survival of the farming communities.”

Kamal Nath,
Hon’ble Minister of Commerce, GoI

Background

Organisation and Objectives. The WTO, the only *international organization dealing with the global rules of trade* deals with the rules of trade between nations

at a global or near-global level. *It is the successor to the General Agreement on Tariffs and Trade (GATT)*. The WTO came into existence on 01 January 1995, with its headquarters at Geneva, Switzerland. The WTO presently has 153 members whose trade accounts for over 97% of the world trade; around 30 others are negotiating membership.¹⁴ The WTO deals mainly with four issues i.e. goods, services, intellectual property and dispute settlements arising out of trade and practices of these three issues.

Growth in Trade, Agriculture and Negotiations. The past 50 years have seen an exponential growth in world trade. Merchandise exports grew on average by 6% annually. Total trade in 2000 was 22 times that of 1950.¹⁵ The growth in the volume of world merchandise trade and GDP for the decade 1997-2007 was 5.8% and 3.5% respectively (Appendix H).¹⁶ The most debated round of negotiations has been the Doha Development Agenda (DDA) of 2001. One of the primary issues being debated in the DDA is agriculture (subsidies and tariffs) as it has far reaching implications for the billions of poor.

Agreement on Agriculture (AoA). Negotiations towards an AoA are being undertaken on three pillars — domestic support, market access, and export competition. Developed and developing nations have conflicting interests, making negotiations extremely complicated. Commonality where existing has given rise to formations of groups like G20 and G33. India is a member of both these groups. The latest negotiations in Geneva held from 21-29 July 2008 have been commented upon later.

The reason for agriculture to be the most debated issue becomes evident with statistics like - agricultural trade is about \$800 billion worth worldwide comprising about 9% of the world total trade. It is the most protected sector in the EU and the USA. The EU is the largest trader in agri-products; it exports \$350 billion and imports about \$380 billion; USA's exports are \$80 billion.¹⁷

Understanding WTO Terms

Trade negotiations in the WTO are based on three pillars and these are explained in the succeeding text to understand India's concerns.

Domestic Support. These subsidies are given by government to encourage certain crops, provide economic assistance and yet promote environmental protection. It is divided into three 'boxes'; Green, Amber and Blue. The Green Box is non-trade-distorting support, the Amber Box contains subsidies that

governments have agreed to reduce but not eliminate and the Blue Box contains subsidies which can be conditionally increased.¹⁸

Market Access. It is the reduction of tariff (or non-tariff) barriers to trade by WTO members. The AoA required average tariff reductions of 36% by developed countries, 24 % average reduction by developing countries and Least Developed Countries (LDCs) were exempted from tariff reductions.¹⁹

Export Subsidies. These are given to facilitate export and are less than \$ 10 billion per year for the entire world.²⁰ Therefore, would have minimal impact in making agri-trade a fair international practice.

Objectives of Agri-Subsidies

Agri-subsidies. The objectives of subsidies have different reasons in developed and developing world. The Economic Survey of India 2007-08 by the GoI states that 'Agriculture is the mainstay of Indian economy because of its high share in employment and livelihood creation notwithstanding its reduced contribution to the nation's GDP. The share of agriculture in the GDP has registered a steady decline from 36.4 % in 1982-83 to 18.5 % in 2006-07; growth of agriculture over a period of time remained lower than the growth in non-agriculture sectors and this decelerating trend is cause for concern (Appendix J)²¹. In contrast, the farmer population is approximately five percent of the total population in the EU and 1.7 % in the USA; the agriculture contributes 0.9 % and 2.1 % to the GDPs of USA and EU respectively.²² The small contribution of agriculture to the GDP in the developed nations like USA also had small proportion of labour force amounting to only four percent in 1992-97.²³ Thus large subsidies benefit relatively smaller farmer and labour population, making their produce extremely cheap. Thus stagnation in agriculture of India has largely resulted from subsidies of the developed world and partly due to India's skewed economic growth in manufacture and service sectors.

International Subsidies. Developed countries can afford large subsidies on which they spend minimal amount (1-2%) of their total GDP; whereas developing countries like India, must spend 13-14 % of the GDP, which is obviously not possible. Thus, cheap agri-produce of developed countries allows dumping in international markets. This threatens the very livelihood of marginal farmers (70 % farmers hold less than two hectares and 16% hold less than 4 hectares²⁴), who manage with inadequate infrastructural support, irrigation and lack modern technology. A few case studies as given in succeeding text would reveal unfair competition faced by developing countries.

Subsidies in the Developed World

- (a) **Rice Exports.** The subsidies given by the USA to its agri-sector increased from US\$ 250 billion in 1995 to US\$ 350 billion in 2003. This enabled the USA to become the world's third largest exporter of rice, notwithstanding much higher farming costs.²⁵
- (b) **USA Farm Bill 2007.** The House Agriculture Chairperson Colin Peterson (Democrat) said "I want to write a Farm Bill that's good for (American) agriculture. If somebody wants to sue us (at the WTO), we've got a lot of lawyers in Washington." The Farm Bill 2007 provides for US \$ 286 billion subsidies over the next five years.²⁶
- (c) **AoA vs. Agri -Tariffs.** In Japan, the bound tariff rate on raw and refined sugar is 224% and 328% respectively. Such differential tariffs on raw and processed commodities inhibit developing countries to trade in value-added sector.²⁷
- (d) **Irony of Subsidies of the Developed World.** Vijay Jawandhia of the Shetkari Sanghatna in an interview said "A European cow gets \$ 2 a day by way of subsidy, which is more than half the world's population gets." Thus, India the world's biggest producer of milk, is unable to export milk as it cannot match low international prices.

Subsidies in India. In contrast, India offers minimum subsidies to its farmers. It can be shown through calculations that Annual Aggregate Measure (AMS) is negative when the same for the developed has been largely positive²⁸. The indirect subsidies (fertilizers, electricity and irrigation) amounted to Rs 14,069 crore in 1993-4, Rs 36,007 crore in 2000-01, Rs 29,117 crore in 2004-05 and Rs.32,667 crore is proposed for 2008-09. The USA alone accounted for US \$ 38,878 million in 2003 as subsidies to its agri-sector.²⁹

Merits and Demerits of Liberalisation of Agri-trade

Intended Approach. Liberalization of the agri-trade intended that all countries would produce crops which make economic sense and the world would live in a happy import-export situation thereby ensuring food security.³⁰ The USA feels that the U.N. Millennium Development Goal (MDG) of halving poverty and hunger by 2015 can be achieved through the open trade. This would increase the income of developing countries by \$200 billion annually and reduce global poverty by 25 % over 15 years.³¹

Demerits. This argument is not convincing as it pre-supposes ability to import at all times, which is far from reality. Also, global production and price fluctuations would make developing countries highly vulnerable. The aforesaid challenges like small farm holdings, lack of technology, etc, would shift the agri-trade balance in favour of developed countries.

India's Compulsions and Stance

The WTO being a truly global body whose members transact 97% of the world trade, India has to be a member of the WTO. However, compromise in agri-sector would be unacceptable. Mr Kamal Nath, Hon'ble Minister for Commerce, walked out of the WTO meet in Geneva on 30 June 2006, as a part of a well-orchestrated policy to assert own influence.³²

Rural Population. Indian agriculture is more than an industry as nearly 750 million (72%) live in rural areas; of this, 64.3% of the population is dependent on agriculture as a major source of livelihood, either as self-employed in agriculture (39.4%) or as agricultural labour (24.9%).³³ Further, the national culture is such that food security is inextricably linked to development.

Demands of India. India has demanded the following at WTO negotiations:³⁴

- (a) Overall tariff reductions on bound rates for developing countries should not exceed 36 %.
- (b) An operational and effective Special Safeguards Mechanism (SSM) to check against global price dips and import surges. The latest negotiations at Geneva held from 21-29 July 2008 failed as India and China did not agree to raise import tariffs whenever import surges exceed 40 %; this was deemed too high and both the countries demanded a cap at 10 %, to which USA did not agree.
- (c) Substantial and effective cuts in overall trade-distorting domestic support by the USA (70-75 %) and by the EU (75-80 %).

New Zealand Experience : Agriculture sans Subsidies

In 1982, Federated Farmers of New Zealand realised that the key cause of inflation was the budget deficit required to fund farm subsidies. In the next few years, subsidies were progressively scrapped. Further, after removal of subsidies, the sector has grown at three percent for the period 1984-2006.³⁵

Way Ahead

It is therefore strongly recommended that the present approach must be continued and maximum benefit must be availed from the growing and lucrative domestic market, which cannot be ignored by the developed world.

It would be economically disastrous to replicate New Zealand's experience till the aforesaid demands of India are fulfilled by the developed countries.

Conclusion

India has realised that isolation from WTO is no longer a viable option as its economy is inextricably linked to the globalised world. Hence, India is following the policy of pushing for reforms while remaining a committed member of the WTO. India is a member of various groups formed by the developing countries and is demanding rationalisation of agri-subsidies offered by the developed countries. Further, India has maintained that its subsidies being far lesser than the developed countries, she would maintain these even if the negotiations break down.

India would never allow welfare of her farmers to be negotiated and would continue negotiations with the developed world to provide a level playing field to developing nations. The firm stand repeatedly taken by the GoI is indicative of its commitment to the domestic agri-sector.

CHAPTER III

GLOBAL WARMING AND CLIMATE CHANGE : IMPLICATIONS FOR INDIA'S FOOD SECURITY

“Trading in soil fertility for the sake of quick returns could prove to be a disastrous, short-sighted policy. It would result in virtual depletion of the soil.”

Mahatma Gandhi

General Concepts and Parameters

Adverse implications of global warming and its associated climatic changes now seem to have dawned on the common person. International and national media, governments and NGOs appear to be succeeding in at least spreading awareness about impending disasters that await the earth by end of this century. A few unexplained extreme weather occurrences and the food crisis of 2008 are being attributed to climatic changes brought in by insatiable development overdrive. Global development through unrestrained consumption of natural resources, ill effects of burgeoning population, excessive use of fertilizers, generation of non-biodegradable waste and deforestation are now becoming visual. Uncontrolled emissions of Green House Gases (GHGs) while pursuing greedy growth, has resulted in global warming.

The international initiative of the UNO i.e. the Intergovernmental Panel on Climate Change (IPCC) and the Indian initiative i.e. National Action Plan on Climate Change (NAPCC) unveiled on 30 June 2008, deserve special mention, while discussing global warming and agriculture.

This chapter discusses the contribution of agriculture to the global warming and its associated climate changes. This is essential as agriculture is one of the primary sources causing global warming (Appendix K) and it is one of the worst sufferers of its own doing.

The IPCC. It was constituted in 1988 to evaluate risk of climate change caused by human activity. The work done by this august body was recognised when it shared the Nobel Peace Prize for 2007 with Mr. Al Gore, the former Vice President of the USA. The IPCC published its fourth assessment report on 02 February 2007. The main issues highlighted by the report are³⁶ :

- (a) **Temperature Increase.** Global warming is occurring at the rate of 0.2°C per decade. In the last 150 years, out of the 12 warmest years, 11 have occurred since 1990. The temperature is expected to rise by 2.0–4.5°C with doubling of CO₂ concentration in the atmosphere.
- (b) **GHG Emission.** GHG emissions (carbon dioxide –CO₂, methane – CH₄, nitrous oxide – N₂O, hydrofluorocarbons - HFC) have grown since pre-industrial times, with an increase of 70% between 1970 and 2004; in this agri-sector has contributed about 27 %. CO₂ emissions from burning of fossil fuels (26 billion tonnes in 2003) and decay of organic matter in the soils that form the bulk of the GHG emissions are increasing. Annual emissions of CO₂, the worst amongst GHGs, grew by about 80% between

1970 and 2004. **It is very likely that the observed increase in CH₄ and N₂O concentration is predominantly due to agriculture.**

- (c) **Water Resources and Sea Level.** Warming is resulting in shrinking of glaciers and rise of sea level (0.3 cm per year and could rise to 0.28 to 0.43 m by 2100). Oceans from being a carbon sink may turn into a carbon source. Heat waves and heavy precipitation events may become more frequent.
- (d) **Bio-diversity.** The warming places 20% - 30% of higher plants and animals at high risk of extinction if temperature increases by 1.5°C - 2.5°C from present values with obvious detrimental effects on food security.
- (e) **India's Vulnerability.** Particular eco-systems like agriculture in low latitudes, tropical rainforests, coastal mangroves, etc, are at increased risk.

