सत्यमेव जयते

NATIONAL DISASTER MANAGEMENT GUIDELINES

MANAGEMENT OF DROUGHT

September 2010

NATIONAL DISASTER MANAGEMENT AUTHORITY
GOVERNMENT OF INDIA

National Disaster Management Guidelines

Management of Drought

National Disaster Management Guidelines: Management of Drought

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The National Guidelines are formulated under the Chairmanship of Dr. Mohan Kanda, IAS (Retd.), Member, NDMA, in consultation with central ministries / departments, the state governments and specialists in the subject/field concerned from all across the country.

National Disaster Management Guidelines

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National Disaster Management Authority
Government of India

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Vice Chairman
National Disaster Management Authority
Government of India

FOREWORD

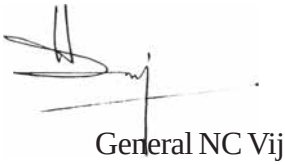
The South-west monsoon accounts for 70 to 80 per cent of the annual rainfall over major parts of India. Its timely occurrence in normal quantity and uniform distribution over all regions determine the prospects of agricultural production and allied activities every year. However failure of rains from south west monsoon results in occurrence of drought in the Indian region. Also there seems to be a clear association between El Nino and La Nina events and weak monsoons. Past monsoon analysis reveals that the Indian region experiences drought or flood in one part of the country or the other almost every year. In the past, drought management strategies were worked out generally during or after the onset of drought which lacked preventive interventions.

Though various Expert Committees/ Working Groups headed by eminent persons have made several useful recommendations/suggestions in the past, many of these have yet to be implemented, which is a cause for concern. The spirit of all these recommendations has informed the content of these guidelines.

The National Guidelines for the Management of Drought have been formulated after a 'nine-step' process-taking on board, through a process of wide-consultation, various Central Ministries/ Departments, States/Union Territories and other stake-holders, including Scientific and Technical institutions, Non-Governmental Organisations and Community Based Organisations. A draft of the document was circulated to all the Central Ministries/Departments and the States and Union Territories for feedback and all workable suggestions have been incorporated.

These guidelines call for a participatory approach involving all the stakeholders to take forward the task of operationalizing the National Vision for securing proactive and pre-disaster preparedness and emphasizing a mitigation-centric approach.

I am grateful to the members of the Extended Group and Core Group who have made valuable contributions to this document. I am happy to place on record my sincere appreciation of the efforts of Dr. Mohan Kanda, Member, NDMA, who guided and coordinated the entire exercise.



New Delhi
September 2010

General NC Vij
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ACKNOWLEDGEMENTS

At the outset, I express my sincere thanks to the members of the Core Group and the Extended Group for their unrelenting cooperation in the extensive effort that went into the formulation of the National Guidelines for Drought Management by the National Disaster Management Authority (NDMA).

I would like to place on record the significant contributions made by the representatives of all Central Ministries/Departments concerned - especially the Ministry of Agriculture, the States/ Union Territories, Scientific & Academic Institutions, eminent professionals, the National Institute of Disaster Management and Non-Governmental Organisations, which helped us improve the content and the presentation of the document.

I would like to express my gratitude to Vice Chairman and all Members of the NDMA for their patient reading of various drafts, constructive criticism, guidance and suggestion in formulating these guidelines.

The efforts of Prof. H. Ramchandran, Department of Geography, Delhi School of Economics, Dr. V. S. Prakash, Director, Karnataka State Natural Disaster Monitoring Centre and Dr. M. Bhaskar Rao, Head, Centre for Disaster Preparedness, MCR HRD Institute, Hyderabad, in providing knowledge-based technical inputs to the Core Group and in drafting the document have been of special value.

I am also happy to acknowledge the support and cooperation extended by Shri A. B. Prasad, Special Secretary, NDMA along with his team, and members of my office Sarvashri Dr. Pavan Kumar Singh, G. V. Satyanarayana, K. V. Ramakrishna Rao, M. Kankaji, Pratap Singh Chauhan and Mahender for their help in organizing the various workshops, meetings and in the preparation of this document.

It is hoped that this humble effort will prove useful to the Central Ministries/Departments and the States/Union Territories in formulating effective Drought Management Plans that will improve holistic and effective management of this phenomenon in the future.

New Delhi
September 2010

Dr. Mohan Kanda, IAS (Retd.)

Abbreviations

The following abbreviations and acronyms appear in the text and have the following meanings:

ATIs	Administrative Training Institutes
BRGF	Backward Region Grant Fund
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CBDM	Community Based Disaster Management
CBO	Community Based Organisations
CBSE	Central Board of Secondary Education
CCIS	All India Comprehensive Crop Insurance Scheme
CMG	Crisis Management Group
CMP	Crisis Management Plan
CRIDA	Central Research Institute for Dryland Agriculture
CRF	Calamity Relief Fund
CWC	Central Water Commission
DAC	Department of Agriculture & Cooperation
DDMA	District Disaster Management Authority
DDP	Desert Development Programme
DM	Disaster Management
DMC	Drought Monitoring Cell
DMP	Disaster Management Plan
DoS	Department of Space
DPAP	Drought Prone Areas Programme
DRU	Drought Research Unit
GoI	Government of India
ICAR	Indian Council for Agriculture Research
ICDS	Integrated Child Development Services
ICRISAT	International Crop Research Institute for Semi-arid Tropics
ICT	Information & Communication Technology
IDMC	India Drought Management Centre
IMD	India Meteorological Department
IPM	Integrated Pest Management

IRS	Incident Response System
IRSS	Indian Remote Sensing Satellite
ISRO	Indian Space Research Organisation
ITK	Indigenous Technical Knowledge
IITM	Indian Institute of Tropical Meteorology
IWMP	Integrated Watershed Management Programme
IWDP	Integrated Watershed Development Programme
LAD	Local Area Development
MARKFED	Marketing Federations
MANAGE	National Institute of Agricultural Extension Management
MoA	Ministry of Agriculture
MHA	Ministry of Home Affairs
MoHRD	Ministry of Human Resource Development
MoST	Ministry of Science and Technology
NAIS	National Agriculture Insurance Scheme
NABARD	National Bank for Agriculture & Rural Development
NATMO	National Atlas and Thematic Mapping Organisation
NCCF	National Calamity Contingency Fund
NCERT	National Council of Education Research & Training
NCFC	National Crop Forecasting Centre
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NDR Fund	National Disaster Response Fund
NDVI	Normalized Difference Vegetation Index
NDWI	Normalized Difference Water Index
NEC	National Executive Committee
NGO	Non Governmental Organizations
NHM	National Horticulture Mission
NIC	National Informatics Centre
NIDM	National Institute of Disaster Management
NIRD	National Institute of Rural Development
NRAA	National Rainfed Area Authority
NRDWP	National Rural Drinking Water Programme
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme

NRSC	National Remote Sensing Centre
NWDPRA	National Watershed Development Programme for Rainfed Areas
OFR	On Farm Reservoirs
OILFED	Cooperative Oil Federations
PDS	Public Distribution System
PMGY	Pradhan Mantri Gramodaya Yojana
PRI	Panchayati Raj Institutions
RKVY	Rashtriya Krishi Vikas Yojana
SAUs	State Agricultural Universities
SBSE	State Boards of School Education
SDMA	State Disaster Management Authority
SDRF	State Disaster Response Force
SDR Fund	State Disaster Response Fund
SEC	State Executive Committee
SGRY	Sampoorna Grameen Rojgar Yojana
SHG	Self Help Group
TNA	Training Need Assessment
UGC	University Grants Commission
UNDP	United Nation Development Programme
ULB	Urban Local Bodies
WHC	Water Holding Capacity

Executive Summary

Background

Drought is a natural hazard that differs from other hazards since it has a slow onset, evolves over months or even years, affects a large spatial extent, and cause little structural damage. Its onset and end and severity are often difficult to determine. Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness. Because droughts are a normal part of climate variability for virtually all regions, it is important to develop plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve. Experience has shown that the democratic from of governance has handled droughts more efficiently than others, as demonstrated by the situation in India before and after independence.

Drought conditions have been widespread in North Africa, the Mid-East, West Asian countries, India, China and have also known to occur in North Central, and South America. The increased frequency and intensity of extreme weather events such as droughts, floods, heat/cold waves, cyclones, delayed or early onset of rains, long dry spells, early withdrawal, during the last two decades has been attribute to global warming.

Drought in India occurs in areas with high as well as regions with meagre rainfall. Water scarcity conditions in the Himalayan region are also not uncommon. Drought is no longer mere scarcity or the absence of rainfall, but related to inefficient water resource management. Requirement of over 80-90 % of the drinking water and over 50 % for irrigation is met from groundwater. The control of this resource is with the owner of land. Water is being over exploited and not harvested. Without effective and large scale rainwater harvesting, only limited recharge is taking place. Analysis of incidence of droughts over the last two centuries in India does not show any increase in the incidence of droughts in recent years. However, their severity appears to have increased. India in 2002 experienced its worst drought in 20 years. However the probability of drought in India varies from once in 2 years in Western Rajasthan to once in 15 years in Assam.

Classification of drought

The National Commission on Agriculture in India classified three types of drought: meteorological, agricultural and hydrological. Meteorological drought is defined as a situation when there is significant decrease from normal precipitation over an area (i.e. more than 10 %). Hydrological drought results from prolonged meteorological drought resulting in depletion of surface and sub-surface water resources. Agricultural drought is a situation when soil moisture and rainfall are inadequate to support healthy crop growth. Drought is also classified on the basis of time of onset as early season, mid season and late season.

Drought Risk

Drought vulnerability is a product of a region's risk of water shortage and the exposure of the communities to the problems arising thereafter. If nations and regions are to make progress in reducing the serious consequences of drought, they must improve their understanding of the hazard and the factors that influence vulnerability. It is critical for countries to better understand this hazard and how it varies temporally and spatially to establish comprehensive and integrated drought early warning systems that incorporate climate, soil, and water supply functions such as precipitation, temperature, soil moisture, snow pack, reservoir and lake levels, ground water levels, and stream flow.

Genesis of National Disaster Management Guidelines: Management of Drought

There has been a paradigm shift in disaster management in India in the recent past. A large number of casualties and heavy economic losses experienced during past major natural disasters in the country have led to the realization that development cannot be sustained unless the Disaster Management activities are mainstreamed into the development work as a national priority. Accordingly, the Government of India has decided to adopt a proactive, multidisciplinary and holistic approach in Disaster Management for building disaster resilience into construction of infrastructure to cope with both natural and man-made disasters. To usher in this paradigm shift in the national approach of Disaster Management, India has taken a defining step by enacting the Disaster Management Act in December 2005 with the formation of the National Disaster Management Authority as the apex body, with the Prime Minister as its Chairperson, and corresponding authorities in the states with the Chief Ministers as the Chairpersons and in the Districts with the District Collector as the Chairperson. This enhances the quality of Disaster Management in the country which, in turn, would make development work sustainable. With this mandate, the National Disaster Management Authority has assumed the responsibility of strengthening the existing disaster management framework by involving all the stakeholders in a holistic approach through a series of mutually interactive, reciprocal and supplementary actions. Based on National Guidelines, Disaster Management plans will be drawn up at all levels of administration.

The National Disaster Management Authority constituted an Extended and Core Group of Experts including representatives of Department of Agriculture & Cooperation, Indian Council of Agricultural Research and National Remote Sensing Centre, along with other stakeholders with a view to bring together all the stakeholders on a common platform for the preparation of these guidelines.

These guidelines place emphasis on risk management, rather than following the traditional approach of crisis management, where the emphasis is on reactive emergency response measures. Developing vulnerability profiles for regions, communities, population groups, and others will provide critical

information on the vulnerability of regions and communities together with the causes. This information, when integrated into the planning process, can enhance the outcome of the process by identifying and prioritizing specific areas, where progress can be made in risk management.

Objectives of the Guidelines and Expected Outcomes

Drought Management is a complex phenomenon which involves active and continuous participation of the State Governments in the country and several Ministries/ Departments of the Central Government involved in different activities relating to Drought Management.

After the formulation of these guidelines on Management of Drought, it is hoped that the authorities involved in Drought Management at Central Government level and at State Government level will be able to manage droughts better in the future. They will ensure that:

i. All contemporary knowledge, experience and information are taken on board, clear destinations identified and road maps drawn with milestones clearly marked off through a wide consultative process involving all stakeholders.

ii. Robust procedures are evolved for drought intensity assessment from time to time using multiple observations.

iii. Standard operating procedures are evolved and practiced in the declaration of drought including the time of declaration.

iv. The India Drought Management Centre (IDMC) is established.

v. A centralized data base at State level and at Nation level related to drought intensity assessment is compiled and maintained.

vi. A Control Room for Drought Management is established and the DM Division in DAC, GoI is suitably strengthened.

Structure of the Guidelines

The Guidelines have been prepared to provide direction to the central ministries/ departments, and state governments for preparing detailed action plans to handle drought as a part of an overall hazard Disaster Management plan.

The National Guidelines consist of 8 chapters:

Chapter 1- Status and Context: The chapter examines the concept of drought which varies from place to place depending upon normal climatic conditions, available water resources, agricultural practices and the various socio-economic attributes of a region. Arid and semi arid areas are most vulnerable where drought is a recurring feature occurring with varying magnitudes.

One of the features associated with recent droughts has been the growing complexity of drought impact. In the past, the impact of drought has been linked mostly to the agricultural sector, as deficiency of

precipitation over an extended period of time, results in depletion of soil moisture, which in turn reduces crop production. This impact continues and is increasing as poor land use practices, rapidly increasing populations, environmental degradation, poverty and conflicts reduce the potential of agricultural production.

The extent and intensity of drought impact is determined by prevailing economic conditions, the structure of the agricultural sector, management of water resources, cereal reserves, internal and external conflicts etc. Generally, the secondary impact is on regional inequality, employment, trade deficits, debt and inflation. The micro level impact at village and household levels are equally important. Drought can result in household food insecurity, water related health risks and loss of livelihood in the agricultural as well as other sectors of the economy.

Chapter 2 - Institutional framework and financial arrangements: This chapter highlights some of the administrative and financial issues that need to be addressed in a holistic manner, besides analysing the present status of drought. Since 2005, the Government of India has brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the process.

The drought early warning surveillance and early response system prepared by the Department of Agriculture & Cooperation (DAC) in 2004, involves at least 11 Ministries/ Departments looking at different aspects of drought management. Effective and timely coordination among these agencies is an important factor requiring attention. The data required for drought assessment and drought declaration are available but in a scattered manner, with different organisations, in local formats making risk quick analysis and decision making difficult.

Until a few years ago, the approach to drought was largely reactive and relief centric. Now there is a shift from the relief-centric approach to holistic and integrated management with emphasis on prevention, mitigation and preparedness, which has resulted in minimising loss of lives and livelihoods on account of drought.

Drought management encompasses three vital components namely, (1) drought intensity assessment and monitoring (2) drought declaration and prioritization of areas for drought management and (3) development and implementation of drought management strategies.

The chapter also discusses the long-term and short-term programmes, which have evolved at the national level, including the Drought Prone Areas Programme, Desert Development Programme, Accelerated Rural Water Supply Programme, National Rural Employment Guarantee Scheme and Pradhan Mantri Gramodaya Yojana etc.

Chapter 3 - Assessment and Early Warning: This chapter enumerates the measures to improve assessment and early warning for drought.

With the launch of the Indian Remote Sensing Satellite (IRS) in 1988 and the follow-on IRS series subsequently, the thrust has also been on remote sensing application to key sectors of development such as land and water resources management, coastal and marine resources, forest management, flood and drought disaster management etc. With the active user participation, the satellite application programme has evolved to provide vital inputs to decision making at Central and State level. The satellite derived vegetation index and wetness index information constitute the main indicators for crop condition monitoring. Owing to the sparse network of ground-based observations available in the country, monitoring suffers from the following deficiencies:

i. Forecasts are general in terms of space and time while the specific needs are at the local level;

ii. The timing does not match user needs;

iii. Information received from different sources sometimes has conflicting messages; and

iv. The language is not clearly understood by users

There is therefore, a need to establish automatic weather stations and rain-gauges at appropriate places to enable micro level analysis and forecasting.

The proposed India Drought Management Centre and Drought Monitoring Cells at the State levels will facilitate the integration of data and expertise from multiple institutions such as ICAR, NRSC, IMD, Agricultural University, State Departments of Irrigation, Ground Water, Revenue, Agriculture, etc., to evolve a robust method for drought intensity assessment on the lines of the US Drought Monitor. Once the indicators cross the defined threshold level (to be decided by the state) the SDMA will help in declaring drought at the sub-district level. Early forecasting helps in the choice of crop varieties to be sown as well as planning the extent of area sown and allocation of water resources.

Chapter 4 - Prevention, Preparedness and Mitigation: Considering the increase in frequency of droughts in different parts of the country, it is necessary that there is a shift in public policy from drought relief to drought preparedness and mitigation measures. Most of these measures are related to integrated soil, water and forest management and form part of soil conservation, watershed development and forestry programmes.

Drought proofing measures are taken before the crop is planted and drought management measures are taken during the crop growing period including in-situ conservation, reduction in plant population, supplemental irrigation etc.

The nutritional aspects of food security will be addressed by the Government through schemes like the Integrated Child Development Services (ICDS) and the Mid-Day Meal scheme. The ICDS is implemented for pre-school children, while Mid-Day Meal has recently been introduced in many for school-going children. Since school dropout rate is high in drought

affected areas, ICDS and Mid-Day Meal Scheme will be expanded to cover children out of school. In the event of drought, PDS will cover the non-target groups also and distribution will be restricted to essential commodities like foodgrains, pulses and oil.

Chapter 5 - Capacity Development: Human Resource Development, Training, Education and Capacity Building are essential components of the strategy for effective Drought mitigation and management. The objective is to put in place a systematic functional mechanism with trained human resources. Capacities need to be enhanced at all levels, which calls for requisite financial, technical and infrastructural support.

A national training and capacity building programme for drought management will be formulated and implemented which would include: Strengthening the Administrative Training Institutes, preparation of District Drought Management Plans and documentation. So far, systematic documentation has not been given due importance in Drought Management. Shortage of well trained and experienced staff is one reason for this. Documentation will capture the process of learning from case studies which will help in a wider understanding of the issues.

State intervention in drought management by and large has had a significant positive impact. But the efficacy of such interventions can substantially increase through the greater involvement of the stakeholders.

Chapter 6 - Relief and Response: Lack of integrated planning is considered a major constraint in achieving the objectives of drought management. Most activities are planned and executed on a sectoral basis e.g. animal husbandry, agriculture, soil and water conservation etc. independent of each other and lack synergy. There are several innovative, pro-active, flexible, institutionally enabled and decentralized schemes that can help quick and efficient drought management.

Chapter 7 - Implementation of the Guidelines - Preparation of Drought Management Plans: The chapter discusses preparation of Drought Management Plans at various levels. Such plans will indicate the detailed work plan and milestone with recommended time-frame and suitable indicators to enable monitoring and review of actual progress made.

