Community-level Climate Change Adaptation

And

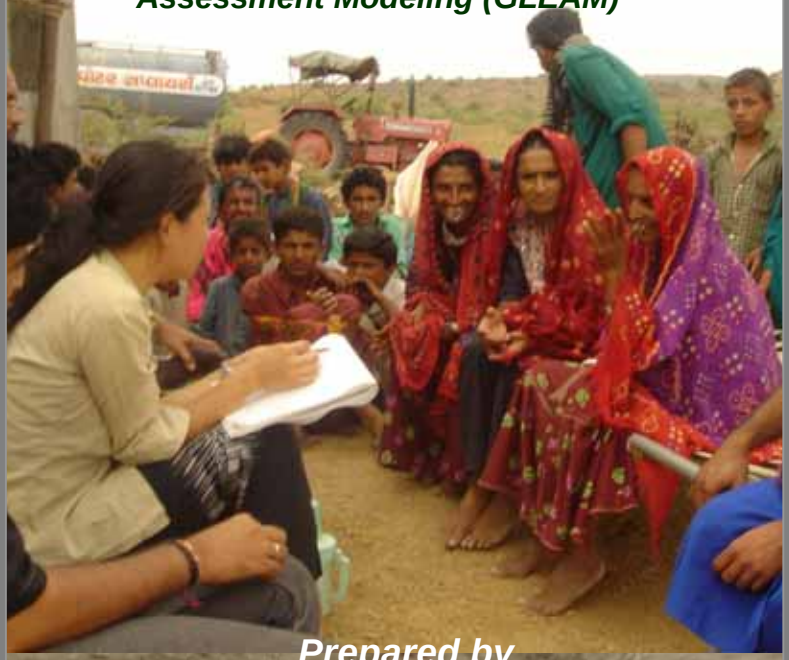
Policy Issues

Inter-linkages of

Environment, Poverty and Livelihood

A Case Study from Gujarat, India

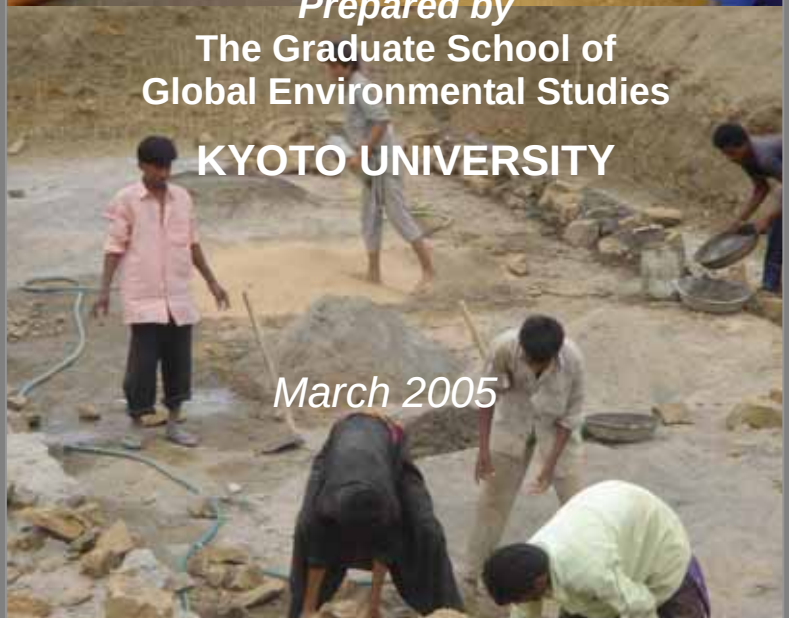
Report Submitted to United Nations University
As a Part of the
Forum for Globally Integrated Environmental Assessment Modeling (GLEAM)



Prepared by

The Graduate School of
Global Environmental Studies

KYOTO UNIVERSITY



March 2005

Report Prepared By

Rajib Shaw
SVRK Prabhakar
Ayako Fujieda

DISCLAIMER

Preface

This is the final report prepared for the research of "*Community-level Climate Change Adaptation and Policy Issues, Inter-likages of environment, poverty and livelihood a case study from Gujarat, India*" conducted by the Kyoto University Graduate School of Global Environmental Studies as a part of the Forum for Globally Integrated Environmental Assessment Modeling (GLEAM) initiated by United Nations University (UNU) and National Institute of Public Health and Environment (RIVM).

The report summarizes climate change impacts on India, with special focus on drought management system, initiatives taken at community level, and its possible reflection in the policy levels. Two specific case studies were conducted, one in Kutch and the other in Porbandar, both located in the drought affected parts of Gujarat, the western state of India. The case study experiences show that with proper involvement at the community level, drought mitigation efforts can be linked to the regular development projects. Innovative approaches at local levels, when planned properly, and linked to local government programs and policies, can lead to successful mitigation measures, which can be effective in long run.

Kutch Navnirman Abhiyan and its associated NGOs helped in data collection and survey in Kutch, while SEEDS (Sustainable Environment and Ecological Development Society) helped in data collection in Porbandar district. The current report reviewed the results of the projects conducted by these two organizations in their respective areas. I deeply acknowledge the kind cooperation of Sandeep Virmani and his team of Abhiyan and Manu Gupta and his team of SEEDS. Ayako Fujieda conducted the field survey in Kutch. Special thanks go to SVRK Prabhakar for compiling the climate change impacts and its relevance to drought in Gujarat. His visit to Japan was sponsored by the project fund.

The current report presents a quick overview of the issues with certain specific field examples. The policy implication part is still under-developed, and need more research in this direction. This study re-emphasized the needs of the climate change adaptation, and its potential policy and community implication, which need future intensive work in a holistic way.

Rajib Shaw
Associate Professor
Graduate School of Global Environmental Studies
Kyoto University

CONTENTS

1. PREAMBLE 5
1.1 BACKGROUND 5
1.2 GOAL AND OBJECTIVE OF THIS STUDY 6
1.3 ACTIVITIES 6
1.4 IMPLEMENTING PARTNERS 7
1.5 SCHEDULE 7
2. CLIMATE CHANGE AND INDIA 8
2.1 OVERVIEW OF CLIMATE CHANGE 8
2.2 IMPACTS OF CLIMATE CHANGE ON INDIA 10
2.2.1 Observational Evidences 10
2.2.2 Future Projections 11
3. ADAPTATION TO CLIMATE CHANGE 13
3.1 AN OVERVIEW OF CLIMATE CHANGE ADAPTATION IN INDIA 15
4. CLIMATE CHANGE AND DROUGHT IN INDIA 18
4.1 DROUGHT VULNERABILITY OF THE COUNTRY 18
4.2 AN OVERVIEW OF DROUGHT MANAGEMENT IN INDIA 18
4.2.1 Drought Early Warning and Response Systems 18
4.2.2 Drought Mitigation Mechanisms 23
4.3 DROUGHT SCENARIO IN GUJARAT 25
4.4 DROUGHT MANAGEMENT IN GUJARAT 26
4.5 CLIMATE CHANGE AND GUJARAT'S DROUGHT VULNERABILITY 28
5. COMMUNITY LEVEL ADAPTATION TO DROUGHT 29
6. DROUGHT CASE STUDIES 30
6. DROUGHT CASE STUDIES 31
6.1 CASE STUDY: PORBANDAR 32
6.1.1 Initiative in Digvijaygadh 33
6.1.2 Initiative in Thoyana 34
6.2 CASE STUDY: KUTCH 35
6.2.1 Water Related Initiatives 36
6.2.2 Livelihood Related Initiatives 37
6.3 IMPLEMENTATION MECHANISMS: SETU 38
6.3.1 Establishment 39
6.3.2 In-House Structure 39
6.3.3 Network Structure 40
6.3.4 Role of SETU 41
6.3.5 Future Possibility of SETU 41
7. GROUND REALITIES FEEDING INTO POLICIES 43
8. REFERENCES 47
ANNEX 1 49
ANNEX 2 55