Impact on Global Food Security. Region-wise likely impacts are summarised below:³⁷

- (a) **Africa.** By 2020, about 250 million people may experience increased water stress and yields from rain-fed agriculture could reduce by about 50%.
- (b) **Asia.** By 2050, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins may decrease. Coastal areas, especially heavily populated mega delta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea.
- (c) **Australia.** By 2020, reduction in biodiversity and agri-production may be experienced due to increased drought and fire.
- (d) **Europe.** In southern Europe, climate change is projected to worsen conditions, reduce water availability and crop productivity.
- (e) **Latin and North America.** By mid-century, in temperate zones, soybean yields may increase. However, major challenges are projected for crops that are near the warm end of their suitable range or which depend on scarce water resources.

Findings of Indian Council for Agricultural Research (ICAR)

The ICAR is an autonomous national organization which conducts and promotes research and training in the field of agriculture and allied sciences. The Council in its presentation to the Parliamentary Committee challenged the validity of IPCC findings, especially those concerning developing countries; e.g. GHG emissions are mostly from

the developed world (Appendix L) and the CH₄ emissions from rice fields in India are much less than estimated (Appendix M). The contribution of different sectors to GHG emissions is placed at Appendix N. All relevant claims by the ICAR are given below.³⁸

Impact on Indian Agriculture. Major impacts of climate change on Indian agri-production as per the ICAR are as follows:

- (a) Productivity of cereals, especially Rabi crops, would decrease (higher temperature and lesser water, especially in Indo-Gangetic plains). Every 1°C increase in temperature reduces wheat production by about 5 mT. This loss can be minimized by changing planting dates.
- (b) Imbalance in global food production may turn India into a net importer of food.
- (c) Increasing temperature would increase fertilizer requirement for the same production targets, thus, resulting in higher emissions.
- (d) **Beneficial Effects.** A few beneficial effects would accrue, but these are far less than the adverse effects. However, it is worth mentioning these gains, which are - reduced frequency of frost damage, less damage to potato, peas, mustard. Also, new 'flooded' areas may become available for fisheries in coastal regions.

Indian Initiatives for addressing Global Warming and Food Security

Prior to examining Indian initiatives, it is worthwhile to peruse India's stand on global warming. Excerpts culled out from an interview of Mr. Shyam Saran, the GoI's key negotiator on climate change, succinctly portray India's concerns and efforts.³⁹ Mr. Saran said "*Looking at historical emissions of carbon dioxide from 1850 to 2000, it was the US that led with 30%, China with 7.3%, whilst India accounted for only 2%. India's stand is. polluter pays... I wonder whether electricity provided to light up the homes of 600 million Indians should be equated with asking German motorists to reduce their speed on the autobahns... India is spending 2-2.5% of its GDP on adaptation to climate change... as climate change takes place, if we don't take remedial action, developing countries will be the worst hit. We have to adapt ourselves at all levels... Our agriculture has to become more drought-resistant otherwise our food security will be affected.*"

NAPCC. The Hon'ble Prime Minister Manmohan Singh released the 'the NAPCC' on 30 June 2008. He said "We have the moral responsibility to bequeath to our children a world which is safe, clean and productive I also believe that ecologically sustainable development need not be in contradiction to achieving our growth objectives." The NAPCC focuses attention on eight priority National Missions — Solar Energy, Enhanced Energy Efficiency, Sustainable Habitat, Conserving Water, Sustaining the Himalayan Ecosystem, "Green India", Sustainable Agriculture and Strategic Knowledge Platform for Climate Change. Thus, NAPCC has unequivocally elaborated India's commitment to her own development that is 'climate friendly'.

The Way Ahead

Affordability vs. Inescapability of Mitigation Measures. Carbon emissions being central to development, prudent energy-mix becomes inevitable. This would incur tremendous costs e.g. by 2030, the cost of stabilising GHG at levels that are considered the maximum for avoiding catastrophic climate change would cost 0.6 % of global wealth (IPCC estimates) i.e. approximately US \$450 billion.⁴⁰

Improved Agro-practices. A great impact can be made through research for adaptation technologies, adjustment of planting dates, crop variety, agri-training, rice cultivation techniques, nitrogen fertilizer application and biomass feedstocks for energy use. It is essential to understand and spread awareness about contribution of various sub-sectors of agriculture responsible for production of GHG (Appendix O)⁴¹; only then can solutions be implemented at grassroot level. India has a vast scope to increase the use of fertiliser per hectare as compared to world average, but this may not be economically and environmentally sustainable (Appendix P). However, there are no universally applicable measures and local governments must adapt strategies that suit the local agro-practices.

Water. Rainwater harvesting, conservation, re-use, desalination, irrigation efficiency, etc, would promote water security, energy efficiency and reduce GHG emissions.

Carbon Tax / Incentives. It may not be practical to levy carbon tax in Indian context when the per capita energy consumption is far below the world average; USA leads with 11.4 kW, Japan and Germany with 6 kW and India 0.7 kW.⁴² However, financial incentives may be considered for improved land management, maintaining soil carbon content, efficient use of fertilizers and irrigation. Index-based weather risk insurance would go a long way in empowering farmers.

Synergy of Policies. It is noticed that policies governing macroeconomics, agricultural, bank lending, insurance practices, electricity, etc, are not congruent. National governments must encourage synergy of all policies to reduce vulnerability to climate changes and promote sustainable development.

Conclusion

The IPCC has warned that ‘warming of the climate system is **unequivocal**.’ Thus, a fatalistic surety has crept in the forecasts of climatic changes due to global warming.

Agri-sector in India unfortunately contributes substantially to the GHG emissions and is itself one of the worst affected sectors due to global warming. This would seriously jeopardize India’s food security as India’s problems are multi-fold e.g. tropical agrarian rain-fed economy, 1.2 billion population (nearly 22 % in BPL category) and energy-deficient status. The GoI is committed to sustainable development which is inclusive. The success of NAPCC would depend upon awareness, capacity building and above all national will. It must be remembered that ‘costs of adaptation and mitigation are unknown but likely to be high; costs of inaction could be even higher.’

CHAPTER IV

BIOFUELS, ORGANIC AGRICULTURE, BIOTECHNOLOGY AND IMPLICATIONS ON FOOD SECURITY OF INDIA

Bio-nano technology takes agriculture from the era of genetically modified crops to the brave new world of atomically modified organisms.’

Mr Sharad Pawar,
H’ble Minister for Food and Agriculture

Background

In the modern age, no technology can be employed in an isolated manner. All technologies have socio-eco-political dimensions, especially agro-technologies. These technologies affect humans and other living forms directly at molecular level and that too irreversibly; hence, informed choices become inescapable.

Biofuels. The fuel price rise from about US \$ 60 per barrel in May 2007 to US \$ 144 in July 2008, inability to find commercially viable new oil fields and climate change have given a great impetus to biofuels – the supposedly ‘green’ solution to energy crisis. However, the food crisis of 2008 has been partly blamed on imprudent diversion of land from food to fuel.

Organic Agriculture. It is a relatively new concept of treading on ‘natural path’, distinct from the traditional fertiliser-pesticide as well as the GE approaches. Low yields and enormous organic resources required may prove to be the nemesis of this approach.

Genetically Engineered (GE) Agriculture. Rapid advances in genetics have ushered in an era of GE agriculture. Effectiveness of presently available GE technology e.g. seeds for improving yield, improving food & nutrition security has been debated against attendant pitfalls like uncontrolled genetic explosion, loss of bio-diversity, etc. The term Genetically Modified (GM) has been used interchangeably with GE, as both actually mean the same.

This chapter therefore argues about merits / demerits of the above mentioned three approaches and tries to assess if there is a common meeting ground.

Definitions

Biofuels. These are defined as fuel derived from recently dead biological material like plants, which distinguishes it from fossil fuel.⁴³

Organic Agriculture. FAO defines organic agriculture as “holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials to fulfil any specific function with the system.”

GE. The technology of isolating gene(s) from the genome of one organism and inserting the same into the genome of another organism is termed as GE.

Such insertion is done randomly and plants / seeds created thus are called Genetically Engineered plants / seeds. Such gene insertion would not normally happen within nature.⁴⁴

Genetically Modified Organism (GMO). A GMO or GE Organism (GEO) is an organism whose genetic material has been altered using genetic engineering techniques. These techniques are generally known as Recombinant DNA (R-DNA) technology. With R-DNA technology, DNA molecules from different sources are combined *in vitro* into one molecule to create a new gene. This DNA is then transferred into an organism and causes the expression of modified or novel traits.⁴⁵

Biofuels

Evolution. Biofuels can be classified into three generations. First-generation bio-diesels use edible food such as sugar, corn etc. These are produced from oils using transesterification and impinge directly on availability of food. Ethanol is the most common biofuel worldwide, particularly in Brazil. The food crisis forced discovery of second-generation biofuels which are produced from non-food crops i.e. waste biomass like stalks of wheat. The need to move away from food and yet have high energy content brought in the third generation based on GE technology e.g. biofuels which are low-input/high yield.⁴⁶

World Market : Biofuels.⁴⁷ Strong market forces are propelling production e.g. in the USA, more than 80% of commercial trucks run on diesel increasing production from 25 million gallons in 2004 to more than 1 billion gallons in 2006. The USA' ambitious programme aims to replace 75% of imported oil by 2025 by alternative sources of energy including biofuels. The food crisis of 2008 has been partly attributed to biofuels by Mr George Bush, the President of the USA, when on 29 April 2008 he said "85 % the world's food prices are caused by weather, increased demand and energy prices and 15 % been caused by ethanol.... .the high price of gasoline is going to spur more investment in ethanol as an alternative to gasoline." In India, a bioethanol programme has just started.

Biofuels : Debatable Issues. A few issues are explained below:

- (a) **Food vs Fuel and Bio-diversity.** This point is aptly summed up by the observation by the Chairman of the IPCC, Dr. Rajendra Pachauri, in March 2008; he stated that 'questions arise on the emissions implications of that route, and that biofuel production has clearly raised prices of corn, with an overall implication for food security'. Biofuels may also cause loss of bio-diversity

as only maximum yield variety e.g. Bt Corn would soon cleanse the bio-diversity sphere.

- (b) **Green Content, Economics and Energy Returns.** Ethanol requires one unit of fossil-fuel energy to create just 0.9 to 1.3 energy units.⁴⁸ Most biofuels are not currently cost-effective and require heavy subsidies. A contrary view states that in the well-to-wheel analysis of first and second generation biofuels, a saving upto 60% and 80 % respectively of carbon emissions can be achieved.
- (c) **Soil, Water and Deforestation.** Increased use / diversion of land for biofuels means conversion of forest land to agriculture and additional use of fertilisers. Both these have adverse effect on global warming. Biofuels consume water for plant growth and for cooling of refining towers during manufacture.

Organic Farming

In Vidharbha, it is too risky to adopt expensive technologies... Vidharbha can be declared as the Organic Farming Zone of Maharashtra, so that its oranges, jowar, cotton and other crops become known as organic products and thereby gain in market value."