Drought management plans for the entire Season will be prepared by the respective state well in advance in the month of May, based on the long season forecast issued by IMD in April and also the previous season's rain fall. The drought management plans will be prepared district wise. Each State will prepare a detailed Drought Manual giving the details of the implementation aspects of the drought management plans.

Interventions relating to agriculture and allied activities would include:

i. Preparation of a contingency plan in case of late on set of monsoon / dry spells during the season with appropriate cropping pattern.

ii. Arranging availability of seeds with short duration varieties on subsidy.

iii. Stocking of quality seeds, well in advance for immediate distribution.

iv. Creating awareness among the farmers on management practices like intercropping, mulching, weed control, intercultural operations.

v. Encouragement of afforestation with subabul, seemaruba, casurina, and eucalyptus.

vi. Promotion of bio diesel plantations like jetropha and pongomia.

vii. Ensuring availability of quality fodder and cattle camps.

Schedule of Completion of Action

The time frame proposed for the implementation of various activities in the Guidelines are considered both important and desirable, especially in the case of those non-structural measures for which no clearances are required from central or other agencies. Precise schedules for structural measures will, however, be evolved in the drought management plans that will follow at the central ministries/state level taking into account the availability of financial, technical and managerial resources. In case of compelling circumstances warranting a change, consultation with the NDMA will be undertaken, well in advance, for any adjustment, on a case to case basis.

Chapter 8 - Summary of Action Points: This chapter sums up all the recommendations that have been made in the National Guidelines that are to be complied-with by the stakeholders at various levels.

1 Status and Context

1.1. Background

Drought is a natural hazard that differs from other hazards as it has a slow onset, evolves over months or even years and affects small pockets to a large regional expanse. Its onset and severity are often difficult to determine. As a result, there is a lack of urgency in response. Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness. Because droughts are a normal part of climate variability for virtually all regions, characterised by extended periods of water shortage, it is important to develop contextual plans to deal with them in a timely, systematic manner as they evolve. Experience has shown that the democratic forms of governance have handled droughts more efficiently, as demonstrated by the situation in India before and after independence. India has managed droughts through a set of progressive and innovative measures like Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP), Integrated Watershed Development Programme (IWDP) and the National Watershed Development Programme for Rainfed Areas (NWDPRA) etc. The Department of Land Records, in the Ministry of Rural Development, has now brought DDP, DPAP and IWDP together, under a comprehensive programme named, the Integrated Watershed Management Programme (IWMP). This programme is to be implemented under the Common Guidelines on Watershed Development. Other factors such as global warming and climate change have made the incidence of droughts even more difficult to predict and their management more complex.

The value of prevention, preparedness and mitigation is now gaining recognition the world over. In India in particularly, after 2005, there has been a paradigm shift from the erstwhile relief-centric response to a proactive prevention, mitigation and preparedness-driven approach for conserving developmental gains and also to minimise loss of life, livelihood and property.

1.2. The World Situation

Drought conditions have been widespread in North Africa, the Mid-East, West Asian countries, India, China and are also known to occur in North Central, and South America. The increased frequency and intensity of extreme weather conditions such as droughts, floods, heat/cold waves, cyclones, delayed or early onset of rains, long dry spells, early withdrawal, during the last two decades, have been attributed to global warming.

With more than 300 river basins in India, some being shared by two or more countries, drought conditions will continue to exacerbate international water conflicts. Growing concerns over a potential increase in the frequency and severity of drought, along with the mounting evidence of the expanding vulnerability of countries to drought, underlining the importance of placing greater emphasis on pro-active drought policies and preparedness is a must.

In many nations, particularly those characterized by more complex economies, the impact of drought quickly radiates to other sectors, as drought conditions extend for multiple seasons and years. In the United States, droughts have had significant impact on transportation, recreation and tourism, energy sector, forest fires, and the environment, endangering the survival of animal and plant species, and aggravating soil erosion.

1.3. The Indian Situation

The traditional approach to drought as a phenomenon of arid and semi-arid areas is changing in India too. Now, even regions with high rainfall, often face severe water scarcities. Cherrapunji in Meghalaya, one of the world's highest rainfall areas, with over 11,000 mm of rainfall, now faces drought for almost nine months of the year. On the other hand, the western part of Jaisalmer district of Rajasthan, one of the driest parts of the country, is recording around 9 cm of rainfall in a year. Total rainfall increases generally eastwards and with height. Increase in precipitation is high at an elevation of around 1,500 metres in the Himalaya Mountains. With average annual rainfall ranging between 20 cm to over 1000 cm, the primary challenge is to store this precious water for the dry season that may follow.

The droughts in Odisha State, which has an average rainfall of 1100 mm, remain a matter for continuing concern. Conditions of water scarcity in the Himalayan region are also not uncommon. Thus, drought is just not the scarcity or lack of rainfall, but an issue related to water resource management.

The requirement of over 80-90 % of the drinking water and over 50 % for irrigation is met from groundwater in India. The control of this resource is with the owner of land. Without effective and large scale rainwater harvesting, only limited recharge can take place.

An earlier analysis of incidence of droughts over the last two centuries in India does not show any increase in the frequency of drought in the recent years. However, the severity appears to have increased (Table 1).

1.4. Drought Risk

Vulnerability to drought is aggravated by a region's risk of water shortage and the exposure of the communities to the problems arising therefrom. If nations and regions are to make progress in reducing the serious consequences of drought, they must improve their understanding of the hazard and the factors that influence vulnerability. The frequency of occurrence of meteorological drought at various levels of intensity and duration defines the drought hazard for drought-prone nations and

Table 1: Drought Intensity – A Historical Perspective

• Period	• Drought years	• No. of years
• 1801-25	• 1801,04,06,12,19,25	• 6
• 1826-50	• 1832,33,37	• 3
• 1851-75	• 1853,60,62,66,68,73	• 6
• 1876-1900	• 1877*+,91,99*+	• 3
• 1901-25	• 1901*,04,05*,07,11, 13,15,18*+,20,25	• 10
• 1926-50	• 1939,41*	• 2
• 1951-75	• 1951,65*,66,68, 72*+,74	• 6
• 1976-09	• 1979*,82,85,87+, 2002*, 2009*	• 6

*Severe drought years = 10 (>39.5% area affected)
+Phenomenal drought years = 5 (>49.5% area)
Source: Drought Research Unit (DRU), India Meteorological Department (IMD), Pune

regions. It is critical to understand this hazard and its incidence across space and over time to establish comprehensive and integrated drought early warning systems that incorporate climate, soil and water supply factors such as precipitation, temperature, soil moisture, snow pack, reservoir and lake levels, ground water levels, and stream flows.

Separate Drought Monitoring Cells (DMCs) will be created at the state level with adequate staff under the control of State Disaster Management Authorities (SDMA's). State level monitoring cells will have requisite Administrative, Technical and data maintenance staff.

[Action: State government/SDMA in collaboration with State Executive Committee (SEC)]

People affected by drought, resort to several socio-economic strategies to cope with it. These include diversification of activities, reducing and modifying consumption, reducing expenditures on non-essential goods, participating in relief works, borrowing, migrating, mortgaging and disposing of assets etc. But, these strategies are not uniformly adopted by people in different drought prone regions. The strategy adopted depends on severity of drought, as perceived by the affected population. Even in a given drought prone region, different sections of society respond differently to the drought situation. For example, small farmers and landless labourers tend to migrate if they face drought situation. Large farmers may diversify their crops so as to reduce the risk. People in some drought prone areas adopt long term strategies to develop natural resources viz., soil, water and vegetation by following the watershed development approach, which could minimize severity of drought. Moreover, in the absence of effective government intervention, drought with mild intensity could cause famine and starvation. Some common practices that are followed during drought have been listed below, along with remedies -

- Borrowing of money by the community in the drought prone areas are mostly from private money lenders at higher rate of interest. Thus, provision of micro-credit facilities is an important intervention.
- Agriculture Universities and NGO's have brought out documentation on best practices in drought coping mechanisms and the same needs to be inventoried at district / sub-district level, validated and replicated.
- Migration during drought is mainly of the younger segment of the population leaving behind aged and children. Social security needs of such population need to be addressed as a part of drought mitigation measures.

1.5. Classification of drought

Drought results from a long continued dry weather and/or insufficient rain, which causes loss of soil moisture, depletion of underground water supply and reduction of stream flow. Drought is frequently defined according to disciplinary perspective. The National Commission on Agriculture in India defines three types of droughts: meteorological, agricultural and hydrological. Meteorological drought is defined as a situation when there is significant decrease from normal precipitation over an area (i.e. more than 10 %). Hydrological drought results from prolonged meteorological drought manifested in depletion of surface and sub-surface water resources. It must be noted that hydrological drought could occur even when the rainfall is normal, if there has been a substantial reduction in surface water holding capacity.

Agricultural drought is a situation when soil moisture and rainfall are inadequate to support healthy crop growth. Drought proofing measures are taken before the crop is planted such as Improving Water Holding Capacity (WHC) of soil through organics/silt, land configurations etc. Drought management measures are those initiated during the crop growing period (in situ conservation, reduction in plant population, supplemental irrigation etc.)

Most classifications emphasise physical aspects of drought, particularly in the context of agriculture and crop production, although its impacts are widespread across several sectors including non-farm sector. The impact, response and interventions would vary depending on at what point of time in a crop calendar there is a water or soil moisture deficit. Generally, three situations are recognised:

(a) Early season: Delayed rainfall (delayed onset of monsoon), prolonged dry spells after onset;

(b) Mid-season: Inadequate soil moisture between two rain events; and

(c) Late season: Early cessation of rains or insufficient rains.

Climate Variability

The IMD recognizes (a) A drought week; when rainfall in a week is less than half of its

normal amount, (b) An agricultural drought; when four drought weeks occur consecutively during mid-June to September, (c) A seasonal drought; when seasonal rainfall is deficient by more than the standard deviations from the normal, (d) A drought year; when annual rainfall is deficient by 20 % of normal or more, and (e) Severe drought year; when annual rainfall is deficient by 25-40% of normal or more.

The Irrigation Commission (1972) set up by Ministry of Water Resources, Government of India (GoI) has defined those areas that experience meteorological drought in 20 percent of years as drought prone areas and those experiencing meteorological drought in more than 40 percent of years as chronic drought prone areas. The National Commission on Agriculture recognized an agricultural drought when at least four consecutive weeks receive less than half of the normal rainfall (< 5 mm) during kharif or six such consecutive weeks in rabi. Hanumatha Rao committee (1994) suggested climatic variables as well as irrigated area and source of irrigation be used to redefine drought prone districts. In addition, one could use variables given in Table 2 in demarcating drought prone districts. Some of these variables are interrelated and may not necessarily be distributed uniformly within the district. Thus, robust methods need to be used in deriving a composite picture using such multiple criteria.

A combination of these variables will be used for the preparation of drought vulnerability maps for Districts and the State. Developing vulnerability profiles for regions and communities will provide critical information on who is at risk, the nature of risk and the reasons for such risk. A drought atlas for India is being prepared by the National Atlas and Thematic Mapping Organisation (NATMO). This information, when integrated with the planning process, will enhance the outcome of the course by identifying and prioritizing specific areas, where progress should be made in risk management.

Table 2: Vulnerability Analysis Using Multiple Criteria

Variables
Meteorological – rainfall, temperature etc
Soils - depth, type, available water content etc
Surface water use - percent irrigated area, surface water supplies
Ground water – ground water availability/ utilization
Crop – cropping pattern changes, geospatial land use, crop condition, anomalies of crop condition etc.
Socio-economic – population of weaker sections, size class of farm holdings

State DMCs will undertake on a priority basis, the preparation of vulnerability maps for their respective States.

[Action: State DMCs in collaboration with National Remote Sensing Centre (NRSC); NATMO, IMD, State Agricultural Universities (SAUs) and Indian Council of Agricultural Research (ICAR)]

1.6. Impact of Drought

Mostly, the impact attributable to drought is extensive/comprehensive, sometimes even difficult to identify. The problem is further compounded by the fact that drought invariably is handled as a 'crisis situation' and a short-term problem. At the household level, individuals perceive drought as a natural hazard, beyond human control. Both lead to different kinds of approaches and solutions. They also lead to many undesirable consequences.

In the long run, defining drought only as a crisis situation or a natural phenomenon beyond human control merely serves to undermine the confidence and capabilities of the people to respond to drought. As a result, they become more and more dependent on the government and expect relief on a larger scale and for a longer time. Social resilience is undermined leading to beliefs that nothing else is possible, that there is really no remedy that will promote self-dependence.

The impact of a drought on the overall economy of the country is evident both at the macro and micro levels. It is either direct or indirect and varies in nature and intensity. The extent and intensity of drought impact is determined by prevailing economic conditions, the structure of the agricultural sector, management of water resources, cereal reserves, internal and external conflicts etc. Micro level impact is largely on the entitlement to produce and procure food, depending upon the social structure, class, village and household resource endowments.

The direct impact of drought is generally classified under four categories, viz. physical, social, economic and environmental. The relative and absolute magnitudes of each impact will however, depend on specific regional characteristics. Droughts cause a loss of assets in crops, livestock and productive capital as these are immediate consequences of water shortage. The lingering impact is felt in the lack of quality seeds in the subsequent season.

1.7. Impact Analysis

In the industrial sector, agro-based industries are directly affected. Lower domestic production of agriculture based inputs for agro-processing units reduces non-agricultural production and employment opportunities. Availability of water for domestic consumption also diminishes. This has implications for health and household activities, including substantial increase in the time spent on collecting water. As water becomes scarce, competition among and within sectors usually increases. Droughts have other important implications for government policies, as it reduces tax revenues through declines in income, employment and exports.

On the expenditure side, the government is faced with increased expenditure on relief, social welfare, health and water supplies, consumption-related subsidies on food distribution, and the logistical costs of drought-related imports. The law and order structure is put under greater pressure by a rise in crime, in turn associated with temporary unemployment, migration and increased destitution.

In addition, there are likely to be pressures for the increased provision of subsidies and credit to the affected productive sectors,

including public utilities. Increased budgetary pressures, resulting from lower revenues and higher expenditure, are usually met by either external and internal borrowings, higher taxes or the imposition of new taxes. Also, reallocation of planned government expenditure might occur, within or among sectors and also, between capital and recurrent spending with attendant opportunity costs.

Droughts have a range of indirect, secondary effects as well. Generally, the secondary impact is on regional inequality, employment, trade deficits, external debt and inflation. The micro level impact at village and household levels, are equally important. Drought may result in a considerable intensification of household food insecurity, water related health risks and loss of livelihoods in the agricultural sector.

1.8. National Manual for Drought Management

The Department of Agriculture & Cooperation (DAC), Ministry of Agriculture (MoA) in association with National Institute of Disaster Management (NIDM) has recently prepared a national manual for drought management and is pursuing the proposal for setting up a mechanism of integrated drought management. This manual lays down that the deficiency in rainfall, the extent of area sown, normalized difference vegetation index and soil moisture index be used as four standard monitoring tools which need to be applied in combination for the declaration of drought. Since the information on these indicators and indices are available at the level of Taluka/Tehsil/Block, droughts will be declared at the level of these administrative units. The annexure-II of the manual specifies the mandate of National and State DMCs. The DAC which is the nodal agency for management of drought, pest attack and hailstorm has already formulated a Crisis Management Plan (CMP). National Disaster Management Authority (NDMA) will provide necessary policy assistance and support as and when required.

To establish a Control Room for drought management and strengthen the Drought Monitoring Cell in the DAC, GoI, will provide all required technical facilities and personnel to increase the capability of analysing and examining reference and research information from various sources.

[Action: GoI-DAC]

Specific guidelines will be developed for the use of Information and Communication Technology (ICT) and role of National Informatics Centre (NIC) for online interaction and availability of real-time drought related information.

[Action: GoI-DAC in collaboration with NIC]

Current Challenges In Drought Management

Drought management encompasses three vital components namely, (1) drought intensity assessment and monitoring; (2) drought declaration and prioritization of areas for drought management and (3) development and implementation of drought management strategies. Each step in drought management needs holistic approach to ensure effective end result. Currently, drought management faces the following challenges among others (Table 3).

Table 3: Current Challenges In Drought Management

	These guidelines will ensure that: -
i.	All contemporary knowledge, experience and information are taken on board, clear destinations identified and road maps drawn with milestones clearly marked off through a wide consultative process involving all stakeholders.
ii.	The evolution and practice of standard procedures for declaration of drought including the time of declaration is promoted and the gravity of the risk and the vulnerability of various States are duly understood.
iii.	Development of standard procedures for drought vulnerability assessment and generation of vulnerability maps in each state is undertaken.
iv.	The critical areas for minimising loss of lives, livelihood and property are addressed purposefully and systematically.
v.	Measures are put in place for drought proofing of chronically drought-prone areas.
vi.	The India Drought Management Centre (IDMC) is set up.
vii.	Organization and development of a centralized data base at state level and at nation level related to drought intensity assessment, drought declaration, vulnerability assessment and drought management are undertaken on priority. Grievance Management Systems are put in place for ensuring that benefits reach the intended beneficiaries.
viii.	Application of ICT is promoted not only to create the databases, but also for effective monitoring the measures being taken. Effective use of e-mail, Video Conferencing, mobile phones for reducing time lag in traditional systems is encouraged.
ix.	Remote sensing technology and data warehousing is promoted to study historical and future trends of the drought occurrence and its effects.
x.	There is institutional participation and use of collective expertise in the drought intensity assessment/drought declaration/drought vulnerability assessment. Expert advisory systems are set up for providing advice to the affected population to mitigate the effects
xi.	A common policy is evolved to dovetail short-term relief measures into long-term interventions being handled in different Ministries/ Departments for comprehensive and all-inclusive Drought Management.
xii.	Global and National best practices in Drought Management are identified and adopted.

Drought Management involves active and continuous participation with not only various States in the country but also several Ministries/ Departments of Central Government involved in various activities of Drought Management. These guidelines are seen as an aid to overcoming some of the above challenges and have been formulated with the objectives set out in Table 4.

After the formulation of these guidelines on Drought Management, it is hoped that the

Table 4: Objectives Of The National Guidelines On Drought Management

i. The primary responsibility of managing drought (or any other natural calamity) is that of the respective State Government. The criteria followed for drought declaration and the time when the drought is declared differs across the states. There is no time limit for declaration of drought by the States.

ii. Involvement of various Ministries/Departments/Organisations in one or the other short-term or long term activities of drought management results in delay in effective and timely coordination. The indicators used and the methodology followed for drought intensity assessment and drought monitoring differ largely from state to state.

iii. Slow setting in of drought makes it difficult to determine the onset and end of drought.

iv. The data required for drought assessment and drought declaration are available but in a scattered manner, with different organisations, in local formats making it cumbersome for quick analysis and decision making.

v. The availability of key data used for drought intensity assessment such as rainfall, crop sown areas, and reservoir levels differs from state to state. The procedures for data collection and data-base maintenance vary across states. This leads to insufficient use of Information and Communication Technology (ICT) tools by various agencies in management of drought.

vi. Lack of check dams in the rainfed areas results in inadequate storage-water in times of need or drought.

vii. Lack of community participation in drought management activities at the village/Tehsil level, and the low levels of involvement of Self Help Groups, NGOs and the corporate sector in drought management reduces the overall value of the effort.

authorities involved in Drought Management at Central Government level and at State Government level will be able to manage droughts better in the future.