1. PREAMBLE

1.1 Background

Available observational evidence indicates that regional changes in climate, particularly increases in temperature, have already affected a diverse set of physical and biological systems in many parts of the world (IPCC 2001). International communities have tried to respond to these changing phenomena though establishing high level Intergovernmental Panel on Climate Change (IPCC). Adaptation to climate change has the potential to substantially reduce many of the adverse impacts of climate change and enhance beneficial impacts, though neither without cost, nor without leaving residual damage. While the climate change adaptation has been discussed over past several years through organizational response, adaptive response, little has been focused on the community level adaptation, and integrating the adaptation methods in the policy perspective. Needless to say that international level interventions are essential for the commitments and negotiations among the governments, however at the community level, there is an urgent need to send the messages to impacts of climate change, and its possible adaptation strategies.

Since the worst sufferers of climate change impacts are the rural communities, (who depends mainly on agriculture as their livelihoods), it is important to focus on the impacts of climate change on livelihoods, and re-establish the links among poverty, livelihood and environment. However, focusing on the communities only are not enough, and so long the community initiatives do not become part of the government policies, it is difficult to sustain the efforts. Perhaps the most important prerequisite for creating sustainable livelihoods, and for achieving sustainable development, is good and accessible government (Helmore and Singh 2001). Thus, the link between local, state, and national governments to the community is of utmost importance.

Therefore, the current research proposes a case study to be undertaken in the state of Gujarat, India. The purpose is to find the sustaining elements from the case study, and apply it to other areas in form of an adaptation model. In past forty years, Gujarat has experienced 12 years of drought, and four major scarcity situations. However, the intensity and return period of major drought

events have increased substantially in last couple of decades, and it is often correlated to the climate change impacts. Although there is a need to study systematically the impact phenomenon, the fact is that the rural masses are highly affected in terms of their livelihood. India, being a major agriculture-based country, and almost 70% of the population living in the rural area, this impact will be a vital one in the long term. Therefore, a preliminary study is needed, based on which a model of community level climate change adaptation can be established, and further focus areas can be stressed.

1.2 Goal and Objective of This Study

The goal of this study was to study the interrelationship of environmental impacts, and suggests possible mitigation measures as policy options, and prepare a community adaptation model. For the environmental impacts, climate change issues are considers, and its effects as a drought in the arid to semi-arid climate will be studied. To achieve this goal, specific objectives were:

1. To analyze the current policies on drought management in the case study country (India)
2. To study the current issues at community level, focusing on livelihoods,
3. To suggest possible community adaptation schemes, and integrate these schemes in the policy options

1.3 Activities

The case study was conducted in Gujarat, in the western state of India. Two districts were selected as the case study areas: Porbandar in the south (with a semi-arid climate), and Kutch in the west (with an arid climate). Following activities were conducted:

1. Analyze the current policies on drought management in the case study country:
    - 1.1 Collect and analyze the documents on drought policies of Gujarat and India
    - 1.2 Conduct interviews with key policy makers at central and state level
2. Study the current issues at community level, focusing on livelihoods
    - 2.1 Field survey in the two target districts
    - 2.2 Conduct interviews with community, local governments and

non-government organizations

2.3 Analyze exiting livelihood issues and options

3. Suggest possible community adaptation schemes and integrate these schemes in the policy options

3.1 Conduct participatory workshops in the field through PRA (Participatory Rural Appraisal) Methods

3.2 Analyze the workshop results and suggest possible community adaptation schemes

3.3 Compile the findings in the form of policy recommendations, community adaptation model, and final report

In reality, there were minor deviations from the proposed activities. The case studies were conducted in the above two districts through the combination of different activities (field survey, interviews, hearing, focus group discussions, and small workshops).

1.4 Implementing Partners

The Kyoto University Graduate School of Global Environmental Studies was the lead implementing organization for the study. The study was conducted in close cooperation with a wide range of stakeholders, which included: national government (National Institute of Disaster Management), state government (Gujarat State Disaster Management Authority) and district governments (Porbandar and Kutch district offices), and non-government organizations (SEEDS and KMVS).

1.5 Schedule

The study was conducted in nine month from July 2004 to March 2005. Activities were conducted as per the following schedule:

1) Data collection, literature survey (July 2004)
2) Field survey, hearing, interview, focus group discussion in Kutch (August 2004)
3) Focus group discussion in Porbandar (July-October 2004)
4) Analysis of data and findings (October 2004 - January 2005)
5) Compilation and report preparation (February-March 2005)

2. CLIMATE CHANGE AND INDIA

2.1 Overview of Climate Change

Since the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) made available in 1990, global climate change has been drawing attention of many to this very important topic, though it was a difficult proposition for many to accept. As the understanding of global climate and its change, mostly human induced, increased over the time, one could see an increasing number of scientists and administrators accepting it as happening. Today, global climate change is a fact with an observed rise in the global surface temperatures to the tune of 0.6 deg Celsius and with a projected rise in the range of 1-3.5 deg centigrade by 2100. Questions have also been raised about the influence of global climate change on the El-Nino and Southern Oscillations (ESNO) and vise versa with some evidences to suggest that the human induced global change is in fact leading to increasingly El-Nino kind of environments in the Eastern Pacific (Timmerman et al., 1999), though it is difficult to quantitatively associate the present changes to the climate change phenomenon. The scientific community, finally, agree that the global climate change is expected to modify the hydrological cycle and hence argue for an increased incidences of droughts and floods globally (Trenberth, 2002).

The 2001 report of the Intergovernmental Panel on Climate Change (IPCC) has identified following major impacts of climate change related extreme events (Table 1):

Table 1: Climate Change and its potential impacts

Extremes	Projected impacts
Simple extremes	
Higher maximum temperatures and hotter days (very likely)	Increased illness and deaths in older age groups Increased heat stress in livestock and wildlife Shift in tourist destinations Damage to number of crops Increased energy demand due to cooling requirements
Higher minimum temperatures; fewer cold	Decreased human morbidity and mortality Decreased risk of damage to a number of crops

Extremes	Projected impacts
days and cold waves (very likely)	and increased risk to others Extended range of activity of some pest and disease vectors Reduced heating energy demand
More intense precipitation events (very likely over many areas)	Increased flood, landslide, avalanche, and mudslide damage Increased soil erosion Increased flood runoff leading to recharge of some floodplain aquifers Increased pressure on insurance and flood relief systems
Complex extremes	
Increased summer drying over most mid-latitude continental interiors and associated risk of drought (likely)	Decreased crop yields Increased damage to building foundations caused by ground shrinking Decreased water quality and quantity Increased risk of forest fires
Increased tropical cyclone peak wind intensities, mean and peak precipitation intensities (likely over some areas)	Increased risk to human life, risk of infectious disease epidemics, and many other risks Increased coastal erosion and damage to coastal buildings and infrastructure Increased damage to coastal ecosystems such as coral reefs and mangroves
Intensified droughts and floods associated with El Nino events in many different regions (likely)	Decreased agricultural and rangeland productivity in drought- and flood-prone regions Decreased hydro-power potential in drought-prone regions
Increased Asian summer monsoon precipitation variability (Likely)	Increased flood and drought magnitude and damages in temperate and tropical Asia
Increased intensity of mild-latitude storms (little agreement between current models)	Increased risks to human life and health Increased property and infrastructure losses Increased damage to coastal ecosystems.