— Dr MS Swaminathan

III-Effects of Fertilizers. The ill-effects of overuse of incorrect Nitrogen:Phosphate:Potash (N:P:K) ratio fertilizers have caused acid rain and depletion of ozone layer. In 2004, 31,000 tonnes of pesticides were used in the UK; 40% of fruit, vegetables, and bread sampled were found to have pesticide residues.⁴⁹ In contrast, organically grown produce has double the flavonoids, an important antioxidant.

Concept. The organic movement which began in the 1930s, excludes use of synthetic agents. Presently about 100 countries are practicing organic farming, albeit in varying quantum.⁵⁰ The main objectives being to make agriculture labour and knowledge-intensive (employment plus environment) rather than capital and resource-intensive, to reduce environmental contamination, etc.

Statistics. Since 1990, market for organic products has grown at an average of 23 % per annum to reach \$33 billion in 2005. Approximately 30.6 mHa are now farmed organically, representing approximately 2% of total world farmland;⁵¹

in India too, similar percentage holds good.⁵² In the USA, number of markets for organic produce has grown from 1,755 in 1994 to 4,385 in 2006.⁵³

Status of Organic Farming in India. In 2000, the Planning Commission identified organic farming as a thrust area in the Xth Plan and the Ministry of Commerce launched the National Organic Programme with Rs 57 crore to fund project on improving organic input supplies and training. Progress in organic farming has been substantial with about 76,000 hectares under organic farming.⁵⁴ India has huge potential to develop organic farm products at least for boosting her agro-exports.

Dichotomy. The quote from Dr MS Swaminathan, father of India's Green Revolution (refer above) and opinion of Dr. Norman Borlaug (the father of Green Revolution of the world and a Nobel laureate) that 'organic agriculture cannot increase agricultural productivity'⁵⁵ highlight the dichotomy on the subject.

Biotechnology and Food Security

*From a negligible area in 1995, the area under GM crop varieties increased to 90 million hectares in 21 countries during 2005 including India. Area under Bt Cotton in India rose to 1.3 million hectares in 2005.....the application of biotechnology in the past decade had resulted in an increase in crop productivity, lowering of production costs and increasing the stability of crop production by reducing the losses due to biotic stresses.*⁵⁶

Mr. Sharad Pawar,
Hon'ble Minister for Food and Agriculture

Need for Biotechnology. Dr. MS Swaminathan had said that, challenges like inadequate resources (water, NSA,) and huge undernourished population, need 'perpetual Green Revolution'. This revolution should also be 'without attendant environmental degradation' to ensure food and nutritional security. At present no solutions are in sight except the hope offered by biotechnology, provided all future environmental and survival aspects are fully integrated in such solutions.

Extent of Food and Nutrition Deficit. In the world about 800 million people cannot afford two courses of meals; about 30,000 people, half of them children, die every day due to hunger and malnutrition; nearly 1.2 billion people live on less than a dollar a day.⁵⁷ The statistics of India are also as alarming as the

world statistics. The future is even bleak as Clive James, Chairman of the International Service for the Acquisition of Agri-biotech Applications has said “In the next 50 years, mankind will consume as much food as we have consumed since the beginning of agriculture 10,000 years ago”.

Basic Concept of GE Agriculture. Genetic traits modified in crops essentially include resistance to herbicides, pesticides, pests, rotting / decay (increase in shelf life) and increase in nutrition value (golden rice). The most common crops are Bt cotton and Bt corn. These are made by creating a plant with a gene drawn from a soil bacterium, called *Bacillus Thurengiensis*, hence the name Bt. The Bt corn is genetically altered to express the bacterial Bt toxin, which is poisonous to insect pests (European corn Borer).⁵⁸ The ‘terminator gene’ has similar dimensions and these genes render sterile seeds at harvest, thus making farmers dependent on Multi National Corporations (MNCs) for seeds. This dependence would cause loss of seed selection skills and biodiversity.⁵⁹

Status of GE Farming : International Arena. The first commercially grown GM whole food crop was rot resistant tomato (1994) in the USA. After an initial setback due to ‘mad cow disease’, GM foods are grown and accepted in many countries like the USA, Argentina, Brazil, India, and China, where agriculture is a major part of the total economy. Between 1995 and 2005, the GSA with GMOs increased 50 times (Appendix Q), of which 55 % was Brazil.⁶⁰

Status : India. The GEAC has approved a total of 263 varieties of Bt cotton for commercial applications and 11 food crops for field trials which include Bt brinjal, cabbage, cauliflower, corn, potato, rice, and sorghum.⁶¹ Bt cotton area from 2002 to 2007 has increased by 210 times (29,000Ha to 6.2 mHa). The number of Bt farmers increased by 190 times to reach 3.8 million in 2007. The Bt cotton production doubled from 2001 to 2007 and India became a net exporter.⁶²

Disadvantages : GE Crops. The GE approach has been labelled as ‘disaster in perpetuity’. Many authors like Dr Suman Sahai (Founder & President of the Gene Campaign and *Chairperson of the Planning Commission’s Task Force on Agrobiodiversity and Genetically Engineered Organisms*), Mr. Devinder Sharma (Forum for Biotechnology) and Mr. P Sainath (Ramon Magsaysay Award winner) have unequivocally opined that GE agriculture is causing irreversible environmental pollution. A few common arguments are given in the succeeding text.⁶³

GE : Imprecise and Unpredictable. The authors argue that the GE is still imprecise and unpredictable. Its primary and most certainly secondary effects are yet to be assessed.

GE Crops vs. Nutrition. Scientific explanation by the authors proves that loss of Vitamin A (during cooking) specially inserted in the 'golden rice' through GE technology makes it more unfavourable than natural rice.

GE Disasters and Pests Ecology. In 1996, a major GE food disaster was narrowly averted when it was found that a Brazil nut gene spliced into soybeans could induce potentially fatal allergies in people sensitive to Brazil nuts. Also, pests develop immunity to Bt crops and therefore, more and more molecular changes would be required.

End User : GE Crops. In USA, most GM crops go into cattle feed and not human food. Thus, effects of GE food consumption would be different in developed and developing countries.

Employment and Skills vs. GE Agriculture. Farmers and their holdings in the USA and India are vastly different. Therefore, role of biotechnology would be vastly different in these two countries. Removal of weeds is a major provider for agri-labour and GE crops may therefore generate large scale unemployment. Further farming skills would also be lost alongwith biodiversity.

GE Agriculture and Cultural Issues. The most difficult question is 'should humankind be seeking control over nature in its pursuit of science & development, or should it take a cooperative approach?' GE is yet in nascent stage and its effect on living beings difficult to predict.

Advantages Biotechnology. The benefits given in the succeeding paragraphs have been taken from two presentations namely, Dr. G.K. Garg, Advisor, Biotechnology, GB Pant University, Pantnagar⁶⁴ and by Mr. Raj Ketkar, Director, Mahyco-Monsanto Biotech Ltd.⁶⁵

Environmental Benefits. The GE technology claims to reduce use of pesticides, losses from pests, improved nutritional efficiency, productivity, prolonged shelf life, greater abiotic stress tolerance (drought, acidity, salinity, temperature), etc. It is estimated that total decrease in pesticide applications worldwide from 1996-2004 was 172,000 metric tonnes, GHG emissions were reduced (10 million mT), diesel fuel has been saved (1.8 billion litres), increase in net income for farmers worth US \$27billion, etc. Benefits to Indian farmers have been estimated at US \$ 122.4 from

2002 to 2004. This has been confirmed by many independent authors like R Bennett, V Gandhi and NV Namboodiri, etc. The ever-increasing demand for Bt cotton seeds is a clear reflection of farmers' confidence in this technology and its benefits.⁶⁶

GE Regulatory Authority : India. The three Ministries i.e. Science & Technology, Environment & Forests and Agriculture have a close knit network of statutory bodies as shown at Appendix R.⁶⁷ The principal statutory body is Department of Biotechnology (DBT). The GEAC under the DBT, is responsible for issue of approvals for use of GMOs, research and applications and conduct of large scale field trials. The Environment Protection Act, 1986 provides basic framework. A number of Acts like Food Safety and Standards Act, 2006 have been enacted to provide safeguards while encouraging GE foods.

International Regulations. The Centre for Biological Diversity (CBD), a body under the UNO was established in 1992. It has 190 parties of which 168 are signatories. In January 2000, the Cartagena Protocol on Biosafety was adopted to protect biological diversity from the potential risks posed by GMOs; it has 147 parties of which 103 including India are signatories. The role played by these institutions in banning the 'Terminator Gene' is noteworthy.⁶⁸

Way Ahead

Suggested Way Ahead. The way ahead as always lies in introspection, frugality and benevolence. A few suggested measures are :

- (a) Second and third generation biofuels be preferred to avoid using food for fuel and putting strain on scarce resources like soil quality and water.
- (b) Plants like *Jatropha* can be grown in marginal lands, thereby converting these to arable lands. Yet, the requirement of fodder for livestock cannot be compromised.⁶⁹
- (c) There is a need to make efforts to manufacture biofuels which are carbon neutral or even carbon negative.
- (d) Organic agriculture needs to be promoted at least for making a niche in export market, especially to the EU; yet, attendant dangers like deforestation to increase NSA (compensating for low yield) must be avoided at all costs.
- (e) **Alternatives to GE Agriculture.** There is a need to have a parallel strategy alongside GE agriculture to ensure food security and biodiversity. A few options are - organic agriculture, evergreen revolution (without overuse of

pesticides, herbicides, fertilizers and water), greater investment in agri & rural infrastructure (roads, irrigation and market access), IT enabled agriculture (AGNET and Chaupal), prudent shift of agri-labour to non-farming activities (food processing).

- (f) **Labelling GMOs.** Citizens and farmers of India must be educated about GMOs and such products must be labelled to assist in making an informed choice.
- (g) **Biosafety Spheres.** Directions of the Hon'ble Supreme Court for maintaining biosafety sphere norms and GEAC directions for obtaining Panchayat's clearance prior to field trial must be followed meticulously.
- (h) **System of Rice Intensification (SRI).** India's natural strengths in agri-sector like bio-diversity, agro-climatic zones and thousands of years of experience need to be optimised and further strengthened through indigenous research. The SRI has been proven to increase yields in crops like paddy, that too with lesser use of inputs like water.

Conclusion

Prof. Amartya Sen said "India has avoided famine. But hunger continues even today". Solutions for food security firstly and nutritional security secondly have to be found rather quickly to avoid food wars. A holistic view needs to be taken to resolve all related issues about these three controversial agri-practices.

CHAPTER V

PUBLIC DISTRIBUTION SYSTEM (PDS) AND FOOD SECURITY OF INDIA

"In 2003-04, out of 14.07 mT of foodgrains issued to 16 states at BPL issue prices, only around 5.93 mT was delivered to the poor families. Of the remaining 8.14 mT, 5.12 mT leaked out from the supply chain (FCI godowns to retail outlets) because of corruption in the delivery system, while 3.02 mT was delivered to unintended beneficiaries (APL households). In other words, for every kg of grains delivered to the

poor; the GoI released 2.4 kg from the Central Pool. Taking into account all the inefficiencies of the TPDS, it is found that GoI spends Rs. 3.65 to transfer Re 1 to the poor. This implies that out of estimated budgetary consumer subsidy of Rs. 7258 crore in 2003-04, only Rs. 3061 crore reached the BPL families.”