1.9. Approach to the Guidelines

Until a few years ago, the approach to disasters was reactive and relief centric. Now, there is a shift in this approach from relief centric to holistic and integrated measures with emphasis on prevention, mitigation and preparedness, which has resulted in minimising loss of lives and livelihood on account of drought.

These guidelines will establish clear principles and operating guidelines to govern the management of drought and its impact. They will be consistent and equitable for all regions, population groups, and economic sectors and for the goal of sustainable development. The overriding idea will be an emphasis on drought management through the application of preparedness and mitigation measures.

These guidelines are rooted in the spirit underlying the provisions of Disaster Management Act 2005 (DM Act 2005) that led to the creation of the NDMA. They attempt to capture the big picture, covering policy issues, institutional aspects and financial arrangements for drought management in general. These guidelines also lay emphasis on emerging concerns such as climate change and are expected to strengthen the structural and non-structural measures for drought management, as proposed in the CMP and Drought Manual of DAC.

1.10. Expected Outcomes

The following outcomes among others are expected to be realised (as envisaged in the CMP on Drought) through:

- Regular meetings of the Crisis Management Group (CMG) under the Chairmanship of Additional Secretary and Drought Relief Commissioner (DAC, GoI) in each quarter to discuss / review preparedness for Drought Management.
- Operationalisation of a Control Room for Drought Management including the strengthening of the DM Division in DAC, GoI.
- Connectivity with all participating Institutions for sharing data and expertise.
- Effective implementation of Drought Management Plans.
- Ensuring regular / continuous monitoring of the implementations of the plans.
- Continuous modernisation of Drought Assessment, Drought Forecast, Early Warning Systems and decision support systems.
- Improving the levels of awareness and preparedness of all stakeholders.
- Enhanced capacity building for effective Drought Management.
- Improving the compliance regimes through appropriate mechanisms.

Inclusion of drought management in the syllabi of graduate and post-graduate courses by ICAR institutions, SAUs, Agro Economic & Statistical Institutions etc.

Establishment of a Web based source for all drought related forecast, monitoring and management (Drought Management Portal).

2 Institutional Framework and Financial Arrangements

2.1. Institutional Framework

As drought is a complex natural as well as man-made phenomenon, its management requires specialized support to address different levels of complexities. This warrants in evolving an institutional framework, which will facilitate coordination of inputs from different governmental organizations and institutions without impinging upon the functional autonomy of the institutions and organizations concerned.

At the National level, droughts are monitored by various agencies such as rainfall and aridity anomaly by the IMD, reservoir storage position by the Central Water Commission (CWC). At State-level Departments like Agriculture, Irrigation, Economics and Statistics monitor crop and seasonal conditions.

2.2 National Institutions/Agencies

Disasters disrupt progress and destroy the hard-earned fruits of painstaking developmental efforts, often pushing nations, in quest for progress, back by several decades. Thus efficient management of disasters, rather than mere response to their occurrence, has in recent times, received increased attention both within Indian and abroad.

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

2.2.1 National Disaster Management Authority (NDMA)

The NDMA, as the apex body for disaster management, is headed by the Prime Minister and has the responsibility for laying down policies, plans and guidelines for DM and coordinating their enforcement and implementation for ensuring timely and effective response to disasters. The guidelines will assist the Central Ministries, Departments and States to formulate their respective DM plans.

Powers and Functions of NDMA

It will approve the National Disaster Management and DM plans of the Central

Ministries/Departments. It will take such other measures as it may consider necessary, for the prevention of disasters, or mitigation, or preparedness and capacity building, for dealing with a threatening disaster situation or disaster. Central ministries/ departments and State Governments will extend necessary cooperation and assistance to NDMA for carrying out its mandate. It will oversee the provision and application of funds for mitigation and preparedness measures. NDMA has the power to authorize the Departments or authorities concerned, to make emergency procurement of provisions or materials for rescue and relief in a threatening disaster situation or disaster. The general superintendence, direction and control of National Disaster Response Force (NDRF) are vested in and will be exercised by the NDMA. The National Institute of Disaster Management (NIDM) works within the framework of broad policies and guidelines laid down by NDMA.

Mandate of NDMA

The NDMA is mandated to deal with all types of disasters, natural or man-made. Whereas, such other emergencies including those requiring close involvement of the security forces and/or intelligence agencies such as terrorism (counter-insurgency), law and order situation, serial bomb blasts, hijacking, air accidents, Chemical, Biological, Radiological and Nuclear (CBRN) weapon systems, mine disasters, ports and harbour emergencies, forest fires, oil field fires, and oil spills will continue to be handled by the extant mechanism i.e., National Crisis Management Committee.

NDMA will, however, formulate guidelines and facilitate training and preparedness activities in respect of Chemical, Biological, Radiological and Nuclear (CBRN) emergencies. Cross cutting themes like medical preparedness, psycho-social care and trauma, community based disaster preparedness, information & communication technology, training, preparedness, awareness generation etc. for natural and manmade disasters will also engage the attention of NDMA in partnership with the stakeholders concerned. Resources available with the disaster management authorities at all level, which are capable of discharging emergency support functions, will be made available to the nodal Ministries/Agencies dealing with the emergencies at times of impending disasters/disasters.

So far, NDMA has issued guidelines on Earthquakes, Chemical (Industrial) Disaster, Preparation of State Disaster Management Plans, Medical Preparedness and Mass Casualty Management, Floods, Cyclones, Pandemic Preparedness Beyond Health, Nuclear and Radiological Emergencies, Biological Disaster, Landslides & Snow Avalanches and Chemical Terrorism. The guidelines for the management of disasters including Urban Flooding, Tsunami, Nuclear – Radiological – Part II (Classified.), Micro Finance & Risk Insurance, Role of NGOs in Disaster Management and Community based Disaster Management are under preparation.

2.2.2 National Executive Committee (NEC)

The NEC includes the secretary to the GoI of the ministry or department having

administrative control of DM, as well as the chairperson and secretaries to the GoI in the Ministries/Departments of Agriculture, Atomic Energy, Defence, Drinking Water Supply, Environment and Forests, Finance (Expenditure), Health, Power, Rural Development, Science and Technology, Space, Communications, Urban Development, Water Resources, and the Chief of the Integrated Defence Staff of the Chiefs of Staff Committee as members. The NEC as the executive committee of the NDMA is statutorily mandated to assist the Authority in the discharge of its functions and ensure compliance of the directions issued by the central government, and in preparing the National Plan and getting it approved from the NDMA and performing such other functions as may be required by the NDMA. The NEC may require a department or an agency of the government to make available human or material resources for handling threatening disasters and relief.

Powers and Functions of NEC

The NEC is the executive committee of the NDMA and is mandated to assist the NDMA in the discharge of its functions and also ensure compliance of the directions issued by the Central Government. The NEC is to coordinate the response in the event of any threatening disaster situation or disaster. The NEC will prepare the National Plan based on the National Policy on DM. The NEC will monitor the implementation of Guidelines issued by NDMA. It will also perform such other functions as may be prescribed by the Central Government in consultation with the NDMA.

2.2.3 National Disaster Response Force (NDRF)

For the purpose of specialised response to a threatening disaster situation or disasters both natural and man-made, the DM Act, 2005 has mandated the creation of a National Disaster Response Force (NDRF). The general superintendence, direction and control of this force is vested in and exercised by the NDMA and the command and supervision of the NDRF vests in an officer appointed by the central government as the Director General of the NDRF.

2.2.4 Central Government

In accordance with the provisions of the DM Act 2005, the central government will take all such measures, as it deems necessary or expedient, for the purpose of DM and will coordinate actions of all agencies. It will ensure that central ministries and departments integrate measures for the prevention and mitigation of disasters into their developmental plans and projects, make appropriate allocation of funds for pre-disaster requirements and take necessary measures for preparedness to effectively respond to any disaster situation or disaster. As drought management is a multi-disciplinary process, all Central Ministries and Departments concerned play a key role in assisting the NDMA in the discharge of its functions. While the nodal ministry for the disaster management is the Ministry of Home Affairs (MHA), the Department of Agriculture and Cooperation (DAC) in the Ministry of Agriculture (MoA) along with other departments of that Ministry is responsible for

the technical aspects of drought management.

2.2.5 National Institute for Disaster Management

The National Institute for Disaster Management (NIDM), which functions within the framework of the broad policy and guidelines laid down by the NDMA, has capacity development as one of its major responsibilities, along with training, research, documentation and the development of a national level information database. It will network with other knowledge-based institutions and assist in imparting training to trainers, DM officials, etc. It will also be responsible for synergizing research activities and will be geared to emerge as a 'centre of excellence' at the national and international levels.

2.2.6 India Meteorological Department

The IMD is responsible for the National Meteorological Service and is the principal government agency in all matters relating to meteorology, seismology and allied subjects. The IMD is mandated to:

- Take meteorological observations and provide current and forecast meteorological information for optimum operation of weather-sensitive activities like agriculture, irrigation, shipping, aviation, offshore oil explorations, etc.
- Warn against severe weather phenomena like tropical cyclones, northwesterly dust storms, heavy rains and snow, cold and heat waves etc., which cause destruction of life and property.
- To provide meteorological statistics required for agriculture, water resource management, industries, oil exploration and other nation building activities.
- To conduct and promote research in meteorology and allied disciplines.
- To detect and locate earthquakes and to evaluate seismicity in different parts of the country for development projects.

For the convenience of administrative and technical control, there are six Regional Meteorological Centres (RMCs) located at Mumbai, Chennai, New Delhi, Kolkata, Nagpur and Guawahati. Under each RMC, there are different types of operational units such as meteorological centres at state capitals, forecasting offices and agro-meteorological advisory service centres. The Drought Research Unit at Pune provides Crop Yield Forecasts. This Unit has developed pre-harvest crop yield forecasting models and issues state wise monthly crop yield and countrywide total production forecasts for major crops, based on agro-meteorological models. The rainfall legend of IMD is -19% to -59% is deficient and -60% to -99% is scanty. Further, since 2009 IMD has started issuing Drought Outlook which, based on forecast rainfall, presents a scenario of drought conditions over our country one week lead. Numerical weather prediction products like

'Probability of Below Normal Monthly Rainfall' one month in advance will be utilized for drought prediction purposes.

2.2.7 Central Water Commission

The Central Water Commission (CWC) is an apex agency in the field of water resources including flood management in India. The River Management Wing headed by the Member (RM) and ex-officio Additional Secretary to the Government of India looks after Flood Management in the country excepting the Ganga and the Brahmaputra river basins for which the GOI has created separate organisations.

CWC is monitoring reservoir storage status of 81 important reservoirs spread all over the country. Out of these 36 reservoirs have hydropower benefit each with installed capacity of more than 60 MW. On basis of the information received, the CWC prepares bulletin on storage position of reservoirs once a week. The bulletin contains information on water levels and storage available in the reservoirs. It analyses the data and the reporting is region and river basin specific. The reports give present storage and comparison with respect to normal storage which is average of the previous ten years storage. CWC is encouraging the States and other dam owning agencies to install automatic WL sensors and make the on-line transmission of data to CWC. The CWC has also installed WL and rainfall sensors fitted with telemetry equipment at some of the reservoirs and in their catchments for purposes of flood forecasting and inflow forecasting.

2.2.8 National Centre for Medium Range Weather Forecasting

The National Centre for Medium Range Weather Forecasting (NCMRWF) is the premier institution in India under the Ministry of Science and Technology (MoST) to provide medium range weather forecasts through deterministic methods and to render agro advisory services (AAS) to the farmers. The Centre offers research opportunities in numerical weather prediction, diagnostic studies, crop weather modelling and computer science.

2.2.9 National Remote Sensing Centre

The Department of Space has established a Decision Support Centre (DSC) at the National Remote Sensing Centre (NRSC) under the Indian Space Research Organisation's (ISRO) disaster management support (DMS) programme. DSC is an operational service provider for space-enabled inputs together with other important data layers for its use in disaster management by the central ministries and departments and the state governments in pre-disaster, during disaster and post-disaster phases. A VSAT based satellite communication network has been put in place for online transfer of space-enabled inputs to the concerned state and central government user departments. The DSC has the provision to mobilise aircraft for obtaining aerial data. At present, the DSC is addressing natural disasters viz. floods, cyclone, drought, forest fires, earthquakes and landslides. Besides these, it also provides support services for specific events such as tsunami impact assessment, monitoring of landslide and

manmade lakes in the remote areas of India and adjoining area of other countries.

2.2.10 National Rainfed Area Authority (NRAA)

The Government of India, set up the National Rainfed Area Authority (NRAA), under the Ministry of Agriculture in 2006, to address the issue of drought mitigation on a long-term basis. The NRAA has been set up as an institution of experts to provide knowledge inputs with reference to systematic upgrading and management of the country's dry-land and rain-fed agriculture.

The NRAA aims to infuse convergence and synergy into the numerous ongoing water conservation and watershed development programmes and monitor their implementation. It will focus on issues related to landless and marginal farmers, particularly their farming practices and livelihood systems.

The NRAA's mandate is to:

i. evolve common guidelines for all schemes of different Ministries including externally aided projects for development of Rain-fed/Dry-land farming systems;

ii. coordinate and bring convergence within and among agricultural and wasteland development programmes being implemented in rain-fed areas of the country;

iii. suggest modalities to strengthen National and State-level institutions, concerned with the Rain-fed/Dry-land areas, and establish institutional linkages with prioritized watersheds; and

iv. evaluate the effectiveness of completed watershed and concurrent evaluation of on-going programmes.

2.2.11 India Drought Management Centre (IDMC)

The 2nd Administrative Reforms Commission has recommended setting up of a National Drought Management Institute. The Government has accepted the recommendations and the DAC is considering setting up of IDMC. This Centre will be set up as an autonomous body under the DAC, which will initiate plans for its establishment.

IDMC will have adequate operational flexibility and freedom in operation and functioning to enable innovative and creative experimentation. It will have on-line access to the data/information/reports of IMD, CWC, CGWB, MoA, MoES, ICAR, NRSA and DMC of State Governments. IDMC will help in selecting appropriate drought mitigation and preparedness measures and methodologies. It will provide guidelines for implementing those measures and monitor the progress, and also undertake impact-assessment and evaluation of the response system. State DMCs and IDMC will:

- take up harmonization and reconciliation of data/information;
- supplement and complement each other;

- be responsible for providing scientific / technical support sought by the DMC and will be involved in training/capacity building of professionals/government officials; emphasize more on inter-state, national and international issues;
- provide solutions for water shortage, food shortage and malnutrition; and
- work in a mission mode approach on the lines of Incident Response System (IRS), although drought is not a incident.

2.3 State-level Organisations

2.3.1 Disaster Management Departments/Commissioners

Disaster Management departments/ Commissioners in the States deal with rescue/ relief operations during droughts.

2.3.2 State Disaster Management Authorities

At the State level, the SDMA, headed by the Chief Minister, will lay down policies and plans for DM in the State. It will, inter alia, approve the State Plan in accordance with the guidelines laid down by the NDMA, coordinate the implementation of the state plan, recommend provision of funds for mitigation and preparedness measures and review the development plans of the different departments of the state to ensure integration of prevention, preparedness and mitigation measures.

2.3.3 State Executive Committee

All state governments will appoint experts on drought management in the respective administrative training institutes. Every state government will constitute a State Executive Committee (SEC) to assist the SDMA in the performance of its functions. The SEC will be headed by the chief secretary to the state government and coordinate and monitor the implementation of the national policy, the national plan and the state plan. It will also provide information to the NDMA relating to different aspects of DM.

2.3.4 District Disaster Management Authorities

At the cutting edge level, the District Disaster Management Authority (DDMA) headed by the District Magistrate, with the elected representative of the local authority as the co-chairperson, will act as the planning, coordinating and implementing body for DM and take all necessary measures for the purposes of DM in the district in accordance with the guidelines laid down by the NDMA and SDMA. It will, inter-alia coordinate and monitor the implementation of the national policy, the state policy, the national plan and the state plan and ensure that the guidelines for prevention, mitigation, preparedness and response measures laid down by the NDMA and the SDMA are followed by all government departments at the district level and the local authorities in the district.

2.3.5 Local Authorities

These include Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs), such as municipal corporations, municipalities, district and Cantonment boards and town planning authorities for control and management of civic services and Schedule VI institutions.

2.3.6 State Disaster Response Forces

For the purpose of a specialised response to a threatening disaster situation or disasters both natural and man-made, the DM Act, 2005 mandates the creation of a National Disaster Response Force (NDRF). To augment their capacities, all state governments/SDMAs are advised to organise, from within their armed police force, adequate personnel for the constitution of State Disaster Response Forces (SDRFs) with appropriate disaster response capabilities. The NDRF will assist the State Governments in training the SDRFs.

2.4 Programmes/Schemes at the National Level

The Government policy towards drought management has changed considerably over the years and now rests upon early warning, preparedness, crisis management (Response), mitigation and long-term drought management measures in which inputs of science and technology play a significant role. A number of long-term and short-term programmes for the rural India have evolved - some of them are: the National Rural Drinking Water Programme (NRDWP), Pradhan Mantri Gramodaya Yojana (PMGY), Food for Work Programme (FWP), National Watershed Development Programme (NWDP), Mahatama Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Integrated Watershed Management Programme (IWMP), Swarna-Jayanthi Grameen Rozgar Yojana (SGRY), Swarna-jayanthi Grameen Swarozgar Yojana (SGSY), Tube Wells, Food & Fodder Development Programmes etc. under different Ministries/Departments of the Central Government and the State Governments. The Central and State Governments will consider the possibility of reorienting regular development programmes for drought relief and management. The most important programmes, which will be used for drought relief and management, are the Mahatma Gandhi National Rural Employment Guarantee Scheme and water conservation programmes supported by the Government of India. Besides, commercial, Regional Rural Banks and the Cooperative Credit sector also provide help for making available financial credit to the farmers on easy terms. The Crop Weather Watch Group at the Central level, brings in data from monitoring mechanisms for rainfall, water resources, crop – growth etc. and assess the status of these parameters on a weekly basis.

In addition to the erstwhile Calamity Relief Fund (CRF) and National Calamity Contingency Fund (NCCF) hereafter to be known as the State Disaster Response Fund (SDR Fund) and National Disaster Response Fund (NDR Fund) respectively, available with the various state governments/central government following the recommendations of the 13th Finance Commission which have

already been accepted by the Central Government and will be issuing a notification to this effect.

2.4.1 Rashtriya Krishi Vikas Yojana (RKVY)

Concerned by the slow growth in the Agriculture and allied sectors, the National Development Council (NDC), in its meeting held on 29th May, 2007 resolved that a special Additional Central Assistance Scheme Rashtriya Krishi Vikas Yojana (RKVY) be launched. The RKVY is a State plan scheme. The eligibility for assistance under the scheme depends upon the amount provided in State Plan Budgets for Agriculture and allied sectors, over and above the base line percentage expenditure incurred by the State Governments on Agriculture and allied sectors.