The above impacts are projected to spread unevenly over the continents. Though broader evidences are available, there are still speculations on what exact changes occur where and in what magnitude. However, it is universally accepted that the number of extreme events would grow from the present level and hence the associated debilitating impacts. All these impacts would also have socio-economic and cultural ramifications as well.

Among all the impacts, the rise in drought events and increased summer drying is most apparent due to reduction in amount of rainfall in some regions and increased surface runoff associated with the intense precipitation events in other areas. The access to the quality water resources will also go down due to increased water temperatures. The number of people living in water stressed regions is expected to grow from present level of 1.7 billion to 5 billion by 2025 depending on the rate of population growth and these impacts are projected to be more severe in central Asia, Southern Africa and countries around Mediterranean Sea. This is expected to threaten the food security and sustainability in these countries.

2.2 Impacts of Climate Change on India

2.2.1 Observational Evidences

The annual mean rainfall is considerably low in most parts of the arid and semi-arid India with high temporal variability. In tropical India, hills and mountain ranges cause striking spatial variations in rainfall. Approximately 80% of the total rainfall over the Indian subcontinent is confined to the southwest monsoon season and a failure of monsoons in this season would mean a severe water deficit in the rain-fed areas and reduced water in reservoirs and stream flows. The available literature suggests a wide range of impacts of climate change in Asia in general and in India in specific. Studies indicate an increase in the temperatures to the tune of 0.57 deg centigrade per 100 years (Rupakumar et al., 1994). However, the analyses of past rainfall events suggest no clear trend. The decadal departures found are above and below the long time averages alternatively for three consecutive decades (Kothyari and Singh, 1996). Extreme summer rainfall events were observed in northwest India during the recent decades (Singh and Sontakke, 2001). In addition, the number of rainy days during monsoons along the east coast has gone down during the last decade indicating more intense rainfall events.

2.2.2 Future Projections

While the analysis of the past climate behavior has been an easier task, the studies on the future climate variations were a difficult ones due to limited understanding of the climate phenomenon. This is the reason why the reports on the future climate variations have been inconsistent. Many studies were conducted using numerical models based on coupled atmosphere-ocean global climate models (AOGCMs). AOGCMs are the complex models being used in recent times and were developed by the Hadely Center for Climate Prediction and Research, UK. These models combine the capability of atmosphere general circulation models and ocean general circulation models with a facility to unite carbon cycle and atmospheric chemistry as modules for better prediction capabilities. Many of these global models failed to simulate the Indian monsoons mostly on the west coast of India owing to their coarse resolution. Since developing high-resolution global simulation models are both a costly affair and has technological limitations such as requirement for heavy computational powers, these limitations are expected to stay for some more time. Some studies are available that uses high resolution second generation Hadley Centre regional climate model (HadRM2). These model observations were relatively closer to the observed values in many parts of the country.

The national level climate projections have also been carried out using various AOGCMs. These studies were based on at least four scenarios taking into consideration the possible future trends of human activities and resultant status of greenhouse gas emissions between constant emissions to either decreasing or increasing emissions at a specified rate over average for the base period of 1961-90. These studies indicated a general increase in temperatures in the order of 3-6 deg centigrade over the base-period average, depending on the scenario, with more warming in the northern parts than the southern parts of the country. Regarding the precipitation, the GCMs project enhanced rainfall particularly in the northwestern India, though models differed in the magnitude of projection. The models projected no or little change in rainfall in the peninsular India. These projections have serious planning consequences in areas such as natural resource management.

Some seasonal asymmetrical warming has been observed in the model predictions. The high winter temperatures were projected when compared to

the summer and rainy season temperatures. This will have serious consequences on the productivity of winter crops such as wheat and with relatively low energy requirements for heating purposes. However, models did differed in their projections in sub-regional projects as well. While HadCM2 (developed in 1994) and HadCM3 (developed in 1998) models of Hadley Center projected differently the rainfall pattern for the 21st century with contrasting results. For example, HadCM3 showed increased rainfall toward the end of 21st Century.

The results from projections on the extreme rainfall and temperature events using regional models such as HadRM2 are available. These projections denote a decrease in rainy days by more than 15 days in western and central parts of the country with increase in amount of rain per day.

3. ADAPTATION TO CLIMATE CHANGE

The global community has called for a number of initiatives to combat the global climate change related extremes and projected impacts. Some of these measures include policy responses such as planned adaptation to the impacts and mitigation (Kane and Shogren, 2000). While the mitigation aims at reduction of greenhouse gas emissions through managing their sources and sinks, the adaptation works around the process of increasing the capacities of communities and regions to cope with such increases such that the possible negative impacts are reduced. Adaptation refers to adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. Adaptation is important in climate change in two ways - in reducing the impacts of the future climate change and in understanding the options for such adaptations to climate changes. There has been a shift in importance from mitigation to adaptation after it has been commonly agreed that the damage already done to the global climate has in fact started showing its negative impacts and that there is a need to adapt to these changes in order to reduce further damage. Two policy-relevant research reports that were recently released, the U.S. National Assessment of Climate Change Impacts on the United States and the Working Group II Report (Impacts, Adaptation, and Vulnerability) of the IPCC Third Assessment, gave prominent attention to potentials for adaptation. According to these studies, adaptation can ameliorate many adverse economic impacts of climate change in developed countries, barring abrupt climate change; however, developing countries and natural ecosystems are at particular risk because they have less ability to adapt. Even in industrialized countries, government programs to promote collective adaptation efforts likely will be needed.

The Third Assessment Report (2001) identifies various key adaptive capacity and vulnerability constraints of various regions. The developing countries of the Asian region have been identified as most vulnerable to climate change related impacts due to their poor adaptive human systems. The following major vulnerability factors are mentioned for Asia:

- Extreme events have increased in temperate and tropical Asia, including floods, droughts, forest fires, and tropical cyclones.

- Decreases in agricultural productivity and aquaculture due to thermal and water stress, sea-level rise, floods and droughts, and tropical cyclones would diminish food security in many countries of arid, tropical, and temperate Asia; agriculture would expand and increase in productivity in northern areas.
- Runoff and water availability may decrease in arid and semi-arid Asia but increase in northern Asia.
- Human health would be threatened by possible increased exposure to vector-borne infectious diseases and heat stress in parts of Asia.
- Sea-level rise and an increase in the intensity of tropical cyclones would displace tens of millions of people in low-lying coastal areas of temperate and tropical Asia; increased intensity of rainfall would increase flood risks in temperate and tropical Asia.
- Climate change would increase energy demand, decrease tourism attraction, and influence transportation in some regions of Asia.
- Climate change would exacerbate threats to biodiversity due to land-use and land-cover change and population pressure in Asia. Sea-level rise would put ecological security at risk, including mangroves and coral reefs.
- Poleward movement of the southern boundary of the permafrost zones of Asia would result in a change of thermokarst and thermal erosion with negative impacts on social infrastructure and industries.