A study by the Planning Commission of India - 2005

Historical Perspective

The PDS in India was introduced in 1939 in Mumbai by the British. It was to ensure equitable distribution of foodgrains to urban consumers due to rising prices. Spiraling inflation due to World War II forced the government in 1943 to also ration supplies in urban areas. Partition in 1947 left India poorer in agri-resources jeopardizing food security.⁷⁰ Subsequently, policies kept changing, with decontrol and control alternating in 1947, 1948, 1953 and 1957. Fair Price Shops (FPS) were opened in 1957 to serve as an accessible outlet with assured fair prices.

The Green Revolution and food self-sufficiency shifted the focus from consumers to protection of farmers from market anomalies and buffer stocking. The Food Corporation of India (FCI) was established in 1965 to function as an autonomous organization, working on commercial lines, to undertake purchase, storage and distribution of essential commodities, viz. wheat, rice, sugar, kerosene, edible oils, etc.

A study in 1992 revealed major weaknesses in the PDS. Therefore, Revamped PDS (RPDS) was created with focus on economically and socially backward areas. RPDS functioned fairly well; yet constraints of infrastructure and lack of integrity in administration, demanded sharper focus only on the real disadvantaged sections; thus came the Targeted PDS (TPDS) in 1997.

PDS Concept and Responsibilities. The concept of PDS is supplemental in nature. The PDS is operated under the joint responsibility of the Central and the State Governments. The GoI through FCI, has assumed responsibility for procurement, storage, transportation and bulk allocation of foodgrains to the State Governments. The operational responsibility including allocation within State, identification of Below Poverty Line (BPL) families, issue of Ration Cards and supervision of the functioning of FPS, rest with the State Governments.⁷¹

Antyodaya Anna Yojana (AAY). The GoI has further enhanced the TPDS by launching the AAY in 2000 for the poorest segments of the BPL population

i.e. one crore poorest of the poor families. The AAY has been expanded thrice to cover widows, disabled persons, landless agriculture labourers, marginal farmers, primitive tribal households, etc.,. Thus, the AAY covers 2 crore people (i.e. 30.66% of BPL families). These get 35 kgs of wheat and rice at Rs 2 and 3 kgs, respectively.⁷² A table indicating subsidies for the three categories is placed at Appendix S⁷³; clearly brings out the genuine welfare initiated by the GoI.

TPDS : Requirements, Constraints and Errors

Magnitude of Procurement and Off-take. The GoI procures foodgrains at Minimum Support Price (MSP) with a threefold aim - remunerative prices for farmers, to serve the TPDS and build up buffer stocks of foodgrains to ensure foodgrain security.⁷⁴ Requirement and procurement for sustaining the TPDS is of gigantic proportion (all data from RBI statistics)⁷⁵; in 2006-07, for 18.04 crore families, 80.8 mT of wheat and rice were required. Against this requirement, the GoI procured 25.1 mT of rice and 9.2 + 5.4 (imports) mT of wheat. This is issued to the States at Central Issue Prices (CIP) for the TPDS at half economic cost for BPL & Antyodaya Anna Yojana (AAY) and at economic cost for the APL segment respectively. The figures released by the Department of Food and Public Distribution regarding off-take from the TPDS indicate that the scheme is undersubscribed (notwithstanding leakages and diversion). Out of total allocation 54.53 % was utilized by the States, the highest being from the BPL segment. This indicates that the TPDS is working fairly well, assuming that intended and actual beneficiaries are the same.

FCI. The FCI plays a crucial role in the TPDS. It has 24.18 mT (owned & hired) of storage capacity in over 1451 godowns all over India. The total stock (storage plus transportation) in Central Pool as on 30 April 2008 was 30.56 mT (126.19 and 174.58 mT of rice and wheat respectively).⁷⁶

BPL Families. The main thrust of the TPDS is correct identification of BPL families (about 65 million) and ensuring that they get 35 kgs of cereals at specially subsidized prices. Thus, TPDS intends to target the subsidized provision of foodgrains to 'poor in all areas' unlike RPDS, which laid stress on 'all in poor areas'.⁷⁷ However, due to errors of incorrect identification (excess inclusion and exclusion) only about 57% of the BPL households have been covered under the TPDS.

FPSs. There are nearly five lakh FPSs in India.⁷⁸ Thus, reach of the GoI to serve the disadvantaged sections is almost complete. Yet, these FPSs are not commercially viable, especially in smaller villages; thus losses are compensated by

leakages and diversions of subsidized grains. Problems of FPSs are compounded by irregularity of supplies, fake ration cards, high cost of transportation and bureaucratic delays.

Delivery Mechanism. Due to collusion between various agencies (government officers, FCI, wholesale dealers and FPS), serious leakages take place. A few states like Tamil Nadu have implemented certain measures that have improved viability of the PDS; these are — allowing only cooperative sector to run FPSs, extension of cash credit to FPSs and allowing trading in non-PDS items to enable commercial viability. A table indicating names of States having large leakage /diversion (as per the Planning Commission of India) is placed at Appendix T.

Present Problems and Way Ahead

The major problems of the TPDS are physical and fiscal non-sustainability due to procurement problems (energy crisis, diversion) and ever increasing subsidy.

Remedial Measures.⁷⁹ A number of remedial measures have been instituted at the central and the state government levels. The two most important and result oriented are :

- (a) **Right to Information Act – 2005 (RTI).** The RTI Act has been made applicable to the TPDS mechanism; it is expected that such a step would reduce corruption in the system.
- (b) **The 9 Point Action Plan.** The results have been encouraging as about one crore fake ration cards have been cancelled, computerization of ration cards have brought leakages to negligible levels in many southern states, FPSs have been made commercially viable, etc.,.
- (c) **Numbers and Procurement.** Till infrastructure and e-governance brings in transparency, numbers of beneficiaries may be restricted to BPL+AAY at 35 kgs / month and quantity to 10 kg /month to APL population. This would automatically restrict procurement to 40mT annually.
- (d) **Empowering the Poor.** The high buffer stocks can give us food sufficiency and resilience; but food security can be achieved through a prudent combination of TPDS and rural employment schemes, which help in raising purchasing power of the underprivileged.⁸⁰

Conclusion

TPDS is the flagship programme of the GoI for ensuring food security of the BPL section of the society. It also offers some protection to the APL segment. The financial and logistics dimensions of the scheme are gigantic. Leakages and diversion of foodgrains are also equally huge. It is expected that e-governance and empowerment of the beneficiaries would, in near future make the scheme a true success.

CHAPTER VI

POLICIES, SCHEMES AND BUDGETARY SUPPORT OF GoI FOR FOOD SECURITY OF INDIA

“ While endorsing the overall approach to the XIth Plan, there was a sense of urgency about the need to redress the weaknesses in the agriculture sector. At less than 2% per annum, the growth of the agriculture sector since the mid-1990s has been a cause for concern.... Reversing the prolonged slowdown in this sector is essential for our goal of inclusive growth..... Small and marginal farming has become an unviable proposition and till we make farming viable at this scale, it would be virtually impossible to reduce rural poverty and distress” .

Address by Hon'ble Prime Minister of India
to the 53rd meeting of the NDC on 29 May 2007

General

Agriculture the Backbone of India. Indian society and economy have been agrarian in content and spirit; the situation would continue in the foreseeable future. The total rural population in 2005 was 74.68% of the total population, which included 80% of the total poor class; of these, 64.3% of the population is dependent on agriculture (self-employed 39.4% and labour 24.9%)⁸¹. The share of agriculture in GDP declined from 61 % in 1950-51 to 24.2 % in 2001; whereas, the dependence of population on agriculture declined marginally from 77 % to 69 % during the same period.⁸² This is contrary to the economies of developed nations. This

deceleration in agri-sector has been the root cause of the problem of rural distress in India that has reached crisis levels in some parts (farmer suicides, Left Wing Extremism).

Fall in Investment in Agriculture and recent Turnaround. The Hon'ble Finance Minister in his budget speech of 2008-09 said that "What ails agriculture, among other things, is the fall in investment. However, there seems to be a turnaround. Gross Capital Formation (GCF) in agriculture as a proportion of GDP in the agriculture sector has improved from a low of 10.2 per cent in 2003-04 to 12.5 per cent in 2006-07. This, however, needs to be raised to 16 per cent during the Eleventh Plan to achieve the target growth rate of 4 per cent."⁸³

The GoI has launched a number of schemes to revive agri-sector. In this chapter, only important policies as related to agriculture and food security have been discussed.

Important Policies of GoI

Rashtriya Krishi Vikas Yojana (RKVY). Decline in agri-sector's contribution to GDP (about 18 % in 2006-07) forced the National Development Council (NDC) to launch RKVY in May 2007. The aim of the RKVY was to reorient agricultural development strategies to meet the needs of farmers and achieve four per cent growth in the Eleventh Plan. The outlay for RKVY is Rs.25, 000 crore.⁸⁴ The main goal is to become self-sufficient in foodgrains.

National Food Security Mission (NFSM). The NFSM of 2007 with an outlay of Rs 4,882 crore, aims to boost production of rice by 10 mT, wheat by eight mT and pulses by two mT by end of the XIth Plan.⁸⁵ The increase is proposed to be achieved through area expansion, productivity enhancement in a sustainable manner and enhancing farm level economy to restore confidence amongst the farmers. NFSM-Rice, NFSM-Wheat and NFSM-Pulses will be implemented respectively in 133, 138 and 168 identified districts of different States.⁸⁶ The scheme has planned integration of Panchayati Raj Institutions for effective implementation at grassroot level.

National Commission on Farmers (NCF) & National Policy For Farmers (NPF). Deceleration of agriculture in the 1990s also prompted the GoI to announce the first National Agriculture Policy in 2000. This policy was reviewed in 2007 and made farmer oriented rather than agri-oriented i.e. a shift from non-profitable occupation to human-welfare approach. The policy seeks to promote regionally differentiated and socially acceptable use of country's natural resources - land, water and genetic endowment. The objective is to improve the economic viability of farming

by increasing income of farmers with emphasis on institutional support, risk mitigation measures, etc.⁸⁷

Schemes based on IT. The Ministry of Agriculture has started a number of IT based schemes for assisting farmers with technology, weather/climate news, marketing and credit assistance. A few specific projects are – Department of Agriculture Cooperation NET (DACNET), Agricensus, Agmarket, Navkrshi portal, etc. Access to these portals is easy and highly informative.

Kisan Credit Card (KCC), Farm Credit and Insurance Schemes. The KCC scheme was introduced in 1998-99 for timely, easy and flexible availability of production credit to farmers. Commercial, Cooperative and Rural Banks are implementing this scheme. A total of 702.25 lakh KCCs have been issued up to September 2007.⁸⁸ Progress of the scheme has not been uniform across the States as performance of NE States has been dismal. Farm credit doubled in just two years 2002-04 and is set to exceed Rs.2, 80,000 crore for 2008-09. Similarly, the National Agricultural Insurance Scheme (NAIS) was allotted Rs.644 crore for 2008-09.⁸⁹

Agricultural Indebtedness. The GoI in March 2008 introduced a scheme of debt waiver. All agricultural loans disbursed through official institutions and overdue as on 31 December 2007 have been covered under the scheme. A complete waiver for marginal farmers (i.e., holding upto 1 hectare) and small farmers (1-2 hectares) and for other farmers, a one time settlement with 25 % rebate for similar period. The scheme would benefit about three crore small / marginal farmers and about one crore other farmers. The cost to the GoI would be Rs 60,000 crore.⁹⁰

Brief Review of the Ist to VIIIth Plan

A review of the eight plans reveals that the linkage between growth, employment and poverty reduction depends crucially upon the sectoral pattern of growth, empowerment of the disadvantaged segments of population and progress of backward regions. Growth rate of Indian agriculture till 1947 was a dismal 0.3 %. The major threats were famine and starvation. The first priority for the GoI was to plan and invest in this primary sector. The Green Revolution alongwith improvements in areas like fertilizers, seeds, mechanisation, credit and PDS, ensured an increase in production of foodgrains from 50.8 mT in 1950-51 to about 199.3 mT in 1996-97.⁹¹

IXth Five Year Plan

The IXth Five Year Plan, launched in the 50th year of India's Independence accorded priority to agriculture. The primacy of agriculture is best seen at the launch of the IXth Plan, as it accounted for almost 27% of GDP, had 65% share in employment and 21% of total exports. The strategy was to double food production (make India hunger free in ten years). A production target for foodgrains was 234 mT with annual growth rate in agriculture of 4.5 %.⁹² The major constraints and solutions recognised by the Plan were :

- (a) The NSA was expected to remain constant at 142 mHa. Hence, the need was felt to bring in barren land under cultivation and stop soil degradation.
- (b) Maximum irrigation potential being limited to 113 mHa, increase in irrigated Gross Cropping Area (GCA) would be the only solution.
- (c) In order to obviate overuse of fertilizers (75.12 kgs per hectare to 207.53 kgs in 2011-12), replacement with bio-fertilizers was planned as a mandatory requirement.
- (d) Funds for subsidies on power, water and fertiliser need to be reallocated for creating infrastructure and orienting agro-policies.