The RKVY aims at achieving 4% annual growth in the agriculture sector during the XI Plan period, by ensuring a holistic development of Agriculture and allied sectors. The main objectives of the scheme are to:

i. incentivise the States so as to increase public investment in Agriculture and allied sectors;
ii. provide flexibility and autonomy to States in the process of planning and executing agriculture and allied sector schemes;
iii. ensure the preparation of agriculture plans for the districts and the States based on agro-climatic conditions, availability of technology and natural resources;
iv. ensure e local needs/crops/priorities are better reflected in the agricultural plans of the States;
v. achieve the goal of reducing the yield gaps in important crops, through
vi. focussed interventions;
vii. maximize returns to the farmers in agriculture and allied sectors; and
viii. bring about quantifiable changes in the production and productivity of various components of agriculture and allied sectors by addressing them in a holistic manner.

2.4.2 National Food Security Mission (NFSM)

The National Development Council (NDC) in its 53rd meeting held on 29th May, 2007 adopted a resolution to launch a Food Security Mission comprising rice, wheat and pulses to increase the production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12). Accordingly, A Centrally Sponsored Scheme, 'National Food Security Mission', was launched from 2007-08 to operationalise the resolution.

The National Food Security Mission has three components (i) National Food Security Mission - Rice (NFSM-Rice); (ii) National Food Security Mission - Wheat (NFSM-Wheat); and National Food Security Mission - Pulses (NFSM-Pulses).

The objectives of this Mission are to:

i. Increase production of rice, wheat and pulses through area expansion and productivity enhancement in a sustainable manner in the identified districts of the country;

ii. Restore soil fertility and productivity at the individual farm level;
iii. Create employment opportunities; and
iv. Enhance farm level economy (i.e. farm profits) to restore confidence amongst the farmers.

To achieve the above objectives, the Mission would adopt following strategies:

i. Implementation in a mission mode through active engagement of all the stakeholders at various levels;
ii. Promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management including micronutrients, soil amendments, Integrated Pest Management (IPM) and resource conservation technologies along with capacity building of farmers;
iii. Close monitoring of fund flows to ensure that interventions reach the target beneficiaries on time.
iv. Integration with the district plan and fixed targets for each identified district; and
v. Continuous monitoring and concurrent evaluation for assessing the impact of the interventions for a result oriented approach.

2.4.3 National Horticulture Mission (NHM)

Recognizing the importance of horticulture sector in the growth of Indian agriculture, National Horticulture Mission, a centrally sponsored scheme approved by the Cabinet Committee on Economic Affairs, was launched by Government of India during the year 2005-06. The objective of this scheme is to provide holistic growth of horticulture sector in India and to enhance horticultural production. The programmes under horticultural research will concentrate on technology generation appropriate to specific agro-climatic and socio-economic conditions.

2.4.4 Watershed Development Programmes

A watershed is a geo-hydrological unit, which drains at a common point. Rain falling on the mountain starts flowing down into small rivulets. Many of them, as they come down, join to form small streams. It is made up of its physical and hydrological natural resources as well as human resources. Management of a watershed thus entails the rational utilization of land and water resources for optimum production while causing minimum trauma to natural and human resources.

Watershed management in the broader sense is informed by an undertaking to maintain the equilibrium between elements of the natural eco-system or vegetation, land or water on the one hand and human activities on the other hand. Watershed development provides the best environmental unit for planning a developmental programme.

The watershed development approach is an important facet of drought management initiatives, taken up through the programmes of the Government of India.

[Action: MoRD in collaboration with DAC and State Governments]

The main objectives of the IWMP of the Ministry of Rural Development and the NWDPRA of the DAC, Government of India, are to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The outcomes are prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area.

2.5. Finance Commissions

The history of funding relief expenditure is intertwined with the awards of the Finance Commissions. These Commissions are appointed under Article 280 of the Constitution of India every five years. They are mandated, amongst others things, to assess the funding needs (non developmental) of the States, and to recommend grants to the States. The Finance Commissions make recommendations on the mechanisms by which the Central Government will assist States in funding expenditure on relief. Earlier, the Commission was restricted to suggestions on the pattern of financial assistance by the Centre. Now, the recommendations also cover the "scheme of financing relief expenditure".

First Finance Commission

It was recognized that the primary responsibility of handling natural calamities like drought is vested with the States. The Central Government however, was expected to provide financial support. The First Finance Commission (1952) provided for Central assistance equivalent to 50% of the requirements for relief works. This was in the form of loans and a grant (not exceeding 2.07 crores annually per State) for gratuitous relief to the destitute. Further assistance was provided to States to handle severe natural calamities through advances.

Fourth Finance Commission

The Fourth Finance Commission introduced the system of Central Team visits to affected States. It was necessary where the Relief Expenditure on a calamity was expected to exceed Rs 92 lakhs. Emphasis was usually placed on funding relief expenditure, as far as possible, within the Plan allocations. The Central Government was expected to fund only half of the expected expenditure. Since most States in India were under fiscal stress, a need was realized to make available recurring funds to States to fund immediate relief effort in routine calamities. This was popularly known as "margin money". Each State was sanctioned a certain amount based on its past expenditure on relief. Any amounts in excess of this margin money, after severe calamities were to be assessed by Central Teams. Additional Central assistance was envisaged only, where relief requirements of a severe calamity could not be met from state resources.

Ninth Finance Commission

The Ninth Finance Commission (1991) through the CRF extended the concept of "margin money". The CRF provided for contributions of the Central and State Governments in the ratio of 3:1. This was to

avoid cash flow difficulties in initiating relief operations. The contributions of the Central and State Governments are credited twice a year. The Chief Secretary of the state operates this fund with the assistance of a committee. The CRF concept was different from margin money only in that it prescribed a larger contribution by the Central Government.

Eleventh Finance Commission

The fundamental shift was in the introduction of the 'normative approach' to relief expenditure. This approach entailed expenditure from CRF on predetermined items, at predetermined rates. This system is prevails even now, despite procedural changes suggested by later Finance Commissions. For calamities of a severe nature, where the relief expenditure could not be funded from the CRF, the Eleventh Finance Commission in 2001, created a NCCF.

Thirteenth Finance Commission

The Thirteenth Finance Commission, recently, in its report submitted to the GoI has recommended that a grant of Rs 525 crores may be allotted to the States during the fiscal cycle of 2010-15 for taking up "activities for building capacity in the administrative machinery for better handling of disaster risk response and for preparation of District and State level Disaster Management Plans (DMPs) as envisaged in the Disaster Management Act (2005). The GoI has accepted the recommendation of the Commission. The grant will be released to the States by the Ministry of Finance on an annual basis from 2010-11. Besides the recommendation of merger of the NCCF into the NDR Fund and the CRF into the SDR Fund of the respective States (which the GoI has already accepted), the Commission has also recommended that the contribution to the SDR Fund should be shared between the Centre and States in the ratio of 75:25 for general category States and 90:10 for special category States And the provisions relating to the District Disaster Response Fund (DDRF) in the Disaster Management (DM) Act may be reviewed and setting up of these funds left to the discretion of the individual States.

3 Assessment and Early Warning

3.1 Drought Assessment and Risk Analysis

National guidelines on Drought Management will reduce risk by developing better awareness and understanding of the drought and the causes of societal vulnerability. The principles of risk management will be promoted by building greater institutional capacity through the improvement and application of seasonal and shorter-term forecasts, integrated monitoring and drought early warning systems and connected information delivery systems, developing preparedness plans at all levels of governance, adopting mitigation actions and programmes, and creating a safety net of emergency response programmes that ensure timely and targeted relief.

3.2. Indicators

Drought indicators are identified from the types and the impact of drought. The impacts of drought are listed as environmental, economic or social. Among the environmental indicators one could include, rainfall, water level in the reservoirs and other surface storage systems, ground water depth and soil moisture. A robust data base that is comparable over time and progressively captures micro-level details has to be built and constantly updated. For each indicator thresholds need to be fixed contextually, to define intensity of the problem. A normal rainfall succeeding a few years of drought would not wipe out the cumulative effect the earlier droughts. On the social and economic front, data relating to trends in agricultural commodity prices, land distribution, copping pattern, changes in copping calendar, sown area, productivity, livestock density etc. have to be built and updated.

When drought begins, the agricultural sector is usually the first to be affected because of its heavy dependence on stored soil water. Soil water will be rapidly depleted during extended dry periods. If precipitation deficiencies continue, then people dependent on other sources of water begin to feel the effects of the shortage.

3.3. Drought Monitoring

Drought in the Indian region is monitored from the progress of the onset and the withdrawal of the southwest monsoon. Weather forecasts is broadly classified into three categories viz. (1) short range forecast (validity for less than 3 days), (2) medium range forecast (validity from 3-10 days), and (3) long range forecast (validity for more than 10 days). These forecasts are issued by the Indian Meteorological

Department through the All India Radio, the Doordarshan and various Newspapers. The National Centre for Medium Range Weather Forecasting in the Department of Science and Technology disseminates weather related information through its network of Agro-Met Advisory Service units located mainly in the State Agricultural universities and ICAR institutes. There is a need for establishing a centralized facility to fully realize the potential of the data base for drought management. Procedures will be streamlined to generate the information in a more objective manner, reducing the subjectivity in the interpretation of the data. The raw data along with their derivatives will be made accessible to the organizations concerned to enable decision making. Detailed project report for Integrated Agriculture Drought Management Information System has been prepared for National Informatics Centre. Maintenance of a substantial segment of such information system, monitoring and dissemination of the information is already in place in Karnataka and Andhra Pradesh.

3.4. Early Warning and Forecasting of Drought

With the launch of the Indian Remote Sensing Satellite (IRSS) in 1988 and the follow-on IRS series subsequently, the thrust has also been on remote sensing application to key sectors of development such as land and water resources management, coastal and marine resources, forest management, flood and drought disaster management etc. With the active user participation, the satellite application programme has evolved to provide vital inputs to decision making at Central and State level. The satellite derived vegetation index and wetness index information constitute the main indicators for crop condition monitoring. Ministry of Earth Sciences in collaboration with ICAR has set up 89 centres for short and medium range monitoring and forecasting of weather.

In order to overcome the limitations of drought monitoring, a project titled 'National Agricultural Drought Assessment and Monitoring System (NADAMS) sponsored by the Department of Agriculture and Cooperation and the Department of Space (DoS) was taken up by the National Remote Sensing Agency in collaboration with the Indian Meteorological Department (IMD), Central Water Commission (CWC) and concerned State Government agencies. Near realtime assessment of agricultural drought at district level for 9 States and sub district level for 4 States, in terms of prevalence, severity and persistence, during kharif season (June-Nov) and submission of monthly drought reports to the Ministry of Agriculture and State Departments of Agriculture and Relief of different States is the main focus of this project.

There is a need to use additional vegetation related parameters (derived from satellite generated products for estimation of agro-meteorological parameters such as rainfall, soil moisture and evapo-transpiration. This is important in view of low density of the network of ground-based observations available in the country.

Efforts will be made to integrate the ground-based information with the space-based information for comprehensive reporting. The role of all departments engaged in drought management will be clearly spelt out.

[Action: IMD in collaboration with NRSC; CWC; NRAA; Central Research Institute for Dryland Agriculture (CRIDA)].

There is also a need to develop ways and means to obtain soil moisture data and also the evapo-transpiration rates to forecast accurately the crop health at different phenological stages in a season. Similarly, there is a need to analyse soil samples to measure the moisture level for an assessment of actual crop conditions.

Automatic weather stations being set up by different agencies, including IMD, will also include moisture sensors for obtaining information about the soil moisture levels under natural environment. Remote sensing applications will corroborate on a weekly basis their findings on the crop health. IMD will have a dedicated webpage on drought monitoring and forecast in its web portal which will be coordinated by DRU, Pune.

[Action: IMD in collaboration with NRSC; DST; CRIDA]

3.5 Agricultural Drought

Agriculture is the first sector to be affected by drought. Within the agricultural sector, marginal and small farmers are more vulnerable to drought because of their dependence on rain fed agriculture and related activities. As a consequence, they face much greater relative loss of assets, thus widening disparities between small and large farmers. Also, as unemployment increases purchasing power decreases- credits shrink and the cost of credit increases. Consequently, the vulnerable segments are either forced to migrate, work at lower wages or live in near hunger conditions. Pressure and fear of losing social status due to drought induced poverty forces farmers to take drastic steps like suicides

In order to understand the diversity of coping strategies, it is necessary to explore the social, political and institutional factors that provide contexts for these individual perceptions. Perceptions, however, are not static and will shift over time or are expressed differently under altering circumstances. Thus perceptions of drought and the associated risks are crucial to formulate appropriate relief and mitigation policies. Perceptions also shape the responses to drought and the confusion on what drought is, which will cause difficulties in dealing with the hazard. Some of the difficulties are:

(i) Drought is perceived as a slow onset phenomenon because its onset and end are often difficult to identify;

(ii) Drought is generally viewed as a transient phenomenon. As a result, it is usually not taken seriously after the rains occur; it is considered as a calamity and managed as an event.

(iii) The direct impacts of drought such as the withering crops, dry watering points, reduced forage for livestock etc., are obvious. Second and third order effects, such as price rise,

increased food imports, surges in rural-urban migration rates, are often not recognized.

Assessment of damage expected will include agricultural production, depletion of water resources, livestock population, land degradation and deforestation as well as human health.

[Action: State DMC in collaboration with State Deparrments of Agriculture, Animal Husbandry and Water Resources; National Crop Forecasting Centre (NCFC)]

3.6. Hydrological Drought

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., stream flow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, stream flow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors. For example, a precipitation deficiency may result in a rapid depletion of soil moisture that is almost immediately discernible to agriculturalists, but the impact of this deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months. Also, water in hydrologic storage systems (e.g., reservoirs, rivers) is often used for multiple and competing purposes (e.g., flood control, irrigation, recreation, navigation, hydropower, wildlife habitat), further complicating the sequence and quantification of impacts. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of the basin. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Like an agricultural drought, this can be triggered by more than just a loss of rainfall.

3.7. Drought Declaration

Different States adopt different methodologies for drought assessment, preparation of drought memoranda, drought declaration and assessment of magnitude of relief required. The administrative units for drought declaration also differ from State to State; while some States consider 'talukas' as units, some 'mandals' and others 'districts'. The time of declaration also differs from state to state. States making drought declarations in the beginning of the season take into account

the impact of subsequent developments. The issues that need to be reflected upon in this context are listed in Table 5.

Table 5: Issues Relating to Time of Declaration

- Different criteria by different states
- Differences in Time of declaration from state to state
- Early declaration (eg. June/July)
- Improved rainfall situation after declaration in June/July not being accounted for
- Drought declaration at the end of the season – too late for relief works
- Differences in timelines of declaration.

Declaration of drought, traditionally, is recommended after the estimates of crop production are obtained through Annewari/ Paisewari. Generally those areas where Annewari/ Paisewari is less than 50 percent, the areas is considered to be affected by a drought. Final figures in respect of Kharif crops are available only in December, while those for Rabi crops are available in March.

If drought is declared as late as December or January, relief works will start only after such a declaration. It will be too late if the distress signals have appeared in the wake of rainfall deficiency. Also if the drought is declared in January or February, the Central Team would visit much after the crop is harvested and it would not be in a position to assess crop losses. To promote management of relief measures in near real time it is necessary to declare early season drought by end of July, mid season drought (growing season) by end of September and end season by November. Timely declaration in Phase 1 and 2 facilitates the commencement of interim relief measures such as crop contingency, supply of inputs etc.

Currently the crop yield assessment arising out of crop cutting experiments are the basis for the declaration of drought and intervention regarding conversion of term loans by the banks. The crop cutting experiments are conducted by the Department of Economics and Statistics. The number of crop cutting experiments is increasing and it is taking more time to arrive at the decisions relating to declaration of drought and benefits to the affected farmers through change in the loan terms and input subsidies for the subsequent sowing season.

It is possible that parts of districts which are declared as drought affected may not be facing drought. As a result some States use Bolcks/Tehsils as unit for declaring drought. Some States such as Rajasthan have used village as unit for declaring drought. This may lead to problems in implementation of drought relief measures vis-a vis neighbouring villages. There is therefore a need to standardise State specific units for declaration of drought to exclude areas not affected by drought and at the same time enable effective targeted relief measures.

Unit of deceleration of drought should be standardised and alternative methods of quicker assessment of crop yield need to be evolved so as to mitigate the impact of drought in time.

[Action: DAC in collaboration with State DMCs and NCFC]

3.7.1 Immediate Measures

With a view to ensuring timely declaration of drought, based on objective considerations, the following steps will be taken:_

i. The Drought Monitoring Cell (DMC) in the States will receive and collate the weather data from multiple sources across the state like IMD, Irrigation Department, Department of Agriculture, Ground water Department;

ii. Data on water levels in reservoirs/ tanks, ground water etc. will be received weekly from the concerned departments;

iii. This work of collection and collation at district level will be done by the existing departments and the information will be supplied to DDMA and SDMA;

iv. The data received from sub-district level through District and State level will be made available online.

The Drought Management Information System of DAC will be revamped, institutionalized and made operational with the support of State DMCs.

[Action: State DMCs in collaboration with DAC]

v. The DMC will prepare weekly status of weather and crop condition on the following indicators:

a. Rain fall deviations at taluka/block level;

b. Number and length of the dry spell at taluka/block level;

c. Progression of crop area sown at district/taluka level;

d. Satellite derived indicators such as Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI) and interpreted maps/images provided by NRSC and ISRO;

e. Soil Moisture (computed on the basis of either water balance approach or geospatial indicators);

f. Ground water availability map;

DMC will facilitate the integration of data and expertise from multiple institutions such as ICAR, NRSC, IMD, Agricultural Universities, State Departments of Irrigation, Ground Water, Revenue, Agriculture etc., to evolve a robust method for drought intensity assessment on the lines of US Drought Monitor. Once the indicators cross the defined threshold level (level to be decided by the state), the SDMA Secretariat will help in declaring drought at sub-district levels.

[Action: State DMCs in collaboration with ICAR; NRSC; IMD; SAUs; State Departments. of Irrigation, Ground Water, Revenue, Agriculture etc].

vi. Declaration of drought will be done in a timely manner preferably in three phases (1) end of July, (2) end of September and (3) end of November;

vii. Declaration in each phase will account for the beneficial effects of rainfall from the time of previous declaration and change in the agricultural situation;

viii. Interim relief measures will commence from the middle of the season;

ix. The final relief measures will be implemented after the final declaration at the end of the season;

x. After declaration of the Drought, the SDMA Secretariat will take steps to approach the Centre for financial and other assistance;

xi. The DMC as a part of State Disaster Management Authority will work in close coordination with State Departments of Revenue, Agriculture, Ground water, Irrigation, Science & Technology for pooling the data and expertise;

xii. The network of the Revenue and Agriculture Departments will be effectively used for collecting the information on crop sown areas, rainfall and crop yield data and for integrating then with DMC data base; and Regional climate models which improve the drought prediction and forecasting, to enable forewarning of drought and preparedness and agro advisories to minimize the impact of drought will be developed and disseminated.