India, as a Party to the United Nations Framework Convention on Climate Change (UNFCCC) that is a Global Treaty to consider what to be done to reduce global warming and cope with the inevitable temperature increases, accords great importance to sustainable development and climate change. India accords high importance since large populations in India are directly dependent on the climate sensitive sectors. In its recent Initial National Communication to the UNFCCC, India identified the following climate change related impacts as important for the country:

- Water stress and reduction in the availability of fresh water due to potential decline in rainfall.
- Threats to agriculture and food security, since agriculture is monsoon dependent and rain-fed agriculture dominate in many states.
- Shifts in area and boundary of different forest types and threats to biodiversity with adverse implications for forest-dependent communities.

- Adverse impact on natural ecosystems, such as wetlands, mangroves and coral reefs, grasslands and mountain ecosystems.
- Adverse impact of sea-level rise on coastal agriculture and settlements.
- Impact on human health due to the increase in vector and water-borne diseases, such as malaria.
- Increased energy requirements and impact on climate-sensitive industry and infrastructure.

The emphasis was clearly on the water related impacts such as droughts and floods.

3.1 An Overview of Climate Change Adaptation in India

After India ratified the UNFCCC in November 1993 and became a non-Annex1 country, it has the responsibility of making efforts towards identification of possible climate change impacts on the country and work towards reducing these impacts through suitable adaptation strategies. In its Initial National Communication submitted to the UNFCCC, India accepted the fact that the country has to work on various adaptation strategies in specific to combating future possible severe floods and droughts. The Initial Communication identified that the strategies specific to drought vulnerability reduction such as change in land-use pattern, water conservation, flood warning systems, and crop insurance are important. While identifying the existing programmes in India that aim at combating water scarcity, the Initial Communication proposes that the same programmes hold good even in climate-change scenario such as extreme events of droughts and floods.

There is no doubt that the existing programmes/approaches may hold good for combating future scarcity events. However, the question arise that whether these programs could able to deliver the outputs expected of them in the past. Many bottlenecks were identified in the existing watershed programs (John Kerr et al., 2002) that need to be removed before one can answer this question. The Initial Communication also identifies that there is a need for common nationwide adaptation strategy such as integrated watershed management starting from the local level water conservation practices to integrating impacts of these practices to a basin level such that the combined effect of water conservation at small levels reflect well at the larger basin level water resources.

The current adaptation research in India largely hovers around understanding various vulnerability factors and coping mechanisms that the communities developed over the time to various vagaries of nature and try to answer the question of whether these coping mechanisms are in response to the past climate change or not and whether these mechanisms are sufficient for coping with the future extreme events. These studies are mostly conducted through institutional collaboration involving advanced research institutions in association with the local non-governmental organizations who work very closely with the communities. These studies are helping in two ways. The advanced research institutions get to know the field level realities while the NGOs trying to understand the linkages between community level facts and how these facts can influence larger policy decisions.

The typical approach adapted in many of these studies include identification of major coping mechanisms, changes in these coping mechanisms over the time and try to map these trends with the past climate trends such as increasing or decreasing frequency of scarcity events in that location. A study conducted in Dungarpur and Mayurbhanj districts of Orisss (Verma, 2002), which are highly vulnerable to droughts and floods respectively, identifies different coping strategies adapted by the local communities in these two locations. The coping mechanisms identified for drought are as follows:

- Reduction in the food consumption to conserve the available food for longer time
- Collecting seeds of short duration crop cultivars to be sown after monsoon revival
- Fodder conservation for cattle
- Rely upon the stored foods such as dried fish and other preserved meat products
- Conserving water resources by limited use
- Resorting to migration, borrowing money from local credit sources etc in the wake of server droughts

These studies corroborate with many such adaptation related studies conducted in this region (Moench and Dixit, 2004, TERI, 2003) or elsewhere (ZENEB and UNDP, 2001). However, many of these studies don’t differentiate

between planned adaptation and autonomous adaptations. Such a differentiation is also important to know what adaptation strategies may have greater positive impacts on the longer run. Similarly, investigations are also necessary to know whether the adaptations were anticipatory or reactive, whether the adaptations were sufficiently able to make communities match with the pace of climate change events or not, and it would have been useful to know whether these adaptation mechanisms have alternative costs or not and if so what made the communities to take such decisions (Carter and Kankaanpaa, 2003).

4. CLIMATE CHANGE AND DROUGHT IN INDIA

4.1 Drought Vulnerability of the Country

India is highly prone to drought risk. The country receives an annual average rainfall of around 975 mm more than 75% of which is received in a span of four months from June to September. The performance of the Indian agrarian economy is very much dependant on these four months. The summer monsoon sets in the first week of June in the southeastern corner of the country and gradually covers the entire country by the second week of July. The monsoons start withdrawing from the first week of September from the West and North and gradually recede from the entire country. This pattern of onset and withdrawal leaves the northwest India with little rainy period while the southwest and northeast parts of the country receive higher rainfall and longer rainy season. In dry land areas the dry soils are low in organic matter with low initial infiltration rates leading to excess runoff and erosion of topsoil. Coupled to this, the rainfall in dry land areas occurring in short and intense spells makes these areas more vulnerable to runoff losses and further drought proneness. The 68% of India's cropped area receives rainfall between 750-2000 mm per annum. Statistical assessments of the historical rainfall in these areas reveal that these areas are highly prone to irregularities in monsoons such as late onset, long breaks and early withdrawal etc. Because of these reasons, these areas are also highly vulnerable to droughts ranging from a month to extended periods.

India has a rich drought history. India faced 22 major drought years (years with rainfall less than one standard deviation below mean) during the period 1871-2002. During the same period, a strong link was also observed between the number of drought incidences and the ENSO patterns. For example, the country faced 10 drought years out of 22 during the ENSO period of 1965-87 while only drought years during 1921-64 during which less correlation was observed between drought and ENSO.

4.2 An Overview of Drought Management in India

4.2.1 Drought Early Warning and Response Systems

Disaster management in India is a state subject with the role of Central government confined to facilitating one. Generally, the central government's

role is seen in dealing with major disasters that are out of State's capacity to deal with. Similar is the case with slow onset disasters like drought. The state level drought management is discussed in detail in the following section taking Gujarat as an example. At the national level, some nodal ministries were identified as responsible ministries to deal with specific disasters (Table 2).

Table 2. Nodal agencies/ministries responsible for managing natural disasters in India.

Type of Disaster/ Crisis	Nodal Ministry
Natural and Manmade Disasters	Ministry of Home Affairs
Drought	Ministry of Agriculture
Air Accidents	Ministry of Civil Aviation
Major breakdown of any of the Essential Services posing widespread and protected problems	Concerned Ministries
Railway Accidents	Ministry of Railways
Chemical Disasters	Ministry of Environment
Biological Disaster	Ministry of Health
Nuclear Accident inside or outside the country, which poses health or other hazards to people in India	Department of Atomic Energy

The Ministry of Agriculture and Cooperation is responsible for drought management in India. The idea of allocating this responsibility to the agriculture department has been that the drought impacts agriculture largely and such an impact will have fallout on the rest of the society in terms of food availability and access.