Xth Plan

Overview. The Xth Plan commenced with large carryover shortfalls of the IXth Plan.⁹³ Agricultural growth fell sharply from 4.69 % in the VIIIth Plan to 2.06 % in the IXth Plan.⁹⁴ Productivity was to be increased by focusing technology and investment on small and marginal farmers, who constitute 78.2 % of all holdings and operate about 32.4 % of total area. The greatest challenge was to take per-hectare yield closer to the world average (Appendix C).⁹⁵

Targets : Xth Plan.⁹⁶ The relevant targets for the Xth Plan were :

- (a) GDP growth was set at 8% with agri-sector growth of 3.97 %.
- (b) Foodgrain production to be increased from 225 to 243 mT per annum by end of the Plan.
- (c) The cropping intensity of irrigated area was to be increased (136% in the IXth Plan to about 143 %).

Evaluation of the Xth Plan. The Xth Plan failed to achieve the desired growth rate in agri-sector inspite of progressive policies, massive investments and favourable

monsoons. The main reason was the extreme slump during the IXth Plan, which consumed the entire period of the Xth Plan for revival. However, the stage was set for a growth oriented environment for the XIth Plan. The main aspects of the Plan were :

- (a) The GDP grew at 7.8 %, the highest so far; yet, agri-sector growth was a disappointing 2.5%.⁹⁷
- (b) Total foodgrains production in 2006-07 was 219.32 mT, though an all time high, failed to achieve even the lower target of 225 mT.⁹⁸

XIth Five Year Plan (2007-12)

The XIth Plan envisaged GDP growth at approximately 9% with agriculture growing at 4% per year.⁹⁹ The XIth Plan has been constructed for a second Green Revolution to ensure food security and rebuild hope about farming.

The Paradox. Doubling the growth of agricultural GDP though would improve rural employment; its associated GDP growth of 10 % would further increase disparity between agri and other sectors. Also, distress migration coupled to gender shift in agri-sector labour (2004-05 women accounted for 34% of principal and 89% of subsidiary workers) has to be tackled tactfully. Thus, parallel strategies would have to be worked out to move out population dependent on agri-sector and offer them livelihood which is culturally and regionally balanced.

Analysis of Central Budgets 2007-08 & 2008-09

Budget 2007-08. The year 2007-08 marked beginning of the XIth Plan. The commitment of the GoI to agriculture is clearly discernible. The allotment increased from Rs. 15,640 crore in 2007-08 to Rs 17,894 in 2008-09 (both about five per cent of total Central Plan Outlay). Fertilizer subsidy alone accounted for Rs 22, 452 crore and yet there was a stern note that an alternative method of delivering the subsidy directly to the farmer must be found.¹⁰⁰

Budget 2008-09. The planning and investments of the Xth Plan and previous budgets seemed to be finally making a pay-off. The GDP growth estimates for the current year have been pegged at 8.7 %. This growth and bumper foodgrains production have, for the first time in decades showed signs of revival of agri-sector. Thus, 2008 can be considered as turning point in the history of modern Indian agriculture. The various schemes like RKVY, NFSM, KCC, loan waiver,

etc, continued to bring buoyancy to this ailing sector. Funding from international agencies like the World Bank sought by the States was encouraged e.g. governments of Tamil Nadu, Andhra Pradesh and Karnataka are likely to receive US\$ 738 million that will benefit an area of 9,00,000 hectares for restoration of water bodies.¹⁰¹

Global Food Crisis

World Statistics. In spite of the GoI policies and funding, the “global food crisis of 2008” affected India, though not causing major impact. Since 2006, the average world price for rice rose by 217 % and wheat by 136 %. This was despite food availability per person increasing during the 1961-2005 period.¹⁰²

India Statistics. As on 01 January 2008, India had 19.2 mT buffer stock and total foodgrains production for 2007-08 was at an all-time high of 227.3 mT.¹⁰³ This coupled with wheat imports (5.5 mT in 2006 and 1.8 mT in 2007)¹⁰⁴ were expected to meet demands of the TPDS and reign in the agflation - a term coined by Merrill Lynch in 2007 indicating that food too can lead to inflation. The wheat imported from Australia in 2006 & 2007 though of marginal quality, was at a high price of approximately Rs.930 and Rs 1200 per quintal respectively.¹⁰⁵ Yet, the inflation has touched 12.01 % in July 2008. The only redeeming factor is that food riots like Africa have not erupted in India. An attempt has been made to explain this global food crisis in the subsequent text.

Reasons for the Global Food Crisis : 2007-08. The dramatic price rise of food across the globe brought in grave crisis causing political, economic and social instability. The main causes of agflation are ¹⁰⁶:

- (a) **Crude Oil Prices.** Oil prices increased from about US \$ 55 per barrel in May 2007 to US \$ 140 in June 2008; this could never have been factored in any economy.
- (b) **Declining World Food Stockpiles.** Technology and growth in food production had probably lulled the world into reducing buffer stocks e.g. in February 2008 wheat stockpiles hit a 60-year low in the USA.
- (c) **Other reasons.** There are many other reasons like extended drought in Australia, economic crisis of USA, diversion to bio-fuels, subsidies of developed nations, etc.

Way Ahead

The GoI policies and GBS in respect of agri-sector is nearly flawless; these must be continued in future.

The policies be implemented with high integrity and monitoring be done through e-governance.

Unexplained imports of cereals be discontinued and MSP be increased appropriately to boost sagging economy and morale of our farmers.

Conclusion

The above analysis highlights the resolve of the successive governments since Independence. The policies have really given a boost to the agri-sector and signs of turnaround are noticeable in 2008. It may not be possible to increase the GBS to agriculture anymore than the present funding and subsidies. The schemes would yield desired dividends in the XIth Plan and India would be well on her way to achieve 'food and nutrition security' and a 'net exporter status' at least as far as cereals are concerned.

A quote from the budget speech (2007-08) would aptly sum up the primacy of agriculture (food security) in the overall Indian economy.

"About 115 million families are classified as farming families. Furthermore, a country with a large population has to be nearly self-sufficient in essential food items; otherwise supply constraints could upset macro economic stability and growth prospects. Hence, agriculture must top the agenda of the policy makers and must hold the first charge on our resources."

CHAPTER VII

PROGNOSIS AND RECOMMENDATIONS

The 'global food and oil crises of 2008' are probably the most discussed events of the year. The food crisis has been attributed to various factors like the oil crisis itself, diversion of land for biofuels, climate changes, etc. India though affected by the food crisis, achieved food-sufficiency, avoided imports and did not experience any food riots. Notwithstanding the fact that inflation touched 11.9 % in July 2008,

agriculture has shown signs of revival this very year. Thus, policies of the GoI have been able to achieve a noticeable degree of food security. In view of the analysis carried out in this thesis, prognosis likely to be valid at least in the near future is considered essential prior to conclusion. The following paragraphs are based on specific chapters of the thesis.

WTO. The WTO talks would continue to remain inconclusive, as has been confirmed by Pascal Lamy, the Director-General of the WTO, in Geneva, on 30 July 2008. Success can accrue only when the developed world provides a level playing field to developing nations.

Climate Change. Negotiations with special reference to agri-sector GHG emissions from the low-technology developing world may also remain unresolved.

Biofuels. Insatiable energy needs of the developed world would compel diversion of more land for biofuels, leading to 'perpetual global food crisis'. However, third generation biofuels would become commercially viable by end 2009 in the developed world; there would not be any noticeable progress in India.

Biotechnology. GE agriculture would make substantial progress in India (at least in cotton sector). The only hope is that prudent use of biotechnology would prevent permanent 'genetic contamination' of food products.

Organic Agriculture. Organic produce would continue to increase all over the world, especially in India; however, it would be mainly for export to the EU market. This would not affect food security atleast in India.

GoI Policies. These would bring lot of succour to the rural poor and the agri-sector. All interventions, especially the TPDS, RKVY and NFSM would be more effective due to e-governance, RTI, investment in rural infrastructure, centre-state confluence, judicial activism and media. The pro-small farmers and agri-labour policies like NPFV would make agriculture viable and thereby ensure food security.

Revival of Agriculture. Indian agriculture, after decades of neglect, is set for revival. The trend noticed in 2008 would continue till end of XIth Plan i.e. 2012.

Recommendations

The detailed discussions have led to recommendations, which have been placed under the heading 'the way ahead' at the end of each chapter. These recommendations have been summarized and placed in the succeeding paragraphs.

WTO. India needs to engage developed nations constructively at WTO forum to optimize benefits from global food trade and yet protect domestic agriculture.

Climate Change

- (a) India needs to change development strategy (albeit slowly) to follow low carbon development pathway with a prudent energy mix.
- (b) Improved agro-practices to reduce GHG emissions, water and soil conservation and carbon incentives need to be implemented as these can be done with least delay and cost.

Biofuels. A pragmatic approach needs to be adopted while dealing with biofuels, organic agriculture and GE agriculture e.g. SRI as a substitute for imported GE culture. These three controversial aspects have potential to ensure economically viable and environmentally sustainable food security for India.

GMOs. GMOs be marketed only after proper labelling and spread of awareness amongst potential consumers. Directions of the Hon'ble Supreme Court (biosafety sphere norms) and GEAC directions (Panchayat's clearance) be followed meticulously.

Shift to Non-agri Sectors. The very high percentage of rural population and labour dependent on agriculture, needs to be prudently shifted to non-farming activities to make agriculture economically viable and generate employment.

GoI Policies. GoI policies be implemented with greater synergy, vigour and integrity to ensure that maximum amount of budgetary support reaches the farmers and rural poor e.g. improving TPDS and avoiding questionable wheat imports.

CONCLUSION

In the globalised world, challenges to 'food security of India' emanate from many external and internal factors. The phenomenal growth of global agri-trade is a lucrative opportunity to agro-exporting countries like India. Yet, population of about 1.14 billion and limited Net Sown Area, present major challenges even to achieve food sufficiency.

The GoI has comprehensive policies to deal with external challenges like global trade regime. These policies have been implemented with noticeable success

in this decade. India has successfully engaged major agro-powers in international negotiations held at WTO. India has been championing the cause of developed nations against immense subsidies of developed nations. Domestic agri-sector has been protected against dumping by world's granaries like the USA. However, lasting solutions to global agri-trade and food crisis can only emerge through international understanding and cooperation, in which India needs to continue playing an active part.