4 Prevention, Preparedness & Mitigation

4.1 Prevention and Preparedness

Prevention and Preparedness means pre-disaster activities designed to increase the level of readiness and improvement of operational and institutional capabilities for responding to a drought. Drought prevention and preparedness involve water supply augmentation and conservation (e.g. rainwater harvesting techniques), expansion of irrigation facilities, effective dealing with drought, and public awareness and education. Transport and communication links are a must to ensure supply of food and other commodities during and just after a drought. Successful drought management requires community awareness on the mitigation strategies, insurance schemes for farmers, crop contingency plans, etc.

Basic to drought management in the Indian context is the delineation of drought prone areas. At the block level, the following indicators are generally used.

4.1.1 Drought Prone Area Delineation (Block/Mandal)

Criteria and data base

i. Rainfall (long term average - 30 to 50 yrs) (Short Term average – 5 to 10 yrs for giving real picture as rainfall pattern may change over the period for e.g. Cherapunji);
ii. Cropping pattern (past 3 to 5 yrs);
iii. Available supplement irrigation (well, tank, ponds, ground water etc.);
iv. Satellite derived indicators (last 10 years);
v. Soil map;
vi. Ground water availability map;
vii. Cattle population and fodder demand;
viii. Socio economic data;
ix. Other water demands like for drinking, industrial use etc.; and
. Collection and creation of data base and spatial framework for analysis

4.1.2 Gradation of Drought Prone Areas (High, Moderate, Low): Areas should also be graded on the basis of degree of drought proneness since it would affect the steps required for greater preparedness. This would require multiple criteria approach that includes

i. Sensitivity to Rainfall Variation;
ii. Frequency of Occurrence of Drought; and
iii. Vulnerability of Community (people and livestock) to Drought

4.1.3 Monitoring of Drought

Having delineated drought prone areas and their gradation one could move on to the criteria for monitoring relevant indicators. The monitoring indicators will be:

i. Rainfall and other associated weather parameters;

ii. Crop health (based on satellite derived NDVI and field reports);

iii. Available ground water (variation in ground water table) and surface water resources; and

iv. Migration and impact on community;

4.1.4 Observational Network

For such monitoring one would require reasonably dense observational network.

i. Automatic weather station (25 km X 25 km);

ii. Automatic rain-gauge (5 km X 5 km);

iii. Ground water table observation (5 km X 5 km in hard rock region and 10 km X 10 km in alluvial plains);

iv. Field report from block / mandal level; and

v. Satellite data of 50 m X 50 m resolution

There is a considerable gap between the existing and desired meteorological and hydrological monitoring network. The efforts put in by IMD and CWC will be supplemented and complimented by the State Governments. For a comprehensive drought management on regional and all-India scales, present day information and communication technologies will play a major role in supporting integrated and non-intrusive approach for tackling multi-faceted problems posed by the threat of drought.

Drought assessment basically starts with rainfall measurement. The spatial and temporal variability of rainfall is very high in the semi-arid and arid areas prone to drought. The Committee constituted by the Department of Agriculture and Cooperation on "Drought and Desertification" have recommended a rain gauge for every 40 sq.km. However, it is felt necessary to have a rain gauge for every 25 sq.km. The rainfall data not only needs to be accurately measured and recorded once in a day but required to be measured more frequently within a day and transmitted on real time basis. Telemetric rain gauges are useful in not only recording real time rainfall data but also transmitting the same to data centre which enables near time analysis. . The availability of real/near real time rainfall/ weather data makes it possible to develop early warning systems. The digital data obtained from telemetric rain gauges enables not only efficient data base management but also in developing and operationalizing early warning systems and development of meteorological, agricultural and hydrological models which provides decision support tools.

Automatic weather stations and rain-gauges will be put in place at appropriate places to enable micro level analysis and forecasting.

[Action: State Government in collaboration with CWC, DST, NRSC].

4.1.5 Medium Range Weather Forecasting for Community Level Advisory

Numerical weather prediction has emerged as one of the important discipline requiring increasing computing power. To have accurate timely forecasts, state-of-art computers are used all over the world. Currently forecasting in India suffers from following constraints:

i. The information is too general in terms of space and time while forecasting needs are at local level;

ii. The timing does not match user needs;

iii. Information received from different sources transmit conflicting messages; and

iv. The language is not clearly understood by users.

State DMCs will harmonize the current/ ongoing efforts by various knowledge centres at the national and international levels.

[Action: State Governments in collaboration with NRSC; IMD].

4.2 Climate Change and Drought

Forecasting weather related information could become more complex with climate change. After several years of deliberation, the Intergovernmental Panel on Climate Change published the first volume of its 4th Assessment Report. The debate will now shift from the reality of climate change to the reaction to climate change. There are two sets of questions to consider: how serious do we expect climate change to affect different parts of India; and how resilient will the society be in its response.

Climate change and agriculture are interrelated processes, both of which take place on a global scale. Global warming is projected to have significant impacts on conditions affecting agriculture, including temperature, carbon dioxide, glacial run-off, precipitation and the interaction of these elements. These conditions determine the carrying capacity of the biosphere to produce enough food for the human population and domesticated animals

In 2008 India released the National Action Plan on Climate Change. The plan "identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively," and outlines existing and future policies and programs addressing climate mitigation and adaptation. The plan identifies eight core "national missions" running through to 2017.

One of the Missions, the National Mission for Sustainable Agriculture will devise strategies to make Indian agriculture more resilient to climate change. It will identify and develop new varieties of crops and especially thermal resistant crops and alternative cropping patterns, capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability.

Climate change issues spread cross sectors and represent an additional stress on ecological and socioeconomic systems due to decrease in yield of cereal crops and enhanced

risk of natural disasters. Rise in temperature and change in humidity will also adversely affect human health due to increased vector borne diseases, heat stress and other communicable diseases.

4.3 Mitigation

Mitigation actions, programs, and policies are implemented during and before drought to reduce the magnitude of risk to human life, property, and productive capacity. Emergency response will always be a part of drought management, because it is unlikely that government and others will anticipate, avoid, or reduce all potential impacts through mitigation programs. A future drought event will also exceed the "drought of record" and the capacity of a region to respond. However, emergency response will be used lesser and only, if it is consistent with the longer-term drought policy goals and objectives.

Considering the increase in the frequency of droughts in different parts of the country, it is necessary that there is a shift in public policy from drought relief to drought mitigation measures. These measures are important for adapting to climate change, restoring ecological balance, and bringing development benefits to the people.

The services of Village Resources Centres being established by Indian Space Research Organization (ISRO), ICAR, State Agricultural Universities and other Organizations, will be effectively used towards management of droughts.

[Action: ISRO in collaboration with SAUs and ICAR]

Given the severity of drought in dry areas, a central challenge for researchers is to devise technologies that lend greater resilience to agricultural production under this stress system. One way in which they have responded successfully to the challenge is by developing varieties of major food crops that are drought tolerant or escape drought through early maturity.

Large scale research will be conducted through the university system to evolve drought resistant crop varieties.

[Action: SAUs in collaboration with CRIDA, NRAA]

These mitigation measures are related to integrated soil, water and forest management, and will form part of soil conservation, watershed development and forestry programmes.

The mitigation measures to be taken will include:

i. Conduct of pilot studies in all categories of drought prone areas for suggesting long term mitigation measures.

ii. Convergence of lessons learnt from studies carried out by CRIDA, International Crop Research for Semi-arid Tropics (ICRISAT), IMD, NRSC, ICAR, and other institutions.

iii. Cloud-seeding as a possible measure of mitigation will be considered.

[Action: Indian Institute of Tropical Meteorology (IITM) in collaboration with SAUs; CRIDA].

iv. Measures for reducing the impact of climate change on drought.

[Action: National Institute for Abiotic Stress Management, ICAR in collaboration with MoEF].

On-farm water management, defined as a systems approach towards controlling water on a farm in a manner that provides for the beneficial management of water for satisfying the irrigation and drainage needs, consists of components such as irrigation, drainage, water sources and sinks etc. Each component must be selected and operated in accordance with the needs and limitations of the other components.

On farm reservoir (OFR) technology in Chhattisgarh, Orissa and Jharkhand created major impact on drought management during the kharif season and the technology will be included in the drought relief programme. Practices such as, harvesting cereal crops for fodder, supplemental irrigation if feasible, and ensuring availability of seeds when alternative crops are beneficial with logistic support from state and district machinery will also be explored.

4.3.1 Judicious use of surface and groundwater

In drought prone areas rainwater is the main source of surface and ground water recharge. Because of more intense use of ground water in most parts of the country during the last few years, recharge of ground water did not take place. The early decade of 1990-2000, witnessed many advances in the airborne instrumentation, radars, flares and software. Water management issues of current concern, therefore, are: (a) less exploitation of groundwater for irrigation, (b) increased concentration of salts in the soil profile and groundwater, (c) increased concentration of specific ions like fluorides and nitrates in water and (d) lack of availability/ reduced availability of drinking water for animals in natural storage structures such as ponds, lakes etc.

Immediate steps are needed to make efficient use of available surface and groundwater in drought prone areas - resorting to drip and sprinkler practices wherever possible, particularly for commercial crops including fruit orchards. Construction of water shed structures at the right place where water recharge can be enhanced will be used for life saving irrigation at critical stages of crop growth and during drought situations.

4.3.2 Cloud seeding in Drought Prone regions of India

The South African cloud seeding experiment was carried out during 1991-1995 with new technology. The results showed statistical increase in rainfall in all types of clouds (i.e. small to large). This gave impetus to cloud seeding research in different parts of the globe.

The interior part of peninsular India is a rain shadow region. The seasonal monsoon rainfall in these areas is lower compared to all India mean monsoon rainfall. The rainfall

Pioneering Efforts

In India, attempts in the field of rainmaking were made by Tata firm in 1951 over Western Ghats using ground based silver iodide generators. Cloud seeding was attempted in 1952 with salt and silver iodide by means of hydrogen filled balloons released from the ground. The committee on the Atmospheric Research of the Council for Scientific and Industrial Research (CSIR) recommended in 1953 that a rain and Cloud Physics Research (RCPR) Unit be set up for undertaking extensive scientific studies on cloud physics and rainmaking. RCPR conducted long term cloud seeding programme over north India using ground based salt generators during the period 1957-1966. The results showed an increase in rainfall by 20%. RCPR later became part of IITM. IITM conducted similar experiments over Tiruvallur (state of Tamilnadu), during 1973, 1975-1977. The seeding experiments were also done over Mumbai in the monsoon seasons 1973 and 1974. In the same years IITM carried out cloud seeding operations over Rihand 4 catchments in the state of Uttar Pradesh. In 1975, operational programme of cloud seeding was conducted over Linganamakki catchment area in the state of Karnataka. IITM carried out cloud seeding experiment over Baramati region of the Maharashtra state during the period 1973-74, 1976, and 1979-86.

variability is larger. The region is drought prone. In the prolonged monsoon-dry conditions, there are demands for the cloud seeding operations from the state governments. The cloud seeding programs with modern technology have been carried out by state governments of Karnataka, Andhra Pradesh and Maharashtra since 2003. The State Government of Andhra Pradesh, during 2003, in the context of erratic rainfall and prolonged dry spells, launched a cloud seeding programme to induce rain in the drought-hit Anantapur district. Two earlier experiments had been conducted in Rangareddy and Anantapur districts of Andhra Pradesh in the early 1990s. This was done again in 2007. An NGO in Karnataka carried out cloud seeding during the drought spell period of 2008. Cloud seeding does not produce rain. It enhances rainfall which otherwise would have fallen in area. The efficacy of the cloud seeding is debated as it is not often supported through properly designed experiments. The experimental requirements are to be considered in the cloud seeding programmes. Both guidelines and research relating to cloud seeding are needed. Claims concerning the efficacy of cloud seeding as a positive intervention need to be validated through more studies, as there is no conclusive evidence that cloud seeding is actually effective in producing rain. However the fulfilment of experimental requirements involves not only higher cost but high scientific skills. IITM, and CSIR (CMMACS) have taken up experiments to assess the efficacy of cloud seeding.

It is necessary to take up more experiments in the country to assess the aerosol characteristics, suitability of nuclides for cloud seeding and alternative types of cloud seeding – (ground based or aerial, warm or cold cloud seeding etc). A cloud seeding policy needs to be formulated at National level and State level for creating required environment to regulate these measures.

[Action: IITM in collaboration with State DMCs; DAC]

4.3.3 Micro Irrigation Systems

The overall development of the agriculture sector and the intended growth rate in GDP is largely dependent on the judicious use of the available water resources. While the irrigation projects (major and medium) have contributed to the development of water resources, the conventional methods of water conveyance and irrigation, being highly inefficient, has led not only to wastage of water but also to several ecological problems like water logging, salinisation and soil degradation rendering productive agricultural lands unproductive. It has been recognized that use of modern irrigation methods like drip and sprinkler irrigation is the only alternative for efficient use of surface as well as ground water resources. The DAC in 2006 launched a Centrally Sponsored Micro Irrigation Scheme under which out of the total cost of the MI System, 40% will be borne by the Central Government, 10% by the State Government and the remaining 50% will be borne by the beneficiary, either through his/her own resources or soft loan from financial institutions. The evapo-transpiration losses could be minimized and crop yield optimized by micro-irrigation systems.

The State Departments of Agriculture and Agricultural Universities will therefore:

i. promote cultivation of crops under crop diversification through sprinklers/drip irrigation systems;
ii. promote protective irrigation through micro irrigation systems through incentives; and
iii. advise on the cropping systems to be covered under protective irrigation through appropriate micro irrigation systems.

[Action: State Departments of Agriculture in collaboration with SAUs]

4.3.4 Post Harvest Management

India suffers an estimated food grain and agriculture produce loss of Rs 50,000 crores every year due to the lack of adequate post harvest infrastructure and inefficient supply chain management by the country's farmers. India loses about 35-40% of the fruits and vegetable produce due to improper Post Harvest Management. A loss estimated at Rs 40,000 crores per year! India wastes fruits and vegetables every year equivalent to the annual consumption of the United Kingdom. To avoid the Post Harvest Losses a chain of cold storages, need to be created along with Post Harvest Management practices like pre cooling, cold storages and refrigerated transport. Pre-harvest losses due to diseases and pests need to be minimized through better management practices. In the absence or lack of proper pre and post harvest crop management the impact of drought gets compounded.

The strategy of procurement, storage and distribution of food grains entail multiple benefits to the society. Food security has always been the biggest concern of the mankind and is a prime agenda for the developing world including India. Thus there is an urgent need for more scientific and targeted management of the agricultural and food sector. Inadequate

storage facilities incapacitate the governments in procurement and distribution. Substantial improvements in storage facilities and prevention of post harvest losses should therefore be the crucial elements in meeting the challenges.

4.3.5 Nutritional Aspects of Food Security

The nutritional aspects of food security will be addressed by the Government through schemes like the Integrated Child Development Service (ICDS) and Mid-Day Meal scheme. The ICDS is implemented for pre-school children, while Mid-Day Meal has recently been introduced for school-going children. Since school dropout rate is high in drought affected areas, ICDS and Mid-Day Meal Scheme will be expanded to cover children out of school.

4.3.6 Water Conservation, Storage Structures and Management

Water harvesting and conservation is very effective, as during the period of water resource depletion, the drought affected area still has significant potential for harvesting and conserving water if an integrated water resources management approach is adopted, and proper policies and investment actions are implemented using recent technologies. Drought mitigation measures have been of late more on issues related to water resource management. The scarce water resource during the drought period requires to be managed optimally. The requirement will be scientifically assessed by the State water resources departments and its subordinate offices. Water Conservation measures have been taken up on large scale by the Government. The initiative will be public driven program with incentives from the Government. Water conservation and management measures have to be prioritized during droughts. In areas facing successive hydrological droughts, regulatory measures to desist from cultivating heavy duty crops may be considered. Closing of the sluice gates of minor irrigation tanks and conserving water to provide drinking water to the livestock needs consideration in case of hydrological droughts. Water User Groups have to be promoted and water conservation measures have to be taken up through consultative approach.

Water management has to be practiced through decision support information obtained from hydrological models. Water budgeting models have to be developed at watershed level and community at the PRI has to be provided with information on availability, demands and management/conservation options for practicing appropriate measures based on the degree and intensity of prevailing drought situation. The monitoring of the efficacy of the watershed treatments through pre and post treatment satellite imageries needs to be taken up.

Farmers will be encouraged to apportion at least 1% of their land holding for digging farm ponds. This will have a salutary effect not only on tiding over the periods of drought due to lack of direct water availability but also help in recharging the ground water table country wide. A definite cropping plan will be designed for late sown crops with short duration varieties.

4.3.7 Availability of Inputs

There is a need to ensure their timely availability of inputs with competitive prices so as to increase production and productivity and thereby enable agriculture to be the springboard for industrialization. Arrangements will be made through institutional agencies in the States like State Seeds Development Corporations (SDC), Marketing Federations (MARKFED), and Cooperative Oil Federations (OILFED).

Credit will be provided promptly in the drought affected areas, and marketing and price support extended.

[Action: Regional Rural Banks (RRBs) in collaboration with Gramin Co-operative Banks; National Bank for Agriculture & Rural Development (NABARD); State Governments].

4.3.8 Afforestation with Bio-diesel species

Forests are one of the most important natural resources that provide fuel, fodder, small timber, food and income to the tribals and the rural poor. In addition to forest conversion for human activities, permanent and shifting agriculture, and development purposes, illegal logging and forest fire are two major causes of deforestation.

The degradation of forests due to various reasons like deforestation for shifting cultivation, over exploitation of Non-Timber Forest Produce has resulted in disappearance of roots and tubers in Anantapur District of Andhra Pradesh, and has affected the nutritional standards of the population. According to the statistics of the Forest Department, Government of A.P., for the year 2001, 19.49 million hectares of soil has been eroded due to deforestation.

According to the 10th Plan document of Planning Commission relating to the Forests and Environment sector, the National Afforestation Programme (NAP) Scheme was initiated by scaling-up the Samnavit Gram Vanikaran Samridhi Yojana experience and converging all afforestation schemes of the 9th Plan period to avoid duplicity or redundancy, and at the same time keeping in focus the decentralization agenda of the government. NAP is being operated as a 100% Central Sector Scheme. The NAP and other state's afforestation programmes should work in tandom.

Through afforestation with bio-diesel species the land goes into forestation which would act as sink to the CO_2 emitted by the use of bio-diesel reducing the actual CO_2 emission. The term bio-fuels describe fuel components produced from biomass, such as plants, straw or waste paper.

Afforestation with subabul, seemaruba, casurina, eucalyptus and bio diesel plantation like jetropha and pongomia will be encouraged.