At national level, the responsibility of weather forecasting, an important aspect in early warning for drought early warning, is rested with the India Meteorological Department (IMD) under Ministry of Science and Technology. The role of IMD is restricted to making available the meteorological observations on current and forecast information for optimum operation of weather-dependant activities such as Agriculture and irrigation. However, the national drought early warning system is through what is called Crop Weather Watch Group (CWWG) (personal communication, Ministry of Agriculture). The

Crop Weather Watch Group consist of a group of administrators representing various government departments responsible for managing essential inputs for agriculture and scientists from the national agricultural system (Indian Council of Agricultural Research, Ministry of Agriculture). The Table 3 enlists the composition of CWWG and its role.

Table 3. Composition of CWWG and its role

Composition	Role
Central Relief Commissioner	Chairman of the group; promote overall coordination
Economic and statistical advisor	Reporting on behavior of agro-climatic and market indicators
India Meteorological Department	Monsoon forecast and progress of monsoon
Central Water Commission	Water level situation in major reservoirs
Crop specialists	Crop conditions and prospects
Agricultural input supply divisions	Supply and demand of all agricultural inputs
Agricultural extension specialists	Reporting on field level farm operations
Ministry of power	Managing electrical power for ground water use
Ministry of petroleum	Diesel supply for ground water use
Indian Council of Agricultural Research	Information for technology transfer

The CWWG meets once every week during monsoon season (June to September) and assesses the monsoon situation and various other parameters of the drought. The information flow after the CWWG identifies an impending drought is given in the Fig 1. below. The following diagram (Fig 2) indicates the path of drought response at national level in 2002 drought (Someshwar and Subbiah, 2003). In the present case study of 2002, the state government assesses the situation and sends a request for the central assistance in the 6th week after identification of drought situation in the state. It can be observed that it took 3 weeks time for the central government to send Central Assessment Teams for assessing the drought situation in the state and respond to the assessment request by the state government. The report prepared by

International Research Institute for Climate Prediction (IRI) and Asian Disaster Preparedness Center (ADPC) (Someshwar and Subbiah, 2003) identifies a crucial gap in climate information dissemination to the end users and says that the end-to-end climate applications system for drought mitigation doesn't exist in India. The report, however, apprise that India has a fine institutional mechanism that is connecting the central government and the state governments down to the district administration and that this mechanism is responsible for better delivery of relief services, safeguarding livelihood systems and in ensuring their recovery ultimately avoiding the famines.

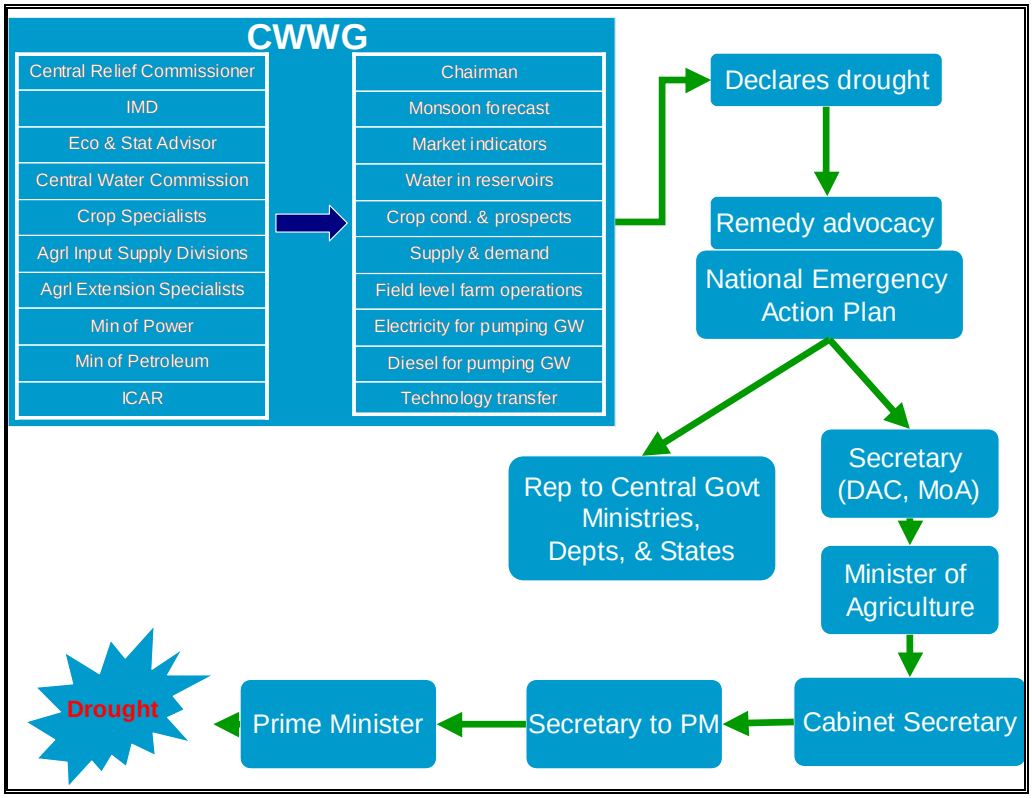


Fig 1. Information flow for declaration of national drought in India.

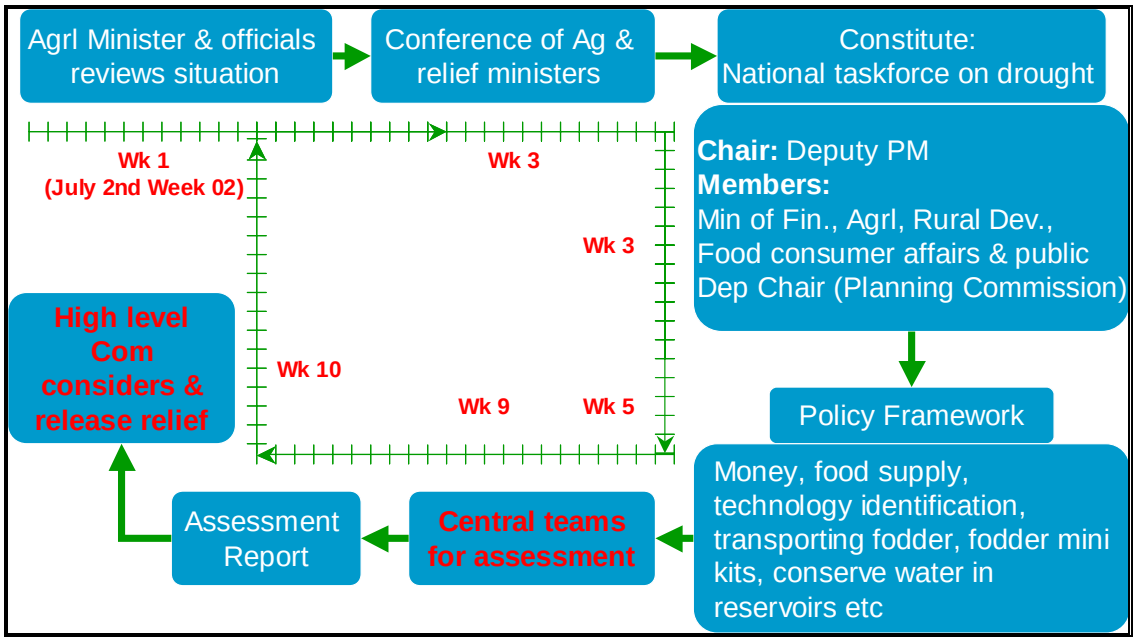


Fig 2. The response path at national level after a drought has been declared.