The internal challenges too have been tackled through pragmatic pro-farmer and pro-poor policies; these policies are fundamental to inclusive growth. Adequate precautions have been taken while initiating biotechnology and giving impetus to organic farming. The NAPCC has chalked out a definite course for tackling global warming. Self-sufficiency in food and absence of food riots even in the face of global crisis, bear testimony to the success of interventions by the GoI. Yet, TPDS, the flagship food security programme suffers from leakages and India has to find solutions for tackling under-nourishment while claiming to be a food surplus nation with export potential.

The stagnant agri-sector has shown the first signs of revival in 2008. India has largely been successful in thwarting adverse impact of the global food crisis. India can consolidate own '**food security**' if the pragmatic policies of the GoI are implemented through good governance to usher in '**inclusive growth**'. India is proud of her farmers and agri-labour who have toiled to ensure nation's food security.

The future course for India is amply explained by the quote -

“Green Revolution resulted in saving land and forests, since productivity improvement and not area expansion has been the pathway of increasing production. What land hungry, but population rich countries need is the enhancement of productivity in perpetuity, without associated ecological or social harm. The green revolution should become an ever-green revolution rooted in the principles of ecology, economics and social and gender equity.”

Dr. M S Swaminathan, 1990

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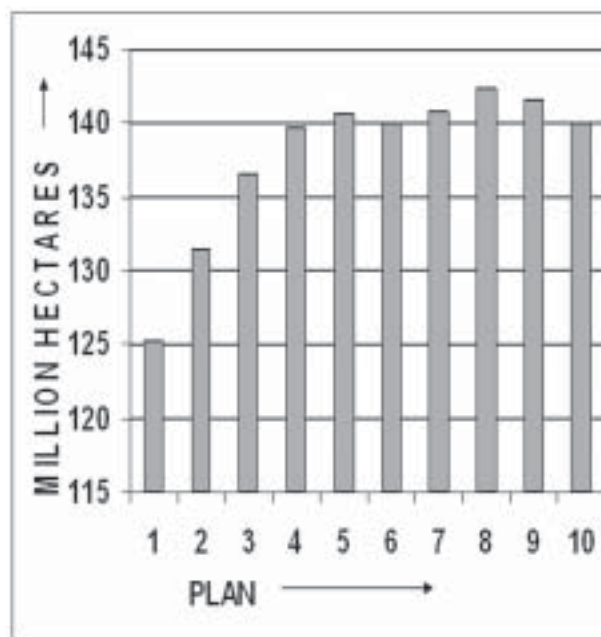
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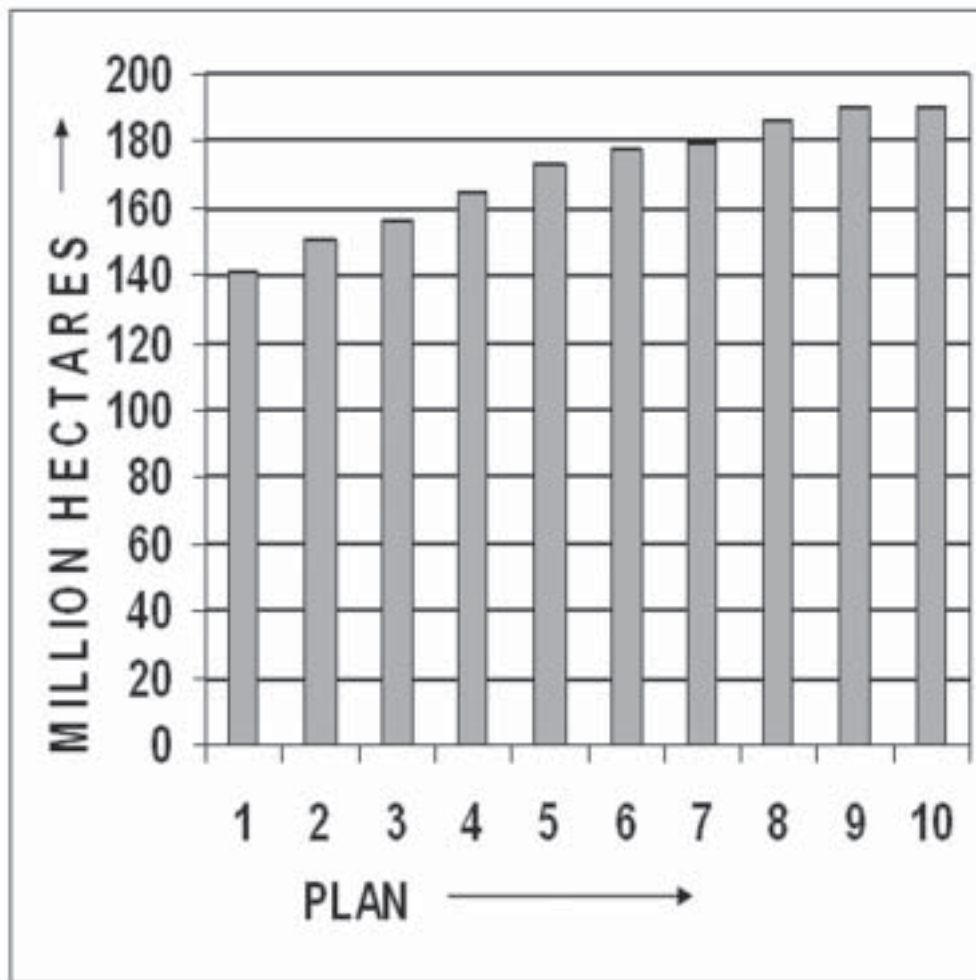
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Appendix B
(Refers to Chapter I)

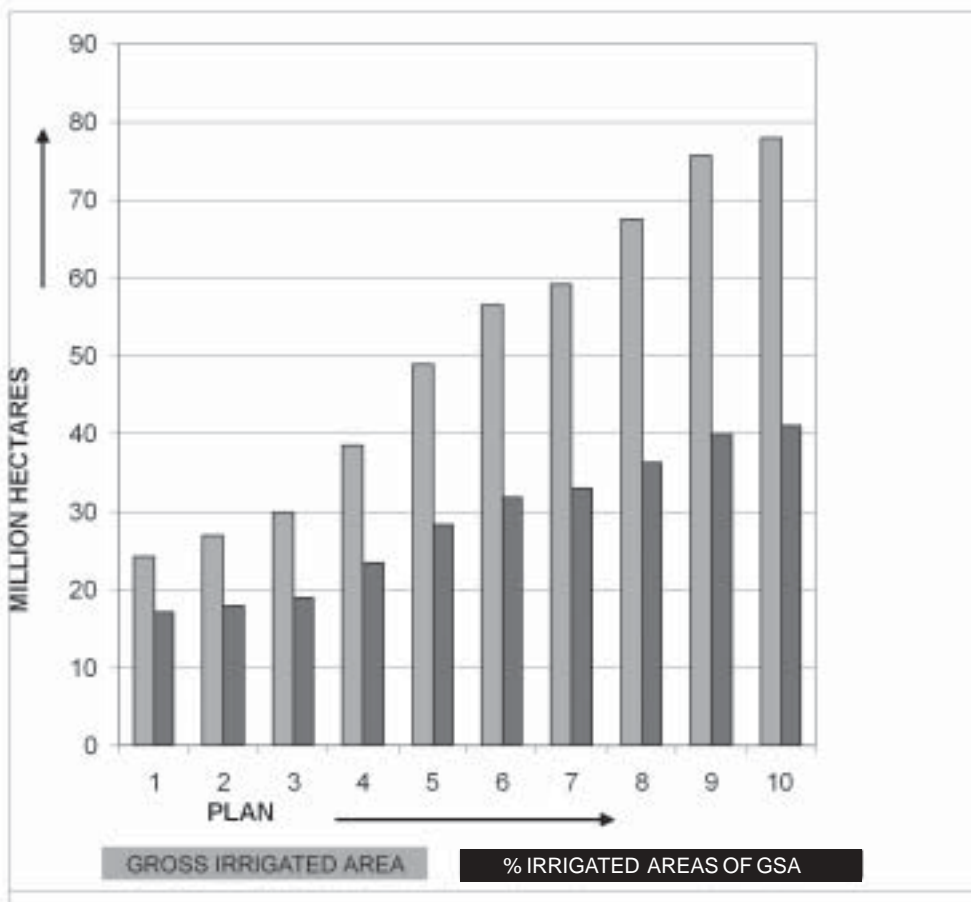
NET SOWN AREA : PLANWISE



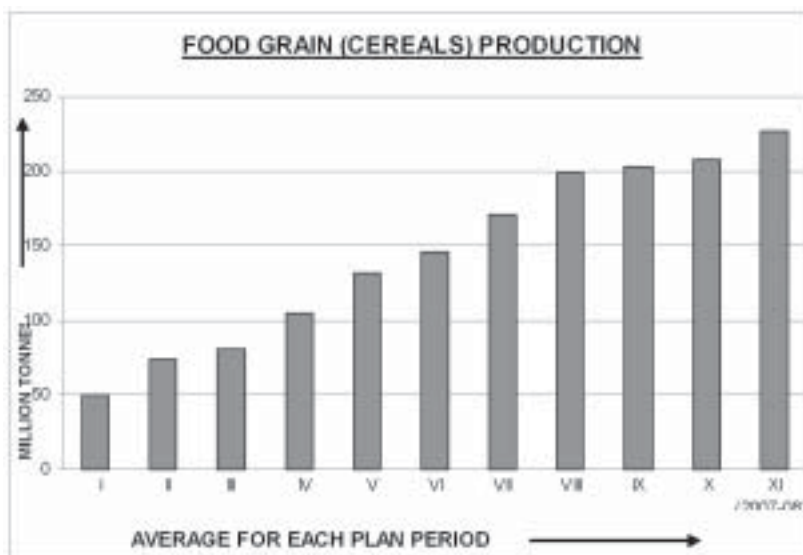
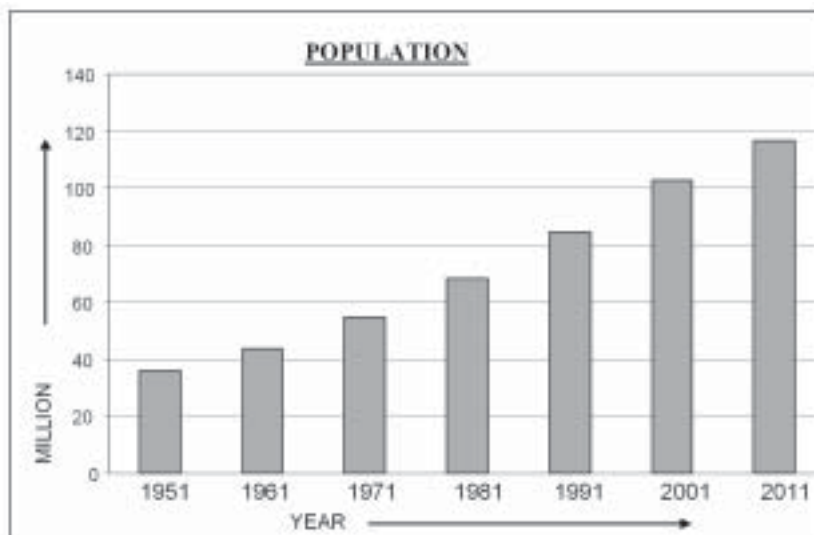
GROSS SOWN AREA: PLANWISE



GROSS IRRIGATED AREA : PLANWISE



POPULATION GROWTH vs FOODGRAIN PRODUCTION : INDIA



Appendix F
(Refers to Chapter I)