[Action: State Forestry Dept.in collaboration with MoEF]

4.3.9 Public Distribution System

Currently, a targeted Public Distribution System with special focus on the groups living below the poverty line is in operation in the country. The Public Distribution System (PDS) is a scheme under which essential requirements,

i.e., food grains and certain other non-food products are supplied to persons at subsidized costs through fair price shops (FPSs). In 1992, a revamped public distribution system (RPDS) came to be introduced and the RPDS was replaced by a Targeted Public Distribution System (TPDS) from June 1997. In this system, allocation of food grains is made to States on the basis of the number of persons living below the poverty line. The TPDS has the main object of ensuring that essential commodities are accessible to households which are BPL and to the 'poorest of poor' sections thus promoting household food security amongst economically poor sections. Efficient functioning of the PDS is a valuable component of drought management.

4.4 Crop Insurance

An important instrument to combat the adverse financial impact of droughts on the farmers is agricultural insurance. Though the agricultural insurance schemes have not been very successful, the GoI has taken several initiatives towards increasing its coverage and reach. An All-India Comprehensive Crop Insurance Scheme (CCIS) for major crops was introduced in 1985. It was subsequently replaced by the National Agricultural Insurance Scheme (NAIS) in 1999. The GoI also set up the Agriculture Insurance Company of India (AIC) in 2003 to serve the needs of farmers better and to move towards a sustainable actuarial regime. As the coverage of agricultural insurance in the country increases, insurance schemes for drought protection will become more viable.

Insurance products will be developed for different agro-climatic zones providing coverage against drought. The Central/State Governments will promote in these zones, agricultural insurance programmes and ensure that farmers are informed about the availability of insurance products and educate them about the need for managing their yield and income risks through insurance coverage. Therefore:

iv. Focus of the Government on crop insurance will continue and role of agriculture insurance company will be widened.
v. Weather insurance will be promoted for crops not having data base on productivity. Government will set up automated weather stations where necessary.
vi. The scope of the National Agricultural Insurance Scheme (NAIS) will be widened to include pre-sowing and post harvest losses.
vii. Awareness will be enhanced with reference to crop insurance through state departments to improve coverage.
viii. Price fluctuations will be stabilized by strengthening links of farm products with agro-based industries.
ix. Price linked insurance products will be promoted to avoid distress sales of farm produce.
x. The use of satellite derived crop condition images as surrogates to crop yield estimates will be explored to facilitate for settlement of insurance claims.

[Action: Insurance Regulatory Development Authority (IRDA) in collaboration with DAC, NABARD, Commercial Banks; State Cooperative Banks and RRBs].

5 Capacity Development

5.1 Capacity Building

Human Resource Development, Training, Education and Capacity Building are essential components of the strategy for effective Drought mitigation and management. The objective of Capacity Building is to put in place a systematic functional mechanism with trained human resources. It has to be understood with a broad perspective to include Knowledge, Skill, Attitude and Resources in an integrated manner.

A realistic national training and capacity building programme for drought management will be formulated and implemented. A programme of resource enhancement encompassing all institutions/ organizations/ individuals will also be developed.

[Action: NIDM in collaboration with National Institute of Agricultural Extension Management (MANAGE); National Institute of Rural Development (NIRD); Administrative Training Institutes (ATIs)]

Capacity Building is a long-term phenomenon which has to be at the policy, implementation, Institutional and individual levels. It also includes development of appropriate tools that will be used to convey useful information pertaining to drought. Capacity development generally encompasses various layers of governance by the central and state governments, district administration, local authorities, PRIs, ULBs and NGOs. Capacity Building will address the needs of all the target groups of government functionaries. Components of the multi-layer capacity development framework include training, techno-legal framework, knowledge management and developing organizational/ institutional and individual capacities.

5.2. National Training and Capacity Building Programme

The DM Act (2005) mandates the NDMA to provide direction and coordination to ensure the implementation of all disaster management policies and plans. Therefore, a major part of activities of the authority is also related to strengthening training and capacity building interventions for an effective drought mitigation and management in India.

Training is the most important, essential and central activity of all capacity development programmes. Training needs have to be identified and appropriate training programmes are to be designed and conducted at all levels and involve the entire spectrum of stakeholders (from government/NGOs and community) to fully address the needs of sensitization, knowledge/information management and skill

development of the DM functionaries in particular.

The target groups identified for training and capacity development will include government officials, scientific and technical institutions, legislators, PRIs, ULBs, NGOs and Community Based Organisations (CBOs) etc.

Organizations have different roles to play in training and capacity building. The state governments in the drought prone States like Andhra Pradesh, Gujarat, Karnataka, Rajasthan have their own specialized institutions which play an important role in various aspects of Research & Development, Training and Capacity building for managing drought. But no single agency has all the requisite expertise, infrastructure and other resources. Hence, there is a need for both coordinating and networking with these organizations and Institutions, as well as outsourcing of R & D and training.

In recent years, several research organizations have been set up that take up work on contractual basis. These organizations offer services such as farm and commercial green house development. Such focussed and result oriented research process will be strengthened and supported in the future.

Agricultural universities and National Research Centres of ICAR will be encouraged to undertake contractual research for industries/farmers as a means of revenue generation and providing solutions to immediate problems.

[Action: SAUs NRCs (ICAR) in collaboration with NRAA and ICRISAT]

5.3 Training in Drought Management

Training Needs Assessment (TNA) of drought management is not carried out properly and seldom, the training needs are identified. Training is an integral part of capacity building as trained personnel respond much better to initiatives. The performance of the personnel will be improved by appropriate, need based training at various levels in all Government departments, organizations and institutions.

Training and Capacity Building is also needed for all CBOs/NGOs and other private institutions/organizations involved in drought mitigation and management. Educational and training institutions will impart training in drought coping and management strategies. Special focus will be given to water resources , crop and soil management.

The ATIs and other institutions will take up pilot projects in a participatory mode with agricultural universities and organizations to undertake research in various aspects of drought management to establish synergy between various aspects of drought including science institution, policy, socio-economic, legal, water, soil, environment and ecology related issues.

[Action ATIs in collaboration with State DMCs; IDMC (DAC); CRIDA; SAUs]

5.3.1. Training of Trainers

There is an acute shortage of qualified and experienced trainers and at the same time there is also a good deal of demand for training various cadres of government servants in

Drought Management and Mitigation in all the States.

Identification of stake holders at various levels in all the relevant government departments and organisations like NGOs and CBOs is required. Since the number of personnel to be trained is very large, a pool of trainers will be developed at district and mandal level to facilitate decentralized training.

Efforts will be made to fill the gap between the requirement and availability of qualified and experienced trainers conversant with natural hazards, especially with drought mitigation and management techniques.

[Action: NIDM in collaboration with ATIs; MANAGE; State DMCs].

5.3.2 Identification of Training Needs

Since the scope and area of Training Needs Assessment (TNA) of drought management is wide spread and many Government Departments and Organizations are involved in Drought Management, there is an urgent need to undertake scientific assessment of Training Needs in Drought Management. Such exercises will be undertaken periodically.

TNA will in the future, take cognizance of the need to develop competent, resourceful and responsible personnel and strengthen their capacity to work in disaster situations through the delivery of continuous, competence based training. Necessary budget will be provided by each department. All the training programmes will be evaluated to assess their effectiveness.

[Action: NIDM in collaboration with Central Ministries/Departments involved; State DMCs; ATIs; MANAGE]

In the absence of detailed training needs assessment in drought management, one could consider a possible list of areas of intervention for training and capacity building in drought management as listed in Table 5.

Table 5. Specific Areas for Training & Capacity Development

i. Natural resources management with specific focus on water conservation and management, watershed development, creation and revival of water bodies
ii. Credit, insurance, micro-finance, alternate occupations/ enterprises/ cottage industry
iii. Post harvest and value addition
iv. Financial, social, legal rules and regulations
v. Use of information technology and remote sensing applications
vi. Monitoring & Evaluation
vii. Special training for elected public representatives and politicians
viii. Synergy between departments and institutions
ix. Ground water recharge management options
x. Use of micro-irrigation and supplement irrigation using harvested water
xi. Re-vitalising of existing facilities, de-silting of tanks, repairs etc.
xii. Livestock development and management and breed improvement

xiii. Agro forestry, farm forestry and dry-land horticulture
xiv. Contingency plan for Agriculture
xv. Drought assessment, prediction and weather based agro-meteorology
xvi. Employment generation schemes

5.3.3. Training Action Plan

The NIDM Administrative Training Institutes (ATIs) and NDMA will take up the responsibility of training all the relevant government personnel from all central ministries and departments and state governments on different aspects of Drought management. These organizations will evolve an action plan jointly in collaboration with the state ATIs and other institutions to offer a comprehensive curriculum on drought management in the form of training modules for various target groups. They will design training programmes and prepare course material, reading material and trainers' material etc., with the help of Agricultural Universities, Scientific and Technical institutions and other knowledge based institutions. All such training programmes will include evaluation and certification of trainers and trainees.

[Action: NIDM in collaboration with ATIs; State DMCs; SAUs; DST; NDMA; MANAGE]

5.3.4. Training of Professionals/ Government officials

Drought management and mitigation is a multi-dimensional and multi-sectoral activity and therefore, requires specific professional inputs. Professional training in drought management will be made an integral part of all foundational and professional courses being conducted in all the ATIs. Specialized courses for drought management will be developed and implemented exclusively for government officials and specific target groups.

The ATIs and NIDM in consultation with reputed knowledge institutions on Drought Management will develop comprehensive programmes for creating trainers from among the faculty members of ATIs, Agriculture and Animal Husbandry Departments and other professionals. The state governments/ATIs will identify potential trainers and design and develop training programmes for different levels of participants. These training programmes will be critically evaluated at regular intervals, upgraded, modified based on evaluation and feedback from the participants and these will be documented.

[Action: ATIs in collaboration with NIDM; State DMCs; State Dept. of Agriculture; State Dept. of Animal Husbandry; MANAGE]

5.3.5. Institutional Upgradation

A mechanism will be developed to identify institutions involved in the field of drought management, assess their capabilities, and enhance and strengthen their capacities in terms of expertise, knowledge and resources. The main areas requiring capacity development in the context of drought management are:

i. establishment of a nation-wide, systematic, and scientific institutional mechanism;

ii. enhancement of expertise and capacities of knowledge centres in different parts of the country covering all drought prone regions; and

iii. strengthening of a few identified institutions, their units and departments in all States and union territories,

PRIs and ULBs will ensure capacity building of their officers and employees in DM to carry out relief, rehabilitation and reconstruction activities in the affected areas in consonance with the State Plan.

[Action: NIRD in collaboration with State Institutes of Rural Development SDMAs and DDMA]

All organizations, institutions, officers, and other personnel involved in drought management operations have to draw upon knowledge of best practices and resources available to them NIDM/SAUs/ATIs must be involved in a big way in Drought management Training and Capacity Building activities.

ATIs, NGOs, PRIs and ULBs will be encouraged to take up awareness programmes on drought management consisting of sensitizing the farmers, communities and other stake holders at house hold level, community level in rural and urban areas and organizational/ institutional level on a large scale. These programmes will be sustained through constant updating of knowledge. Best practices, traditional knowledge, indigenous wisdom, practices etc. needs widespread dissemination.

[Action: ATIs in collaboration with PRIs; NGOs; ULBs]

5.3.6 Strengthening of Administrative Training Institutes (ATIs)

Training programmes conducted for government personnel involved in drought management and conducted at the national level by the NIDM and at the State level at the DMCs operating within the State ATIs is inadequate. Presently, 29 ATIs are functional in the country to provide the necessary training to government personnel. The number of training and awareness programmes on Drought management is abysmally small. Hence, there is a need to strengthen these ATIs and the NIDM by providing specialized training, to the training faculty of these institutes.

Capacity building will not be limited to professionals and personnel involved in disaster management but will also focus on building knowledge, attitude and skills of the community to cope with the adverse effects of drought. Capacity building for effective drought management needs to be grounded and linked to the community and local level responders on the one hand and also to the institutional mechanism of the State and the Nation on the other hand.

The Ministry of Agriculture will establish a dedicated faculty in selected ATIs/ Organizations exclusively for Research and Training in Drought Management by instituting chair positions. The funds allocated by 13th Finance Commission for capacity building will be utilized for this purpose.

[Action: DAC in collaboration with NIDM; State DMCs; ATIs; MANAGE]

Training modules will be prepared in areas indicated earlier in Table 5. In absence of TNA, tentative contents of the modules are elaborated in Table 6, which will serve as a starting point.

5.4. Education

Education plays a significant role in drought management and research/innovations. Interdisciplinary subjects like ecology and

Table 6: Training and Capacity Development in Drought Management

Department	Specific areas for capacity building
Agriculture	Agricultural practices, farming methods, Agricultural inputs, Extension services, Seeds supply, Demand management of seeds for contingent crop planning and promotion of I.D. crops, Mechanization of Agriculture, Promotion of Drought resistant crops, Water conservation
Agro-Industries	Training of rural youth for custom hiring, farm mechanization, post-harvest, value addition, etc.
Animal Husbandry	Animal rearing, Poultry, Fisheries, Horticulture, Improving the area under cultivation in fallow lands (CPRs) for fodder production. Promotion of chaff cutters to avoid wastage.
Banking	Strengthening of SHG-Bank linkages, Loans for farming & allied activities, Risk coverage
Forest	Value addition of forest products, Alternate livelihoods, Aforestation Programmes, Prevention of soil erosion, Pollution control
Ground water	Ground water conservation, water supply storage and distribution, , Awareness creation through participatory ground water monitoring, Recharging dried up Ground water systems, Increase Water use efficiency
Health	Awareness on sanitation, health and hygiene, Nutritional status, Socio-psychological aspects, Counselling
Horticulture	Popularization of dry-land horticulture and micro-irrigation technique, training of rural youth. Self employment schemes
Insurance	Coverage of all rain-fed crops, Risk coverage for less than average low yield/ low productivity/ and farmer-friendly mechanism
Irrigation	Creation of awareness about availability of water in advance for crop planning .Improving Irrigation efficiency
Panchayati Raj	Awareness, preparation and implementation of action plan for drought proofing in participatory mode. Supply of drinking water from safe source. Gruel centres in years of drought.
R&D	Awareness creation about drought proofing mechanism, fore-warning documentation, training, research, etc.
Disaster Management/ Revenue (Relief)	Drought declaration, Criterion for Drought declaration, Drought monitoring and evaluation, Electronic data base creation and management for taking up drought proofing measures
Rural Electrification	Coverage to all areas, Correct Voltage regulation, Assured power supply with proper voltage during day time without any interruptions.

environmental science that have the characteristics to accommodate the knowledge and skills of various natural, social and agricultural sciences and promote specialization modules on drought management will be widely encouraged and made popular .

ICAR will update the syllabi of graduate and under-graduate courses in agriculture to include drought management.

[Action: ICAR in collaboration with SAUs and NDMA]

NDMA has taken initiatives to integrate and institutionalise DM education into the formal systems of education and develop nationwide culture of prevention by introducing the DM aspects in curricula of courses that cover arts, sciences and commerce and professional disciplines. As a beginning of the process of imparting DM concerns into activities of educational institutions discussions are being carried out with Ministry of HRD. The subject of social sciences as taught in class VIII and IX of secondary schools contains specific chapters on disaster management. NDMA is in further contact with the department of HRD/University Grant Commission (UGC) to introduce advanced capsules of DM in the courses of Civil Engineering & Architecture throughout the country.

To introduce DM capsules in the higher education streams of Humanities, Law, Sciences & Engineering and Architecture Ministry of Human Resource Development has formed a committee. ICAR has recently introduced DM at Under Graduate level.

UGC will encourage universities under their new and innovative educational programmes for setting up Centres for Disaster Management to foster research in disaster management. Higher Education Department Ministry of Human Resource Development (MOHRD) would make a request to the UGC to accord priority to such proposals.

[Action: UGC in collaboration with ICAR and SAUs]

Curriculum development with a focus on dissemination of disaster related information on a sustained basis, covering junior, middle and high schools will be worked out by the different school boards in the country. Disaster related curricula have already been introduced in class VIII, IX and X levels in Central Board of Secondary Education (CBSE) schools.

The education boards of all the States will also develop similar contents in their curricula. Invariably, a chapter on drought mitigation will be included in the curricula under the subject of environment science in all classes from 8th standard onwards. Invariably, a chapter on drought mitigation will be included in the curricula under the environment science in all classes from 8th standard onwards. The development of high-quality educational material, textbooks, field training, and a high standard of teaching at all levels will be given due emphasis. Education and training programmes will be designed with greater focus on the development of the capacity and skills of trainers and teachers. The central and state governments will encourage knowledge institutions to undertake research, teaching and training, in drought mitigation and management.

[Action MOHRD in collaboration with State Boards of School Education (SBSE); National Council of Education Research & Training (NCERT) ; CBSE].

5.4.1. Community Awareness

Spreading community awareness and developing community leadership for effective Drought Management is the need of the hour. Investments in disaster education, public awareness, community leadership development, will be encouraged. Sensitizing the communities will be the most important activity. Since low income groups are the most vulnerable to drought, the design and content of the education material will be based on considerations like alternate livelihoods, supplementing income, creating awareness of government schemes for them etc. Community will be made to understand the importance of drought preparedness and mitigation. The aim will be to promote an informed, alert and self confident, motivated community that will cope with the drought.

Drought mitigation aspects will be disseminated through the PRIs and local bodies which are ideally suited for Community Based Disaster Management (CBDM) initiatives in the States at different levels. As far as the empowerment of local bodies is concerned, efforts will be made to strengthen them through regular financing. CBDM activities will be included in the plans prepared at the district, mandal and village levels.

[Action: PRIs in collaboration with ULBs; NGOs; MANAGE; NIRD and CBOs]

5.5. Documentation

Systematic documentation will be given due importance in drought management because of a variety of reasons. Shortage of well trained and experienced staff is one of the reasons for lack of documentation. Documentation will capture the process of learning and case examples which would help in a wider understanding. The state DM (Revenue) department will prepare/revise/update the existing drought manuals. A committee of experts representing Agriculture, Animal Husbandry, Irrigation, Water Supply department, IMD, State Remote Sensing Agency and ATI will be constituted to revise and update the existing drought manuals. Subject specialists from academic institutions will also be included. A number of documents, reports and manuals etc. that have been prepared in the past and have now become difficult to access. The Disaster Management departments will take measures to collect these and digitize them from various sources and save and maintain them. The documentation will facilitate learning from past experiences and provide for improvement for effective planning for drought preparedness and mitigation measures.

The NIDM and ATIs will facilitate the preparation of films, manuals, and other training material targeting various stakeholders. They will also:

i. Formulate and implement a comprehensive HRD Plan, covering all aspects of Drought Management training through the ATIs;
ii. Organize awareness Training Programmes on Drought Management for the MPs, MLAs, and other elected representatives of PRIs and ULBs;

iii. Formulate a training strategy in consultation with the state relief department and cover all the departments involved in Drought Management; Develop training modules on Drought Management, undertake research and documentation and conduct training programmes;

iv. Establish a network of district level Resource Persons (DRPs) in all the drought prone districts.