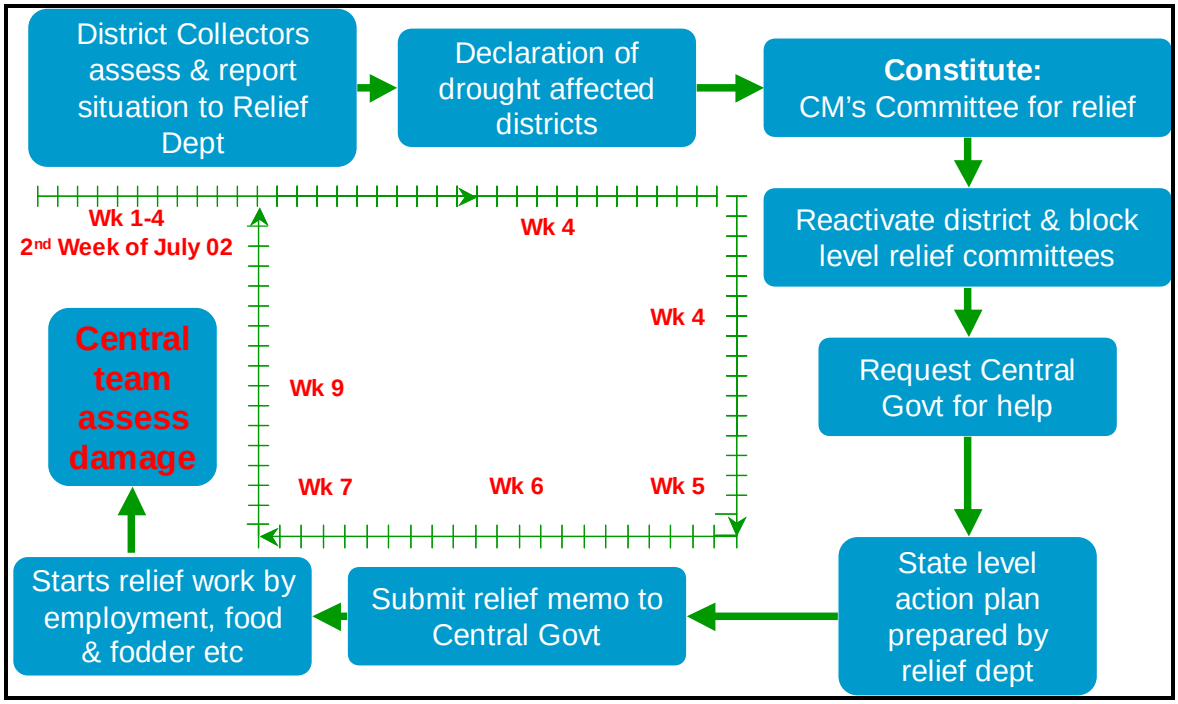


Fig 3. State level drought response mechanism of Rajasthan during 2002 drought.

4.2.2 Drought Mitigation Mechanisms

Watershed development programs and other social developmental programs mainly drive drought risk mitigation in India with an aim at overall development of stressed environments. An indicative list of various programmes is given below (Table 4).

Table 4. Drought proofing programmes in India

Programme	Coverage/expenditure (INR)
Drought Prone Areas Programme (DPAP)	180 districts of 16 States, Rs[1] 19.0 billion
Desert Development Programme (DDP)	40 districts of 7 States, Rs 8.5 billion
Watershed approach: A geo-hydrological approach for in situ soil and water conservation	Rs 22.6 billion
Others	
Food for work Programme, Employment Assurance Scheme (EAS)	Rs 16.0 billion
Jawahar Gram Samridhi Yojana (JGSY)	Rs 16.5 billion
Pradhan Mantri Gram Sadak Yojana (PMGSY)	Rs 25.0 billion
Swaranjayanti Gram Swarozgar Yojana (SGSY)	Rs 5.0 billion
Antyodaya Anna Yojana (AAY)	
National Old Age Programme (NOAP)	
Annapurna Scheme	Rs 3.0 billion
Integrated Child Development Scheme (ICDS)	
Mid Day Meal for School children	

The programmes such as Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and Integrated Wasteland Development Projects which are run by the Ministry of Rural Development and National Watershed Development Programme in Rain fed Areas (NWDPRA) under the Ministry of Agriculture mainly rely on the watershed-based approaches. These approaches, mainly driven by government and non-government organizations, aims at conservation of natural resources that also lead to water conservation at different levels. There were several studies conducted on the efficacy of

[1] 1 US$ = 45 Indian Rupees.

these programs. Some of the major drawbacks identified are as follows (Kerr et al., 2002):

- Top down approach leading to less fulfillment of local felt needs
- Poor community participation
- Least development of community based assets
- Lack of sustainability
- Monitoring of projects in terms of financial management rather than on outputs such as natural resource management and on how such interventions could lower the drought vulnerability of the program villages or regions.

The study conducted by John Kerr et al. (2002) concluded that the government projects often failed due to lack of participatory approaches and NGO or NGO-Government projects succeeded mainly because these projects provided opportunity for people's participation through preparing communities before projects are initiated. Such an approach even could facilitate better maintenance of assets even after the project period, even better than the government projects that provided lots of subsidies to the communities while implementing waster conservation measures. However, the study didn't make any comment on whether or not these interventions are sufficiently takes care of future possible threats.

Till more recently, the above mentioned area development programmes have laid down their own guidelines depending on the main objective of these programmes. However, a national committee under the Chairmanship of Prof Hanumantha Rao reviewed these programmes and gave a recommendation for common guidelines for implementation of watershed based projects in India. The committee observed that these programmes failed to meet the targets, both financial as well as those related to outputs, mainly due to the inappropriate administrative arrangements. The committee also observed that the projects could not achieve sustainability mainly due to lack of public participation. The committee gave a new set of guidelines for governing the watershed programmes with a name 'Hariyali.'

The above review of drought management in India reveals that much is required in the area of drought risk mitigation in the current scenario i.e. how

the natural resources such as water are being managed even before considering the future climate change. Many guidelines governing watershed approach, the main approach considered for mitigating drought risks in India, also do not consider climate change as an aspect.

It is pertinent to mention here that there exist an opportunity for governments to build sustainable livelihoods using drought relief measures as a means. For example, a shift from ad-hoc measures to planned relief interventions that aim at creating of longer-term livelihood options is an important thing to be considered. However, it may be difficult for the administrators to think in that direction as the main aim of relief measures are to alleviate the immediate impact of the drought. Having said this, the developmental workers and livelihood specialists argue that there exist an opportunity for making these interventions more useful in longer term. Following are the areas where the drought relief measures could lead to generation of sustainable livelihoods:

1. Identification of vulnerable livelihoods and making specific corrective interventions.
2. Development of local market facilities and non-farm employment opportunities (livelihood diversification) that reduces the vulnerability to drought related events.
3. Identification of local needs and using the drought relief resources to fulfill these needs.
4. Emphasize more on the mitigation measures that take care of future vulnerabilities as well.