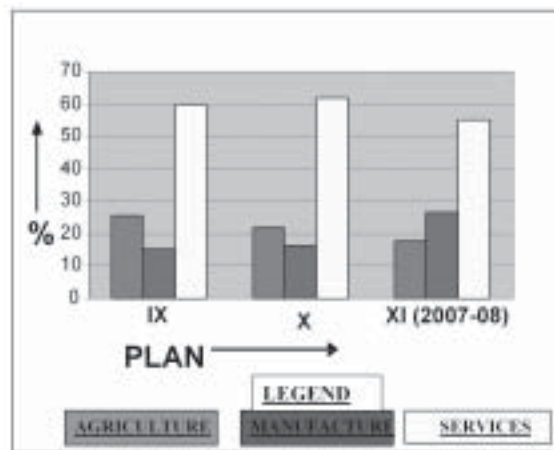
COMPARATIVE YIELD : WORLD & INDIA

Country	Paddy	Wheat	Maize	Ground nut	Sugar cane
India	2929	2583	1667	913	68012
China	6321	3969	4880	2799	85294
Japan	6414			2336	
U.S.A	6622	2672	8398	3038	80787
Indonesia	4261		2646	1523	
Canada		2591	7974		
Vietnam	4105			1435	
World average	3845	2711	4313	1336	65688
Rank of India in production in the world	Second after China	Second after China	accounts for only little over 4% of world's production	Second after China	Second after China

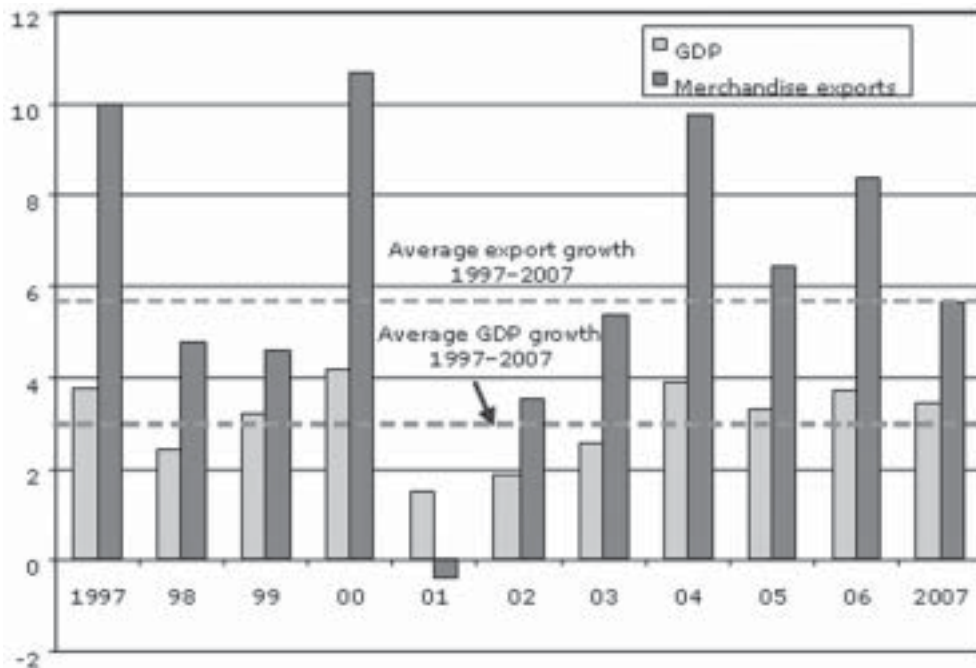
Source : Agriculture at a glance, 2002, Ministry of Agriculture

Appendix G
(Refers to Chapter I)

SECTORAL CONTRIBUTION TO GDP



GROWTH IN THE VOLUME OF WORLD MERCHANDISE TRADE AND GDP : 1997-2007



AVERAGE GDP GROWTH RATES OF AGRICULTURE AND OTHER SECTORS : 1951-2007

Period	Total economy	Agriculture & allied	Crops & livestock	Non-agriculture	
Pre-Green Revolution	1951-52 to 1967-68	3.7	2.5	2.7	4.9
Green Revolution period	1968-69 to 1980-81	3.5	2.4	2.7	4.4
Wider technology dissemination period	1981-82-1990-91	5.4	3.5	3.7	6.4
Early Reforms period	1991-92 to 1996-97	5.7	3.7	3.7	6.8
Ninth and Tenth Plan	1997-98 to 2006-07	6.6	2.5	2.5	7.9
	2005-06 to 2006-07	9.5	4.8	5.0	10.7

GLOBAL ANTHROPOGENIC GHG EMISSIONS : YEAR-WISE, INDIVIDUAL GAS-WISE AND SECTOR-WISE

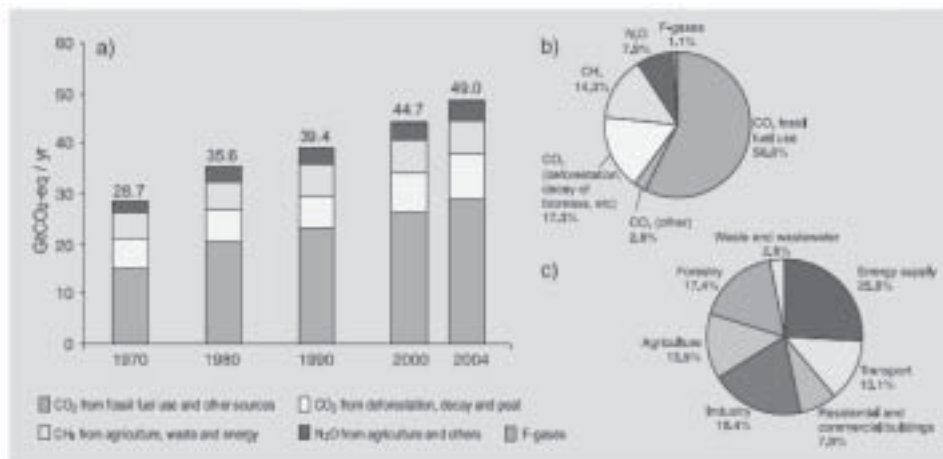
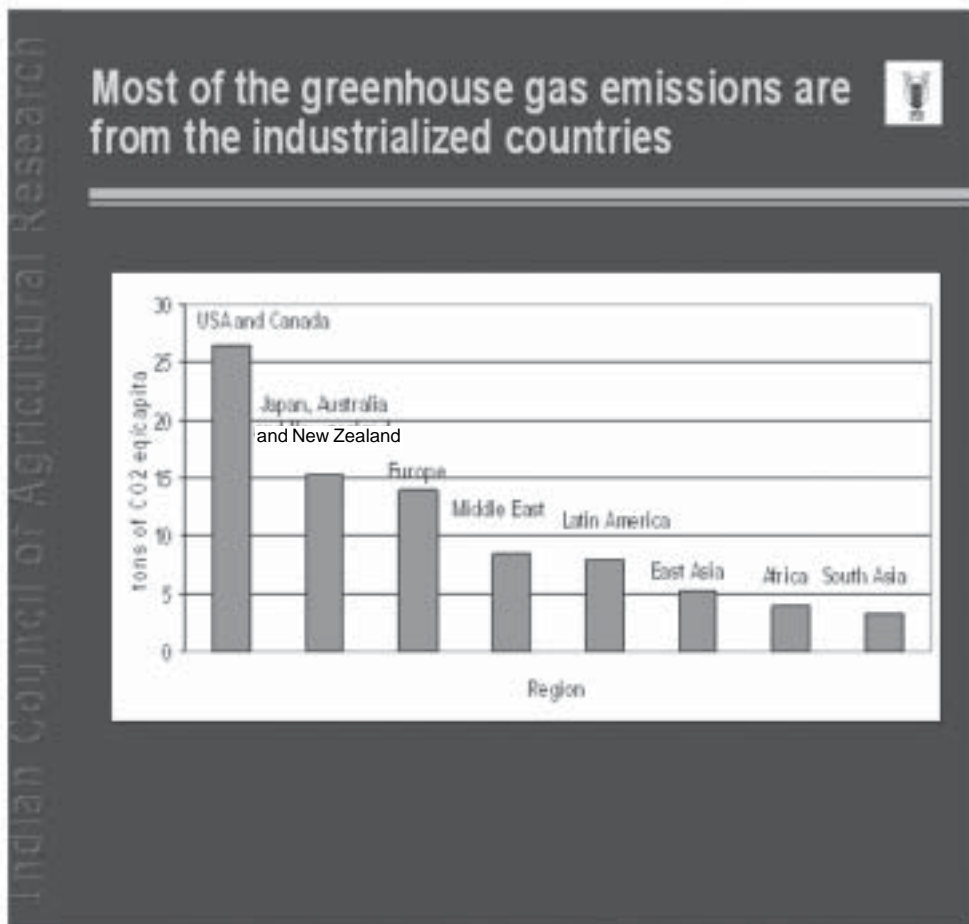
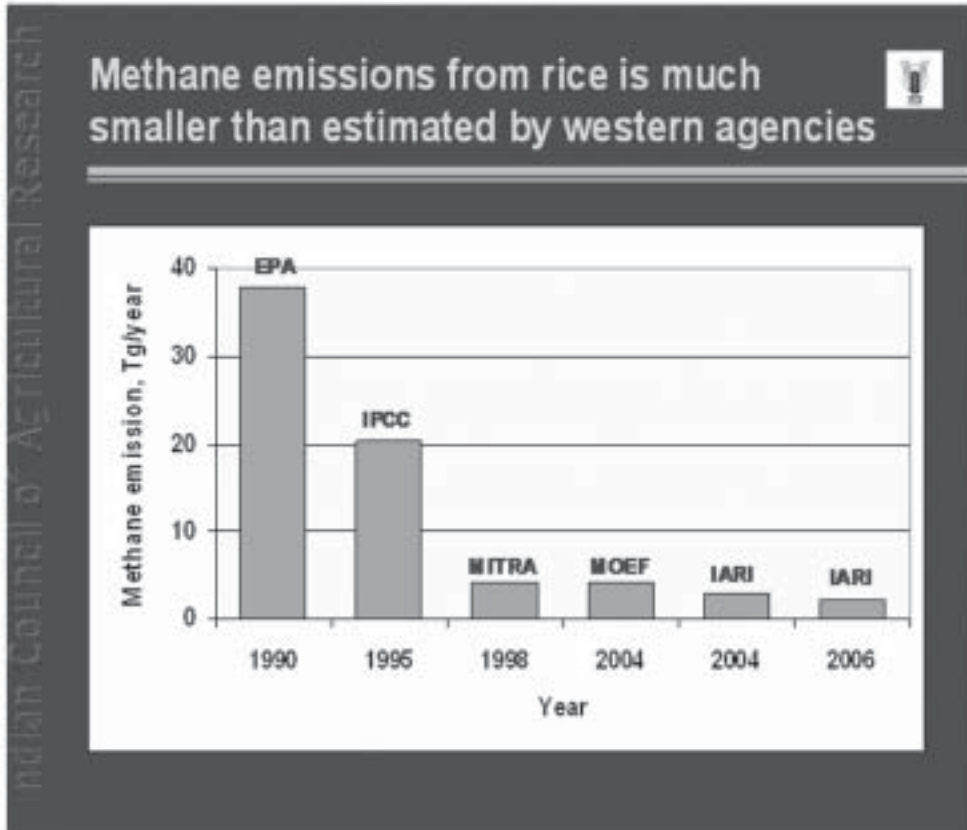


Figure 8PM.2. (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004* (b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of carbon dioxide equivalents (CO₂-eq). (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO₂-eq. (Forestry includes deforestation.) (Figure 2.1)