[Action: NIDM in collaboration with ATIs and State DMC]

5.6. Community Participation

Community mobilization contributes substantially to social motivation and the effectiveness of relief operations. Providing opportunities for public representatives to contribute to planning and monitoring drought management programmes through institutional arrangements at the local and state levels have helped to provide relief. In the past involvement of non-governmental organizations (NGOs) in the delivery of specific relief to society, particularly in running cattle camps and providing fodder, drinking water has helped in reaching the goals on a large scale.

Community participation is an essential feature of drought mitigation programmes.

The villages in Alwar have improved their socio-economic conditions through community-led water management. These communities used traditional water harvesting structures, which increased the ground water table in the area, resulting in increased water storage and substantial increase in crop production and resultant income. These micro-level success stories need to be spread to other parts of the country for other communities to replicate.

Rainwater harvesting holds the key to drought mitigation and the government policies emphasize community-based water resource management.

Women's Self-Help Groups (SHGs) play an important role in a large number of measures targeted at drought mitigation. SHGs will be involved in rainwater harvesting, running PDS and day care centres and overseeing water distribution and utilization in their community. They will also take measures to promote greater equity and efficiency in natural resource management.

Drought relief and mitigation measures will to the extent possible, be implemented through the Panchayati Raj Institutions. Examples of several droughts have shown the importance of involving these institutions in drought management in order to improve the efficacy of delivery.

6 Relief And Response

6.1. Long Term Management

Every year, some parts of India are affected by drought. The drought prone States have to analyze the drought phenomenon and find long-term solutions, including immediate relief. GoI has to help them focus on the main issues for policy formulation and further actions like: (i) understanding the nature of drought, (ii) modifying the perception and response to drought, and (iii) changing the approach from relief to mitigation of drought. Significant issues in drought mitigation and relief policy are the identification of vulnerable areas and populations, and their inclusion and effective land use planning. There is an urgent need to use transparent criterion for the identification of vulnerable areas and populations. This will help target development programs and drought relief to the most needy and deserving of them.

Drought adversely impacts livelihood and economies of large population in the rain-fed, arid and semi-arid regions. Any long term planning for drought management must be based upon strategies, which take into account livelihood opportunities and support system both in irrigated and rain-fed parts of drought prone areas and Indigenous Technical Knowledge (ITK) in relation to drought management.

The CMP and the National Manual for Drought Management of the DAC provides valuable direction to administrators, experts and the civil society and deals extensively with the implementation of drought response and relief measures. This chapter therefore focuses on the convergence of national employment schemes and improved access to institutional finance for better management of drought.

6.2. Relief Employment

The most important relief component in drought management is generation/ provision of employment during the drought period. On account of drought, agricultural operations are reduced substantially, restricting the scope of seasonal employment. It is therefore necessary for the State governments to start relief employment programmes immediately and provide work to those who need employment within a radius of five kilometres. The Government of India is required to support these relief employments with cash assistance and release of foodgrains.

6.2.1 Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)

Most State Governments have their own food for work programme. The Government of India has started Sampoorna Grameen Rojgar Yojana (SGRY) in 2002, as a programme for

addressing the problems of seasonal unemployment, with a special component for drought. The Government of India has started the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in all districts of the country w.e.f. April 01, 2008. This programme together with other schemes will create substantial employment to tide over the hardship and deprivation caused by drought. Drought management efforts will gain substantially in value if:

i. MGNREGS also cover non-manual labour;

ii. Number of days under MGNREGS is increased in the event of drought;

iii. Bio-fuels like Jatropa and Pongamia and nurseries are developed on the waste – lands for continuous employment generation; and

iv. Both area approach and target group approach are adopted in drought prone areas;

v. Wages paid in the form of a food basket also instead of cash alone.

Agencies concerned in all the districts covered by this programme will be sensitized regarding their value in generating employment in the drought-affected areas and building assets such as tanks and wells which reduce the impact of drought.

[Action: State Governments/ SDMA in collaboration with DDMAs]

Relief programmes supported through the SDR Fund or the NDR Fund are generally inadequate to meet the needs of employment. The MGNREGS also restrict employment to one member per family or/and a specified number of days (100 days in a year). It is thus necessary that the State Governmentscombine other development schemes such as water conservation programmes with relief employment programmes. This will increase the availability of funds for relief and generate employment for larger workforce or greater number of days. These works will be started under the following programmes:-

i. National Watershed Development Programme for Rainfed Areas (NWDPRA)

ii. Integrated Watershed Management Programme (IWMP)

The Departments, responsible for the implementation for these programmes, need to start works under these programmes in drought-affected areas to maximize the number of people employed. Also Local Area Development (LAD) scheme for the Member of Parliament and Members of State Legislature will provide resources for relief employment.

The funds available under the National Programmes such as National Horticulture Mission, National Bamboo Mission, National Food Security Mission, RKVY, Accelerated Irrigation Benefit Programme, Artificial Ground Water Recharging, Compensatory Afforestation Fund Management and Planning Authority (CAMPA) of Ministry of Environment & Forests and other afforestation programmes will be converged to support a coordinated development

process. The Backward Region Grant Fund (BRGF), which is an untied source to fill up identified gaps and requires only a decision by the local Panchayat , will also be put to use wherever applicable.

6.3 Role of State Departments during Drought

The Government of India and State Governments will set up DMCs at the national and State levels. At present these functions are carried out by inter-departmental agencies and scientific institutions. Considering the frequency and impact of drought, the present mechanisms are not adequate for meeting the demands of drought management. Drought management requires coordination with Agriculture, Animal Husbandry, Water Conservation, Irrigation and Finance Departments.

The DAC, State DMCs, State Governments/SDMAs will therefore:

i. Prepare a contingency plan in case of late on set of monsoon / dry spells during the season with appropriate cropping pattern;

ii. Arrange availability of seeds with short duration varieties on subsidy;

iii. Stock quality seeds, well in advance for immediate distribution;

iv. Create awareness among the farmers on management practices like intercropping, mulching, weed control, intercultural operations;

v. Take care of controlling of sucking pests; and

vi. Encourage the farmers to have crop insurance irrespective of whether they are indebted or not.

[Action: State DMC in collaboration with State Agriculture Dept].

6.4 Improved Access to Financial Services

It is necessary to support the communities and farmers financially so that they are able to invest in seeds, livestock, irrigation equipment and storage facilities for seed and fodder, etc. To this end, credit systems will be provided through mechanisms that have been developed and tested. Communities will also be supported in learning and utilizing the marketing systems that are available for less known produce and also when best to sell and buy various livestock so as to get the best economic returns on this investment both in good and bad years. It will also be necessary to develop insurance systems, both in kind and financial systems that will see communities and individual farmers through difficult periods. In-kind insurance will be provided through community seed banks and fodder banks while community based financial insurance schemes will protect farmers from economic loss in the case of the death of livestock. Diesel subsidy introduced by DAC in 2009 is a welcome step as it will enable farmers to provide supplementary irrigation through diesel pump sets in the drought and deficient rainfall areas to protect the standing crops. This will help in mitigating the adverse impact of

drought on food grain production. The possibility of weather insurance as a part of drought management in rain-fed regions will be explored.

Provision of consumption loan will also be encouraged in drought prone areas and efforts will be made to bring agricultural labour into the net of social security. To improve access to financial services, provision of support to local micro-finance institutions will be encouraged by central/state.

[Action: NABARD in collaboration with IRDA and DAC]

6.5 Human Health Coverage

Severe food grains shortage during even the most severe droughts is a thing of the past. The apprehension of nutrition deficit among vulnerable groups in pockets of acute distress is still a factor to guard against.

i. Supplementary nutritional programme will be extended to drought prone areas.

ii. Rural population will be covered under health insurance in drought prone areas in particular (Corporate Sector dealing with health segment will be tapped for contributions).

6.6 Cattle Health Care

The role of animal husbandry in providing livelihood during droughts is important, as the impact is less in areas where integrated farming is practised. Therefore veterinary camps for farm animals are beneficial.

Health hazards in humans and animals are largely caused by lack of access to nutritional food and water during drought. Programmes such as ICDS, currently in place to meet the need of children and women with reference to nutritional issues are required for animal sector. State Governments are required to formulate and put in place fodder policy as existing in Tamilnadu. Drinking water requirements of the livestock should be given due importance.

Vaccines for various diseases and essential medicines will be procured as required. Fodder, Cattle feed and mineral mixture will be supplied to all productive animals to prevent distress sales of cattle.

[Action: State Dept. of Agriculture in collaboration with Animal Husbandry; SAUs]

6.6.1 Ensuring Availability of Quality Fodder

Securing feed for livestock in drought conditions is another difficult task. A large number of unproductive male and female cattle are bound to suffer badly as farmers' try to save their productive animals as they utilize all available resources to feed them. In event of a drought, irrigated States like Haryana, Punjab and Western Uttar Pradesh will also not be able to spare fodder for arid regions because of the sub-normal fodder production in their territory. One option is to establish cattle camps in the assured irrigation parts of the drought prone areas. In case of Rajasthan, these camps will be established along the Indira Gandhi Canal where water for drinking and growing fodder is more easily available.

To mitigate/moderate the situation and to save the animals the following strategy will be adopted:

i. Assessment of need for fodder will be done well in advance. If a deficit is identified, ways and means to fill the gap will be explored including supplies from the nearest area, within the mandal, within the District, or in the nearby State.

ii. Raising of fodder in Government as well as farmers' lands with buy back arrangements for fodder cultivated will be promoted

iii. Use of tank bunds for fodder cultivation.

iv. Utilizing the period between crops for fodder cultivation.

v. Distribution of fodder produced within a State in nearby areas.

vi. Establishment of fodder banks.

vii. Conserving fish and aqua culture during droughts.

viii. Utilizing the assistance of Ministry of Railways in transport of fodder and drinking water from unaffected areas to those affected.

ix. Organizing online availability of information relating to demand and supply of fodder

x. Undertaking market intervention to keep the prices reasonable.

xi. Intensification of water conservation measures in the villages.

[Action: State Departments of Agriculture in collaboration with State Depts. of Animal Husbandry; State DMCs and SAUs]

7 Implementation of Guidelines- Preparation of Drought Management Plans

7.1. National Plan on Disaster Management

The Government of India in 2002 decided to retain the issue of management of drought with the Department of Agriculture and Cooperation when it was decided to transfer the management of all other type of natural and man-made disasters with the Ministry of Home Affairs. As per the standing arrangements for drought early warning surveillance and early response system prepared by the Department of Agriculture & Cooperation in 2004, at least 11 Ministries/Departments are looking after different aspects of drought management. The Ministries/Departments involved are Animal Husbandry Dairying and Fisheries; Department of Drinking Water Supply; Department of Food and Public Distribution; Ministry of Health and Family Welfare; Ministry of Petroleum; Ministry of Power; Ministry of Rural Development, Ministry of Railways; Department of Urban Development; Ministry of Water Resources; Department of Women and Child Development.

Comprehensive DM plans will be prepared at the national, state and district levels. At the national level, the DM plan will focus on various aspects of DM including preparedness, mitigation and response. These plans will clearly identify the roles of key stakeholders for each disaster level and also include assessments of their own response capacities.

In accordance with the various disaster specific guidelines laid down by the NDMA, the NEC will prepare a National DMP, incorporating the DM plans prepared by the central ministries/departments and state governments for drought affected States and districts.

[Action: NEC in collaboration with NDMA]

The National Plan will comprise:-

i. **A National Response Plan** spanning all the Central Ministries/ Departments and related agencies covering disasters. This will be prepared by an Inter Ministerial Central Team formed by the NEC in the MHA.

ii. **Mitigation and preparedness plans** prepared by the various Central Ministries and Departments and other agencies covering different disasters specifically.

A National Human Resource and Capacity Building Plan, being prepared by National Institute of Disaster Management.

This plan, to be approved by the NDMA, will include the aspect of drought management. The main features to be included in the plan are:

i. Preparation of state DM plans with the aim of managing drought hazard.

ii. Training of trainers in professional and technical institutions.

iii. Development of simple and effective information and warning dissemination systems that can reach affected communities in far flung areas clearly and in time. To leverage on NeGP(National eGovernance Program) to provide information services to citizens in their vicinity in local languages

iv. Documentation of the lessons learnt from previous drought incidences, and their wide dissemination.

v. Preparation of an action plan for upgrading the capabilities of organisations and institutions involved in drought management studies with clear roadmaps and milestones.

[Action: Central ministries in collaboration with the NEC; state governments]

7.2 Drought Management Plan of the Nodal Department

The provisions of Allocations of Business Rules, 1961, had entrusted DAC with the responsibility of coordination of relief activities necessitated by Drought. The DAC is the nodal agency for implementation of the Drought Management Plan. The Department will be adequately strengthened with trained technical manpower for implementation of the plan.

The responsibilities of the DAC as the nodal agency include coordinating all activities related to drought mitigation, monitoring the occurrence of droughts anywhere in India with the assistance of various departments of the central and state governments, coordinating and carrying out preliminary investigations of these incidences, reporting the same to various designated functionaries in the GoI and state governments, and carrying out other relevant studies.

Crisis Management Plan (CMP)

The DAC has prepared a CMP to clarify the goals and in defining the roles and responsibilities of various responders (Ministries / Departments, Organisations and individuals) involved in crisis management, and putting together a communication process for quickly notifying the public in the event of a crisis. It is important in this connection that while all precautionary measures are essential and should be initiated in time, the preparatory phase should not create unnecessary fears in the minds of the people. This CMP is a part of the overall spectrum of the Drought Management Plan and restricted to the management interventions required during the time of crisis.

7.3 Drought Management Plans of State Governments

All state governments/SDMAs will prepare their drought management plans in accordance with these guidelines. State Governments will also encourage preparation of community preparedness plans to address their own special features and outline the linkages of the various state support systems and the jurisdiction of each of these departments.

The GoI executed the GoI-United Nations Development Programme (UNDP) Programme on Disaster Risk Management (DRM) to encourage the development of district, block, taluka and village drought management plans. In the year 2007, NDMA released the guidelines on the Preparation of State DMP to assist in the preparation of state plans. The States are requested to modify the existing plans according to these guidelines, where required, in order to streamline and optimise the response systems. These DM plans will be widely disseminated among various stakeholders for creating greater public awareness. These plans must indicate the officer responsible for carrying out specific tasks along with timelines for implementation.

[Action: State Governments/SDMAs]

NDMA is also implementing a part of the Disaster Risk Reduction Programme with the support of UNDP with a budget provision of Rs. 63 crores. The State Plans will take into account the aspect of drought management and will encourage horizontal partnerships of the community which has to be sought through well recognized techniques like participatory rural appraisal, focused group discussions, etc., by involving the DDMAs PRIs, ULBs, NGOs, SHGs CBOs and, most importantly, the vulnerable groups which are most likely to be affected. Historical knowledge and lessons learnt in handling earlier drought situations and traditional coping mechanisms and skills need to be incorporated into these plans at various levels. The salient features of the state plan will be:

i. Each State will prepare a detailed drought Manual giving the outline of the implementation aspects of the Drought Management Plan.

ii. Drought management plans for the entire season will be prepared by the Agriculture Department of the respective State well in advance in the month of May, based on the long season forecast issued by IMD in April and also the previous season's rain fall.

iii. Drought management plans will be prepared district wise.

iv. As the season progresses from June onwards, the DMC will review the plans prepared earlier at the onset of the monsoon and revise the strategy if required.

v. Weekly monitoring of the season and crop condition from June onwards till the end of the season and make necessary midseason corrections as and when required.

vi. The DMC will make use of the frontier techniques like remote sensing and GIS while providing the inputs to the SDMA.

vii. A sound database will be created and updated regularly on weather, crop conditions, input supply, credit, insurance and market information, fodder supply etc. in order to assist the SDMA for Drought declaration and Management.

viii. Awareness will be brought among the farmers on drought regulations and enforcement.

7.4 Implementation of Plans

The development and implementation of disaster plans will be a coordinated programme of the NDMA, NEC, DAC as the Nodal agency, and the national, state, district and local administrations. These plans will indicate clearly, the structure of the monitoring system and the reports to be generated at various levels together with the agency to which the report is to be sent, its format and the frequency/timing. The drought management plan of the States will be a part of the overall DM plan and will be implemented by State Governments'/SDMAs.

The NEC/DAC will be responsible for preparing the National Plan on the basis of these Guidelines, getting it approved by the NDMA, and subsequently for its implementation.

[Action: NEC in collaboration with DAC]

The capacity and potential of other government organisations, knowledge institutions and academic institutions will be harnessed and incorporated into the drought mitigation endeavour.

[Action: NEC/DAC in collaboration with SDMAs; DDMAs; districts administrations; local administrations].

The DDMA will ensure the convergence of the existing schemes for better management of resources and will involve NGOs, CBOs, Panchayat Raj Institutions and other local bodies for dissemination and implementation (Social Audit) of the Plans.

[Action: The DDMAs.]

Local bodies include PRIs and ULBs such as municipal corporations, municipalities, district and Cantonment Boards and town planning authorities, which are responsible for the control and management of civic services.

These Bodies will ensure DM capacity building of their officers and staff, carry out relief activities in the affected areas, and will prepare DM plans in consonance with the guidelines of the NDMA, SDMAs and DDMAs.

[Action: State governments in collaboration with district administration; local bodies.]

7.4.1 Implementation and Monitoring

These plans will indicate clearly the structure of the monitoring system and the reports to be generated at various levels together with the agency to which the report is

to be sent, its format and the frequency/ timing.

Drought management plans prepared by the nodal ministry, departments concerned, state governments, district authorities, rural bodies, urban local bodies, and other stakeholders in accordance with these Guidelines will be implemented by them in accordance with in-built schedules.

[Action: Nodal ministry in collaboration with state governments; district administrations; PRIs; ULBs.

7.4.2. Mainstreaming of Drought Management in Developmental Plans

As a part of the effort of mainstreaming DM concerns into the overall developmental effort, the Planning Commission had agreed to the conduct of a DM audit of all new and on-going projects and selective revisiting of completed projects. This has now been finally approved in the form of inclusion of DM Audit in the Expenditure Finance Committee and the Public Investment Board forms as a self certified portion. The Finance Ministry and the Planning Commission have accepted the need to ensure funding for this activity, as well as support the measures arising from the DM Plans required to be made by the Central Ministries/Departments and the States/Union Territories.

The central and state ministries/ departments will mainstream disaster management efforts in their developmental plans. In the annual expenditure plans, specific allocations will be made for carrying out disaster awareness programmes, maintaining preparedness and for undertaking mitigation efforts. Wherever necessary and feasible, the corporate sector should also be involved in supporting drought risk management efforts as part of CSR.

[Action: Central ministries in collaboration with state governments; NDMA.]

8 Summary of Action Points

State intervention in drought management has by and large has had a significant positive impact. Dividends from such interventions will substantially increase with greater involvement of the stakeholders. An analysis of the relief expenditure in the States shows that it has increased many times, because of increased coverage of the affected areas and population. The pattern of relief expenditure also reveals that wage employment has the major share. It varies each year, depending on the intensity of drought. Fodder supply, tanker based water supply and gratuitous relief expenditures are the other major ingredients. Meeting the drinking water needs of rural and urban populations is going to be a major issue in the coming years. The present practices would be unsustainable in the long run. Effective management of droughts depends on the policies of the States and the efficacy of their delivery system.