4.3 Drought Scenario in Gujarat

Spatial analysis suggests that the Northwest India followed by peninsular India face severe droughts with large departure or rainfall from the normal (Table 4). This could be due to weakening of monsoons by the time they reach the northwestern India. This brings our discussion to one of the major drought prone states in India situated in the northwest India i.e. Gujarat. Drought occurs once in 4 years in Gujarat and its neighboring state of Rajasthan has a drought frequency of once in 2.5 years. The average rainfall of Gujarat is XXXX mm. The gradation of rainfall is much steeper in Gujarat with eastern parts receiving more than 2000mm rainfall and gradually declining to less than 400 mm towards the western parts (Fig. 4). Lack of adequate surface water sources is

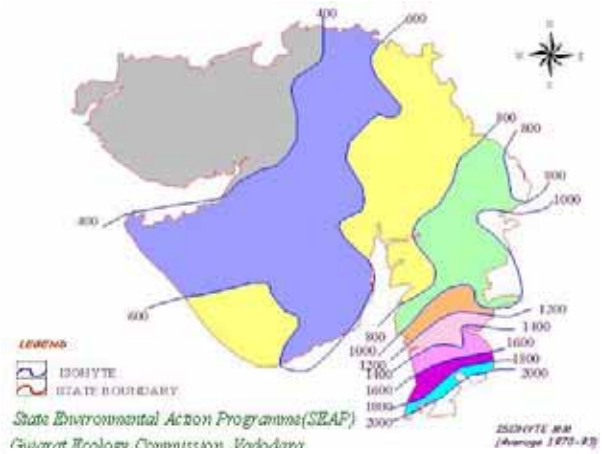


Fig 4. Isohytes in Gujarat.

compounding the problems in Gujarat with all major perennial rivers being located in the extreme south of the state. Recurring droughts and lack of proper surface water sources are causing the ground water table to recede. For example, a fall in water table level of 1.85 m in confined aquifers and –16.7 m in confined aquifers was observed in Gujarat in last ten years. The 2002 drought caused a fall of –1.83 m in confined aquifers here. In addition to its scary hydrological situation, the poor forest cover also threatens the Gujarat state. The state has a forest cover of 15,152 km^2 (7.73% of geographical area) mostly distributed in south, southeast and eastern parts leaving much of its western and northern parts vulnerable to climatic vagaries (Forest Survey of India, 2001).

Table 5. Percentage departure from normal (long term average) during major droughts in India

Region	1918	1965	1972	1979	1987	2002
All India	26	18	25	19	19	19
North West	36	28	36	18	46	48
Central	0	0	0	31	28	31
East	20	30	22	23	14	2
Peninsular	32	22	31	14	27	27

4.4 Drought Management in Gujarat

Drought management in Gujarat is not much different from many states in India and it is very much in terms of response. However, the state has established a drought early warning system under the chairmanship of Principal Secretary, Revenue named as Weather Watch Group. The working of WWG resembles very much to that of the National Weather Watch Group formed by the Ministry of Agriculture and Cooperation (see the previous Section). This group meets once in every week and assesses the drought situation by monitoring

parameters such as rainfall, irrigation facilities, water in reservoirs and electricity supply etc. The state has a clear response mechanism to drought. The state Cabinet Committee, which is a standing committee, gets activated in the wake of declaring drought in the state. The Cabinet Sub Committee is responsible for policy decision-making, monitoring and implementation of the drought relief work. There are separate groups for policy making and monitoring and implementation purposes. The Chief Secretary is the head of the Group that is responsible for Policy making while the Relief Commissioner is the head for the implementation group. The State Relief Manual mainly facilitates the relief work and outlines clear guidelines for implementing the drought relief. Appropriate institutional mechanisms are in place to check the quality aspects in implementation of drought relief work.

In general, the drought relief interventions of the state comprises of the following measures:

- Monetary relief (loans, grants etc)
- Food supply
- Water supply
- Fodder supply
- Crop contingency relief measures such as supply of seeds and fertilizers

The practice has been that the affected population has been distributed with the food grains against the work they do in the government drought relief programs. Typically, the affected population would be engaged in works such as deepening of village ponds, agricultural ponds, construction or repairing of check dams, and construction or repair of roads etc. Cattle camps are one such activity that provide centralized facilities for arranging feed and water facilities. Though widely debated and controversial, giving away cash doles has been a common practice. However, such ‘grants’ are made to only aged, infirm, children and pregnant women who are categorized as most vulnerable sections of the society. Supply of drinking water is another important aspect of drought management in the state, as the case in many other states in India. The transportation of water through rail and road transport facilities to reach the doorsteps of affected communities is both cost intensive and well establishes the fact that many states in India don’t have longer term policies for securing drinking water supply during stress conditions.

4.5 Climate Change and Gujarat's Drought Vulnerability

Our review on the available results from the model studies indicate that there would be a general increase in rainfall over western part of the India with more intense rain events. While the increased rainfall is a welcoming development to this much drought stricken part of the country, an increase in intensity rainfall might lead to a high surface runoff and loss of water from the region where it has fallen.

The past analysis of rainfall data for the state of Gujarat indicates a different picture all together. Gujarat has experienced 12 years of drought, and four major scarcity situations. However, the intensity and return period of major drought events have increased substantially in last two-three decades, and it is often correlated to the climate change impacts. Traditionally, Gujarat has a drought cycle of 5 years, where in 2 years there is moderate rainfall, 2 years less rainfall, and 1 year of good rainfall. Consecutive 2 years of less rainfall makes it difficult for the communities to sustain their livelihoods. It becomes worse, when there is 3 years of consecutive less rainfall. Statistical data show that in last two decades, the intensity of the 3 years of consecutive less rainfall is increasing, and thereby creating severe drought situation (Fig 5). There is still a need to study systematically the impact phenomenon of these increasing drought incidences and on how the local communities are coping with them.

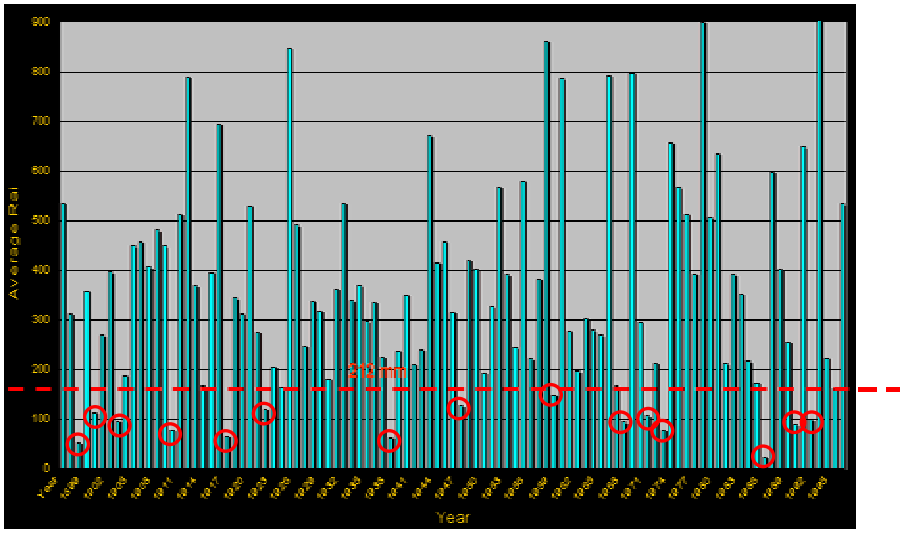


Fig. 5. 100 years of rainfall trend for Kutch District, Gujarat (1897-1997)
(SOURCE: Kutch Ecology Fund)