GHG EMISSIONS : COUNTRYWISE

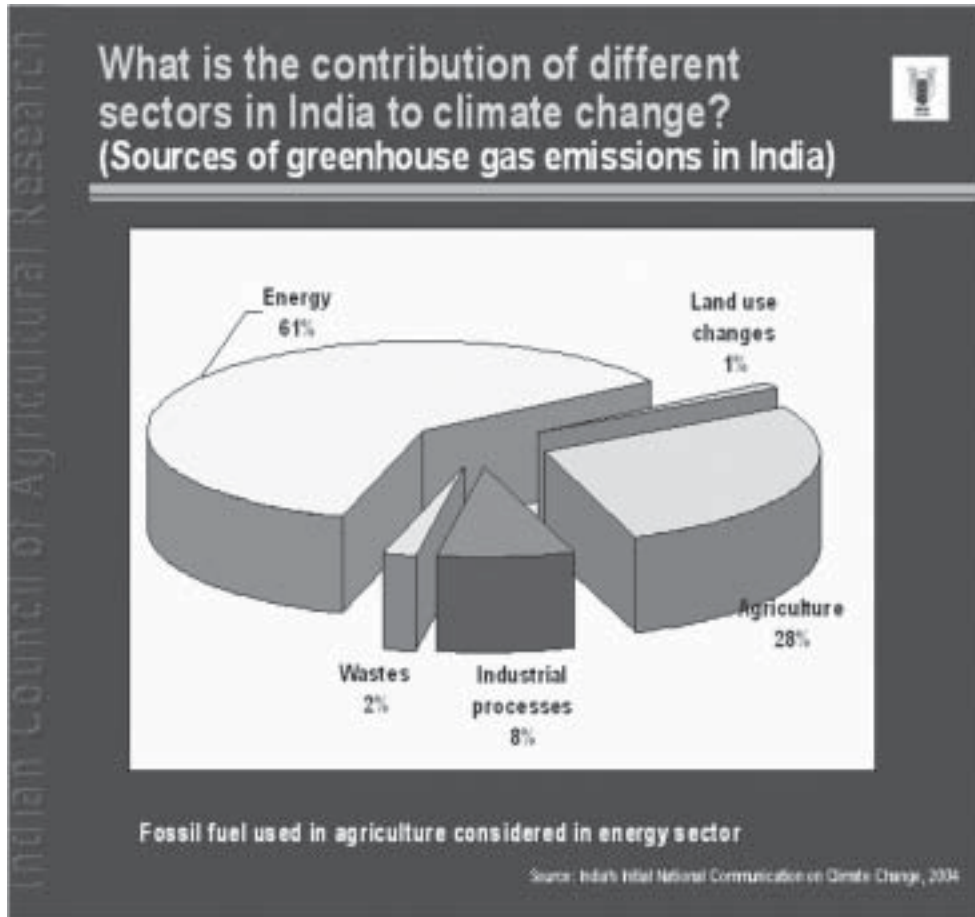


METHANE (CH₄) EMISSIONS ESTIMATES BY DIFFERENT STUDIES

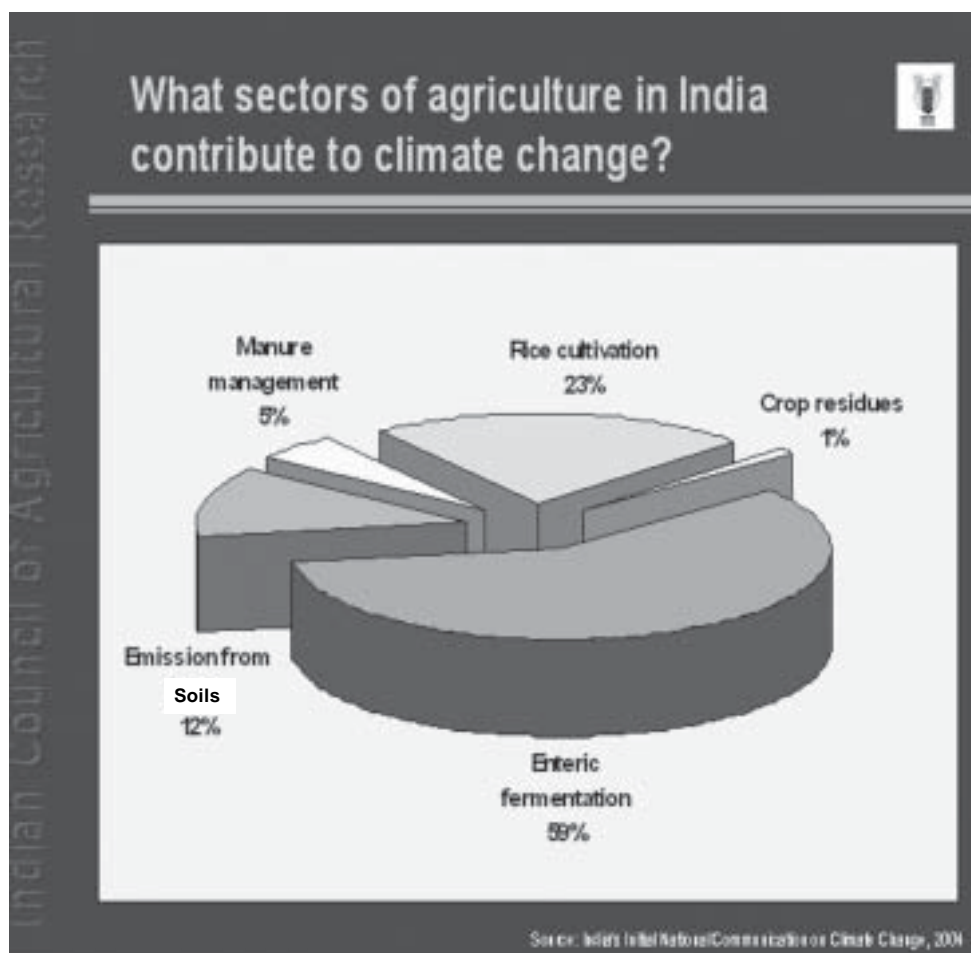


EPA Environmental Protection Agency, USA.
MITRA Mitra Sudip of University of Bonn.
MOEF Ministry of Environment and Forest, India.
IARI Indian Agricultural Research Institute

CONTRIBUTION OF DIFFERENT SECTORS IN INDIA TO CLIMATE CHANGE



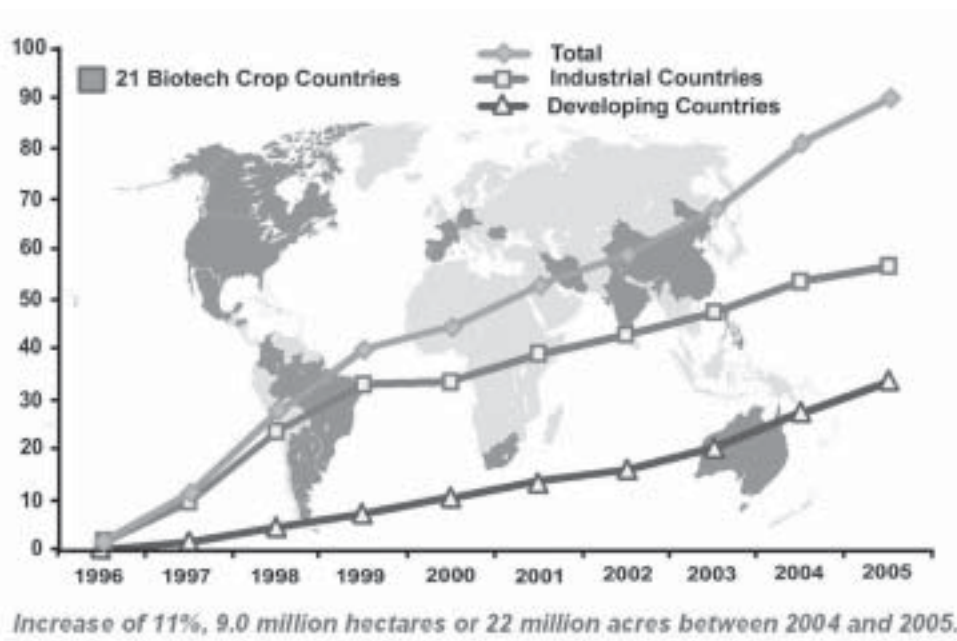
CONTRIBUTION OF SUBSECTORS OF INDIAN AGRICULTURE TO CLIMATE CHANGE



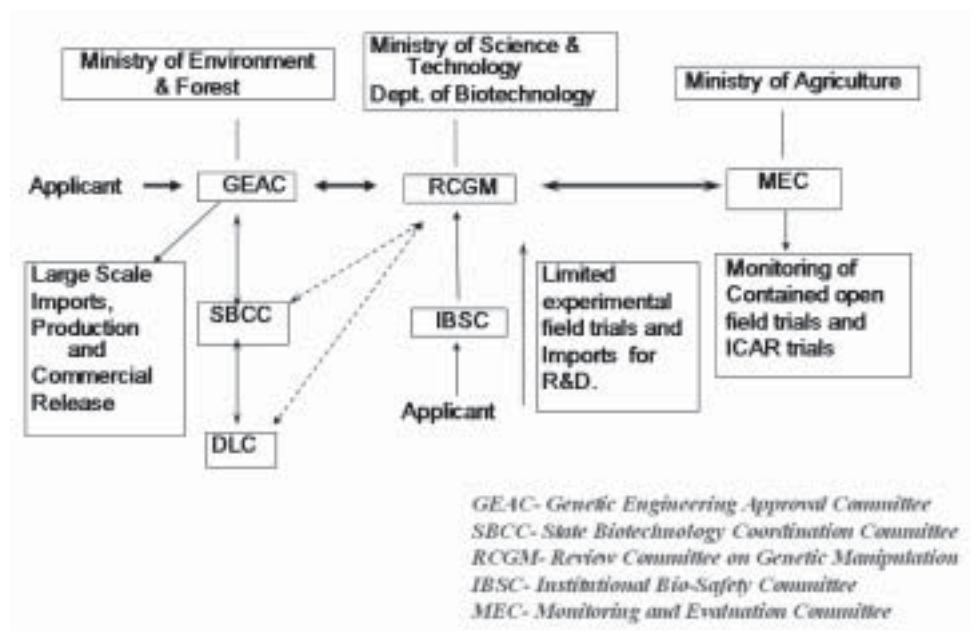
**FERTILISER CONSUMPTION PER HECTARE
(2002-03)**

<u>Sl No.</u>	<u>Country</u>	<u>Fertiliser (kg/Ha)</u>
1	Australia	5
2	USA	47
3	China	71
4	India	89
5	UK	106
6	Pakistan	109
7	Germany	153
8	Bangladesh	158
9	Netherlands	172
10	Japan	247
11	Korea	357
	<u>World</u>	28

GLOBAL AREA INCREASE : BIOTECHNOLOGY CROPS (1996-2005)



GM REGULATION NETWORK : INDIA



Appendix S
(Refers to Chapter V)

COST OF FOOD SUBSIDY PER QUINTAL TO THE GoI

	ECONOMIC COST(per Qtl.)		AAY	BPL	APL
WHEAT	Rs.1,307/-	CIP (Rs / Qtl.)	200	415	610
		Subsidy (Rs per Qtl.)	1107	892	697
		Subsidy(%)	85	68	53
RICE	Rs.1,445/-	CIP(Rs per Qtl.)	300	565	830
		Subsidy (Rs per Qtl.)	1145	880	615
		Subsidy(%)	79	61	43

Appendix T
(Refers to Chapter V)

LEAKAGE OF FOODGRAINS FROM THE TPDS : STATEWISE

Abnormal Leakage (More than 75%)	Very High Leakage (50%-75%)	High Leakage (25%-50%)	Low Leakage (upto 25%)
1	2	3	4
Bihar and Punjab	Haryana, Madhya Pradesh and Uttar Pradesh	Assam, Gujarat, Himachal Pradesh, Karnataka, Maharashtra and Rajasthan	Andhra Pradesh, Kerala, Orissa, Tamil Nadu and West Bengal

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