Institutional linkages between and also within key U.N. agencies, federal agencies, NGOs, and appropriate regional and national institutions, will facilitate the exchange of information and experiences and will help in building a drought preparedness network with the goal of building greater institutional capacity in the system to cope with future events. A few of the important recommendations made in the guidelines are listed below:-

Chapter 1

1. Separate Drought Monitoring Cells (DMCs) will be created at the state level with adequate staff under the control of State Disaster Management Authorities (SDMA's). State level monitoring cells will have requisite Administrative, Technical and data maintenance staff. [Action: State government/SDMA in collaboration with State Executive Committee (SEC)] (Section 1.4).
2. State DMCs will undertake on a priority basis, the preparation of vulnerability maps for their respective States. [Action: State DMCs in collaboration with National Remote Sensing Centre (NRSC); NATMO, IMD, State Agricultural Universities (SAUs) and Indian Council of Agricultural Research (ICAR)] (Section 1.5).
3. To establish a Control Room for drought management and strengthen the Drought Monitoring Cell in the DAC, GoI, with all required technical facilities and personnel so as to have the capability of analysing and examining the reference and research information from various sources. [Action: GoI-DAC](Section 1.8).
4. Specific guidelines for use of Information and Communication Technology (ICT) and

role of National Informatics Centre (NIC) for online interaction and availability of real-time drought related information will be developed. [Action: GoI-DAC in collaboration with NIC] (Section 1.8).

Chapter 2

5. The watershed development approach is an important facet of drought management initiatives, taken up through the programmes of the Government of India.[Action: MoRD in collaboration with DAC and State Governments] (Section 2.4.4).

Chapter 3

6. Efforts will be made to integrate the ground-based information with the space-based information for comprehensive reporting. The role of all departments engaged in drought management will be clearly spelt out. [Action: IMD in collaboration with NRSC; CWC; NRAA; CRIDA] (Section 3.4).

   Automatic weather stations being set up by different agencies, including IMD, will also include moisture sensors for obtaining information about the soil moisture levels under natural environment. Remote sensing applications will corroborate on a weekly basis their findings on the crop health. IMD will have a dedicated webpage on drought monitoring and forecast in its web portal which will be coordinated by DRU, Pune. [Action: IMD in collaboration with NRSC; DST; CRIDA] (Section 3.4).

7. Assessment of damage expected will include agricultural production, depletion of water resources, livestock population, land degradation and deforestation as well as human health. [Action: State DMC in collaboration with State Depts. of Agriculture, Animal Husbandry and Water Resources; National Crop Forecasting Centre (NCFC)] (Section 3.5).

8. Unit of deceleration of drought should be standardised and alternative methods of quicker assessment of crop yield need to be evolved so as to mitigate the impact of drought in time. [Action: DAC in collaboration with State DMCs and NCFC] (Section 3.7).

9. The Drought Management Information System of DAC will be revamped, institutionalized and made operational with the support of State DMCs. [Action: State DMCs in collaboration with DAC] (Section 3.7.1).

10. DMC will facilitate the integration of data and expertise from multiple institutions such as ICAR, NRSC, IMD, Agricultural Universities, State Departments of Irrigation, Ground Water, Revenue, Agriculture etc., to evolve a robust method for drought intensity assessment on the lines of US Drought Monitor. Once the indicators cross the defined threshold level (level to be decided by the state), the SDMA Secretariat will help in declaring drought at sub-district levels. [Action: State DMCs in collaboration with ICAR; NRSC; IMD; SAUs; State Depts. of Irrigation, Ground Water, Revenue, Agriculture etc] (Section 3.7.1).

Chapter 4

11. Automatic weather station and rain-gauges will be put in place at appropriate spacing to enable micro level analysis and forecasting [Action: CWC in collaboration with DST; NRSC] (section 4.1.4).

12. State DMCs will harmonize the current/ ongoing efforts by various knowledge centres at the national and international levels.[Action: State Governments in collaboration with NRSC, IMD] (Section 4.1.5).

13. The services of Village Resources Centres being established by Indian Space Research Organization (ISRO), ICAR, State Agricultural Universities and other Organizations, will be effectively used towards management of droughts. [Action: ISRO in collaboration with SAUs and ICAR] (Section 4.3).

14. Large scale research will be conducted through the university system to evolve drought resistant crop varieties. [Action: SAUs in collaboration with CRIDA, NRAA] (Section 4.3).

15. The mitigation measures to be taken will include:

    i. Conduct of pilot studies in all categories of drought prone areas for suggesting long term mitigation measures.

    ii. Convergence of lessons learnt from studies carried out by CRIDA, International Crop Research for Semi-arid Tropics (ICRISAT), IMD, NRSC, ICAR, and other institutes

    iii. Cloud-seeding as a possible measure of mitigation will be considered.

    [Action: Indian Institute of Tropical Meteorology (IITM) in collaboration with SAUs; CRIDA] (Section 4.3).

    v. Measures for reducing the impact of climate change on drought.

    [Action: National Institute for Abiotic Stress Management (ICAR) in collaboration with IMD] (Section 4.3).

16. It is necessary to take up more experiments in the country to assess the aerosol characteristics, suitability of nuclides for cloud seeding and alternative types of cloud seeding – (ground based or aerial, warm or cold cloud seeding etc). A cloud seeding policy needs to be formulated at National level and State level for creating required environment to regulate these measures. [Action: IITM in collaboration with State DMCs; DAC] (Section 4.3.2).

17. The State Department of Agriculture and Agricultural Universities will therefore:

    i. promote cultivation of crops under crop diversification through sprinklers/Drip irrigation systems; and

    ii. promote protective irrigation through micro irrigation systems through incentives;

    iii. advise on the cropping systems to be covered under protective irrigation through appropriate micro irrigation systems. [Action: State Department of

Agriculture in collaboration with SAUs] (Section 4.3.3).

18. Credit will be provided promptly in the drought affected areas and marketing and price support extended. [Action: Regional Rural Banks (RRBs) in collaboration with Gramin Co-operative Banks; National Bank for Agriculture & Rural Development (NABARD); State Governments] (Section 4.3.7).

19. Afforestation with subabul, seemaruba, casurina, eucalyptus and bio diesel plantation like jetropha and pongomia will be encouraged. [Action: State Forestry Dept. in collaboration with MoEF] (Section 4.3.8).

20. Insurance products will be developed for different agro-climatic zones providing coverage against drought. The Central/ State Governments will promote in these zones, agricultural insurance programmes and ensure that farmers are informed about the availability of insurance products and educate them about the need for managing their yield and income risks through insurance coverage. Therefore:

    i. Focus of the Government on crop insurance will continue and role of agriculture insurance company will be widened.

    ii. Weather insurance will be promoted for crops not having data base on productivity. Government will set up automated weather stations where necessary.

    iii. The scope of the National Agricultural Insurance Scheme (NAIS) will be widened to include pre-sowing and post harvest losses.

    iv. Awareness will be enhanced with reference to crop insurance through state departments to improve coverage.

    v. Price fluctuations will be stabilized by strengthening links of farm products with agro-based industries.

    vi. Price linked insurance products will be promoted to avoid distress sales of farm produce.

    vii. The use of satellite derived crop condition images as surrogates to crop yield estimates will be explored to facilitate for settlement of insurance claims.

    [Action:Insurance Regulatory Development Authority (IRDA) in collaboration with DAC, NABARD, Commercial Banks; State Cooperative Banks and RRBs] (Section 4.4).

Chapter 5

21. A realistic national training and capacity building programme for drought management will be formulated and implemented. A programme of resource enhancement encompassing all institutions/ organizations/ individuals will also be developed. [Action: NIDM in collaboration with National Institute of Agricultural Extension Management (MANAGE); National Institute of Rural Development (NIRD); Administrative Training Institutes (ATIs)] (Section 5.1).

22. The agricultural universities and National Research Centres of ICAR will be encouraged to undertake contractual research for industries/farmers as a means of revenue generation and providing solutions to immediate problems. [Action: SAUs NRCs (ICAR) in collaboration with NRAA and ICRISAT] (Section 5.2).

23. The ATIs and other institutions will take up pilot projects in a participatory mode with agriculture universities and organizations to undertake research in various aspects of drought management to establish synergy between various aspects of drought including science institution, policy, socio-economic, legal, water, soil environmental and ecology related issues. [Action ATIs in collaboration with State DMCs; IDMC (DAC); CRIDA; SAUs] (Section 5.3).

24. Efforts will be made to fill the gap between the requirement and availability of qualified and experienced trainers conversant with natural hazards, especially with drought mitigation and management techniques. [Action: NIDM in collaboration with ATIs; MANAGE; State DMCs]. (Section 5.3.1).

25. TNA will in the future, take cognizance of the need to develop competent, resourceful and responsible personnel and strengthen their capacity to work in disaster situations through the delivery of continuous, competence based training. Necessary budget will be provided by each department. All the training programmes will be evaluated to assess their effectiveness. [Action: NIDM in collaboration with Central Ministries/ Departments involved; State DMCs; ATIs; MANAGE] (Section 5.3.2).

26. The NIDM and Administrative Training Institutes (ATIs) and NDMA will take up the responsibility of training all the government personnel from all central ministries and departments and state governments on different aspects of Drought management. These organizations will evolve an action plan jointly in collaboration with the state ATIs and other institutions to offer a comprehensive curriculum on drought management in the form of training modules for the various target groups. They will design training programmes and prepare training course material, reading material and trainers' material etc. with the help of Agricultural Universities, Scientific and Technical institutions and other knowledge based institutions. All such training programmes will include evaluation and certification of trainers and trainees. [Action: NIDM in collaboration with ATIs; State DMCs; SAUs; DST ; NDMA; MANAGE] (Section 5.3.3).

27. The ATIs and NIDM in consultation with reputed knowledge institutions on Drought Management will develop comprehensive programmes for creating trainers from among the faculty members of ATIs, Agriculture and Animal Husbandry Departments and other professionals. The state governments/ATIs will identify potential trainers and design and develop training programmes for different levels. These training programmes will be critically

evaluated at regular intervals, upgraded, modified based on evaluation and feedback from the participants and these will be documented. [Action: ATIs in collaboration with NIDM; State DMCs; State Dept. of Agriculture; State Dept. of Animal Husbandry; MANAGE] (Section 5.3.4).

28. PRIs and ULBs will ensure capacity building of their officers and employees in DM to carry out relief, rehabilitation and reconstruction activities in the affected areas and will prepare DM plans in consonance with the guidelines of the NDMA, SDMAs and DDMAs. [Action: NIRD in collaboration with State Institutes of Rural Development SDMAs and DDMA] (Section 5.3.5).

29. ATIs, NGOs, PRIs and ULBs will be encouraged to take up awareness programmes on drought management consisting of sensitizing the farmers, communities and other stake holders at house hold level, community level in rural and urban areas and organizational/ institutional level on a large scale. These programmes will be sustained through constant updating of knowledge. Best practices, traditional knowledge, indigenous wisdom, practices etc. needs widespread dissemination. [Action: ATIs in collaboration with PRIs; NGOs; ULBs] [Action: ATIs in collaboration with PRIs; NGOs; CBOs] (Section 5.3.5).

30. The Ministry of Agriculture will establish a dedicated faculty in selected ATIs/ Organizations exclusively for Research and Training in Drought Management by instituting chair positions. The funds allocated by 13th Finance Commission for capacity building will be utilized for this purpose. [Action: DAC in collaboration with NIDM; State DMCs; ATIs; MANAGE] (Section 5.3.6).

31. ICAR will update the syllabi of graduate and under-graduate courses in agriculture to include drought management. [Action: ICAR in collaboration with SAUs and NDMA] (Section 5.4).

32. UGC will encourage universities under their new and innovative educational programmes for setting up Centres for Disaster Management to foster research in disaster management. Higher Education Department, Ministry of Human Resource Development (MOHRD) would make a request to the UGC to accord priority to such proposals. [Action: UGC in collaboration with ICAR and SAUs] (Section 5.4).

33. The education boards of all the States will also develop similar content in their curricula. Invariably, a chapter on Drought mitigation will be included in the curricula under the environment science in all classes from 8thstd onwards. Invariably, a chapter on Drought mitigation will be included in the curricula under the environment science in all classes from 8th standard onwards. The development of high-quality educational material, textbooks, field training, and a high standard of teaching at all levels will be given due emphasis. Education and training programmes will be designed with greater

focus on the development of the capacity and skills of trainers and teachers. The central and state governments will encourage knowledge institutions to undertake research, teaching, and training, in drought mitigation and management. [Action MoHRD in collaboration with State Boards of School Education (SBSE); National Council of Education Research & Training (NCERT); Central Board of Secondary Education (CBSE)]. (Section 5.4).

34. Drought mitigation aspects will also be disseminated through the PRIs and local bodies which are ideally suited for Community Based Disaster Management (CBDM) initiatives in the States at different levels. As far as the empowerment of local bodies is concerned, efforts must be made to strengthen them through regular financing. CBDM activities will be included in the plans prepared at the district, mandal and village levels. [Action: PRIs in collaboration with ULBs; NGOs and CBOs] (Section 5.4.1).
35. The NIDM and ATIs will facilitate the preparation of films, manuals, and other training material targeting various stakeholders. They will also:
    i. Formulate and implement a comprehensive HRD Plan, covering all aspects of Drought Management training through the ATIs;
    ii. Organize awareness Training Programmes on Drought Management for the MPs, MLAs, and other elected representatives of PRIs and ULBs;
    iii. Formulate a training strategy in consultation with the state relief department and cover all the departments involved in Drought Management; Develop training modules on Drought Management, undertake research and documentation and conduct training programmes;
    iv. A network of district level Resource Persons (DRPs) in all the drought prone districts will be established

    [Action: NIDM in collaboration with ATIs and State DMC] (Section 5.5).
36. Promotion of investment in drought mitigation measures will be encouraged for economic sustainability of small & marginal farmers. IDMC when set up will have linkages with the NFSM and RKVY by providing them information on drought situation & its management. [Action: IDMC (DAC)] (Section 5.5).

Chapter 6

37. Agencies concerned in all the districts covered by these programmes will be sensitized regarding their value in generating employment in the drought-affected areas and building assets such as tanks and wells which reduce the impact of drought. [Action: State Governments/ SDMA in collaboration with DDMAs] (Section 6.2.1).
38. The DAC, State DMCs, State Governments/ SDMAs will therefore:
    i. Prepare a contingency plan in case of late on set of monsoon / dry spells

during the season with appropriate cropping pattern.

ii. Arrange availability of seeds with short duration varieties on subsidy

iii. Stock quality seeds well in advance for immediate distribution.

iv. Create awareness among the farmers on management practices like intercropping, mulching, weed control, intercultural operations.

v. Take care of controlling of sucking pests.

vi. Encourage the farmers to have crop insurance irrespective of whether they are indebted or not.

[Action: State Agriculture Dept in collaboration with DMC] (Section 6.3).

39. Provision of consumption loan will also be encouraged in drought prone areas and efforts will be made to bring agricultural labours into the net of social security. To improve access to financial services, provision of support to local micro-finance institutions will be encouraged by central/ state. [Action: NABARD in collaboration with IRDA and DAC] (Section 6.4).

40. Vaccines for various diseases and essential medicines will be procured as required. Fodder, Cattle feed and mineral mixture will be supplied to all productive animals to prevent distress sales of cattle. [Action: State Dept. of Agriculture in collaboration with Animal Husbandry; SAUs] (Section 6.6).

41. To mitigate/moderate the situation and to save the animals the following strategy will be adopted:

i. Assessment of need for fodder will be done well in advance. If a deficit is identified, ways and means to fill the gap will be explored including supplies from the nearest area, within the mandal, within the District, or in the nearby State.

ii. Raising of fodder in Government as well as farmers' lands with buy back arrangements for fodder cultivated will be promoted

iii. Use of tank bunds for fodder cultivation.

iv. Utilizing the period between crops for fodder cultivation.

v. Distribution of fodder produced within a State in nearby areas.

vi. Establishment of fodder banks.

vii. Conserving fish and aqua culture during droughts.

viii. Utilizing the assistance of Ministry of Railways in transport of fodder and drinking water from unaffected areas to those affected.

ix. Organizing online availability of information relating to demand and supply of fodder

x. Undertaking market intervention to keep the prices reasonable.

xi. Intensification of water conservation measures in the villages.

[Action: State Departments of Agriculture in collaboration with State Depts. of Animal Husbandry; State DMCs and SAUs] (Section 6.6.1).

Chapter 7

42. In accordance with the various disaster specific guidelines laid down by the NDMA, the NEC will prepare a National DMP, incorporating the DM plans prepared by the central ministries/departments and state governments for drought affected States and districts. [Action: NEC in collaboration with NDMA] (Section 7.1).

43. The GoI executed the GoI-United Nations Development Programme (UNDP) Programme on Disaster Risk Management (DRM) to encourage the development of district, block, taluka and village drought management plans. NDMA in the year 2007, released the guidelines on the Preparation of State DMP to assist in the preparation of state plans. The States are requested to modify the existing plans according to these guidelines, where required, in order to streamline and optimise the response systems. These DM plans will be widely disseminated among various stakeholders for creating greater public awareness. These plans must indicate the officer responsible for carrying out specific tasks along with timelines for implementation. [Action: State Governments/SDMAs] (Section 7.3).

44. The NEC/DAC will be responsible for preparing the National Plan on the basis of these Guidelines, getting it approved by the NDMA, and subsequently for its implementation. [Action: NEC in collaboration with DAC] (Section 7.4).

45. The capacity and potential of other government organisations, knowledge institutions and academic institutions will be harnessed and incorporated into the drought mitigation endeavour. [Action:NEC/DAC in collaboration with SDMAs; DDMAs; districts administrations; local administrations] (Section 7.4).

46. The DDMA will ensure the convergence of the existing schemes for better management of resources and will involve NGOs, CBOs, Panchayat Raj Institutions and other local bodies for dissemination and implementation (Social Audit) of the Plans.[Action: The DDMAs.] (Section 7.4).

47. These bodies will ensure DM capacity building of their officers and staff, carry out relief activities in the affected areas, and will prepare DM plans in consonance with the guidelines of the NDMA, SDMAs and DDMAs. [Action: State governments in collaboration with district administration; local bodies.] (Section 7.4).

48. The drought management plans prepared by the nodal ministry, departments concerned, state governments, district authorities, rural bodies, urban local bodies, and other stakeholders in accordance with these Guidelines will be implemented by them in accordance with in-built schedules.

[Action: Nodal ministry in collaboration with state governments; district administrations; PRIs; ULBs.] (Section 7.4.1).

49. The central and state ministries/departments will mainstream disaster management efforts in their developmental plans. In the annual expenditure plans, specific allocations will be made for carrying out disaster awareness programmes, maintaining preparedness and for undertaking mitigation efforts. Wherever necessary and feasible, the corporate sector should also be involved in supporting drought risk management efforts as part of CSR. [Action: Central ministries in collaboration with state governments; NDMA] (Section 7.4.2).

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