5. COMMUNITY LEVEL ADAPTATION TO DROUGHT

The major part of Gujarat has semi-arid to arid type of climatic conditions, and suffers from recurrent droughts. Two case study areas, Kutch and Porbandar are not exceptions. Due to the climatic characteristics, life of people and droughts are inseparable. Since majority population in these areas engages in agriculture, droughts are one of the major drawbacks. The impacts of drought includes decline in groundwater levels, drinking and irrigation water scarcity, reduced agricultural productivity and production, fodder scarcity and reduced food security. Droughts do not only cause short-term livelihood problems but also constrict their long-term development.

On top of this, recent increase in number of severe droughts, desertification, and salinisation in some areas has made the condition worse. Therefore, there is an urgent need to develop community level adaptation strategies. As in other drought prone areas, local communities in these case study areas have traditional coping mechanism against the droughts. It is important to understand how people have adapted to or coped with drought and to develop strategies by bringing some changes in current natural resource management and livelihood patterns to mitigate the adverse effects of drought.

As impacts of drought vary, different types of measures are adapted by local people and communities. The diagram in next page summarize the various strategies have been and could be emerged to mitigate the negative impacts of drought. According to hearings conducted in case study areas, despite the government promotes drought management, which focus on the long-term measures, more people has been depend on short-term relief measures provided by government after drought occurs. Although they may help people survive during the scarcity period, their capacity to drought is not built and they keep suffering from reoccurrence drought.

Following section introduces long-term drought proofing initiatives taken by local communities with the support of NGOs in two case study areas. These initiatives not only have achieved desired physical goals such as saving water or generating income, but also created awareness of droughts and idea of long-term drought proofing among local people. They have begun working

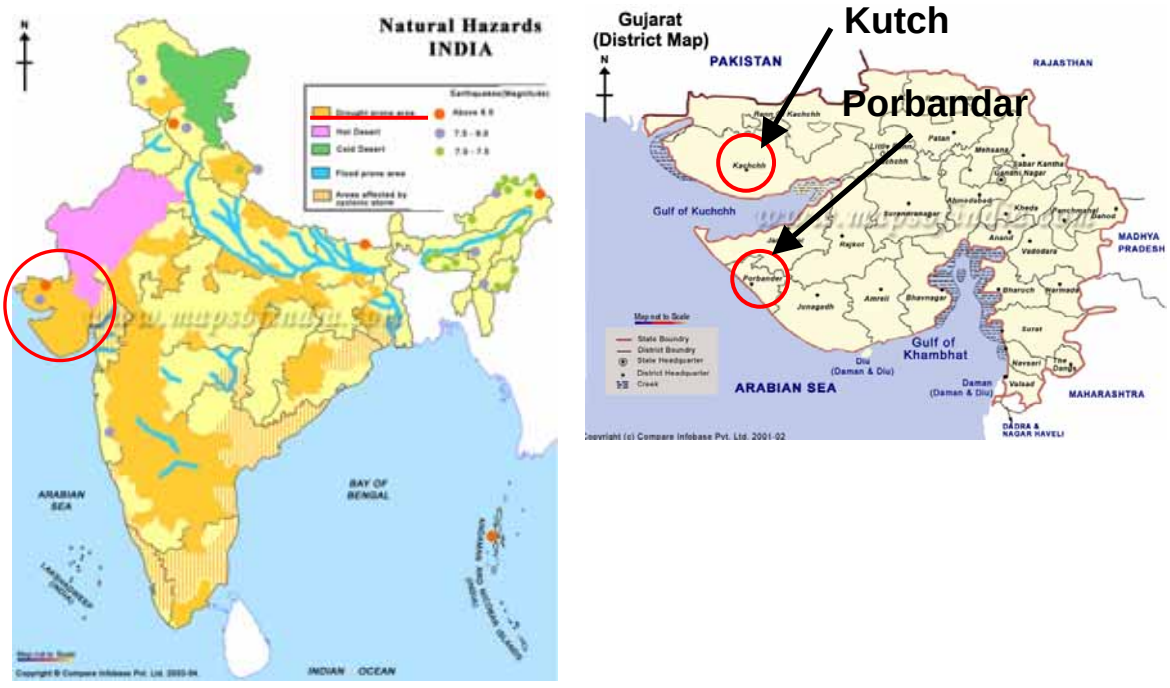
more on long-term measures and became less depending on short-term relief. These case studies may be good examples of community level initiatives could be taken by different areas.

Table 6: Various strategies to adapt to and cope with drought by local communities

	Short -Term	**Long- Term**
Water Management	- Deepen Well - Utilize Government Water supply	- Construct dams - Artificial recharge of ground water aquifers - Integrated watershed management - Decentralize water resource - Conserve water
		- Promote rainwater harvesting system - Improve agronomic practices - Promote drought tolerant seeds - Soil conservation - Seeds conservation
Animal Husbandry	- Migration - Utilize fodder bank - Utilize cattle camp	- Control livestock population - Conserve fodder
Local Economy	- Engage in non agricultural labor work - Engage in relief work - Migration - Loans	- Secure income from other livelihood options - Save cash - Save crops

6. DROUGHT CASE STUDIES

In two case study areas in Gujarat (Fig. 6), Kutch and Porbandar, there are significant cases that local NGOs work with local communities to enhance their ability to adapt effectively to drought. The first one is an initiative taken in Porbandar by Delhi based NGO called SEEDS (Sustainable Environment and Ecological Development Society). SEEDS promote sustainable methods of rainwater harvesting techniques, which designed, maintained and managed by the local communities. The second one is initiatives taken in Kutch by local NGO networks, Abhiyan (Kutch Nav Nirman Abhiyan). Here introduces two initiatives taken by Abhiyan. The first initiatives called Drought Proofing Program which creates local dams to decentralize rural drinking water and sanitation and to secure water for drought period. The second initiatives focused on livelihood options. Since Kutch is traditionally well-known for its handcraft, Abhiyan supports local people engage handcraft works especially women to create livelihood option.



SOURCE: Maps of Inidia

Figure 6. Map of India showing the project locations

As the results of these initiatives, though specific focuses were different, all these targeted communities were able see the advantages of implementing

measures which support their livelihood. Significance of these initiatives is not only the physical results but also they promote the local people's participation and utilize local knowledge. As described below, both NGOs in two case study areas emphasized the process of initiatives.

6.1 Case Study: Porbandar

In order to promote sustainable methods of rainwater harvesting techniques, SEEDS decided to test and promote activities involving collecting rooftop rainwater and recharging underground water. Based on their survey, existing village data and focus group discussions, two villages in Porbandar, Thoyona and Digvijaygadh were selected. Thoyona especially suffers from irregular availability of irrigation water while DigvijayGadh has drinking water problem.

Therefore, activities decided for work were:

1. Roof top Rainwater Harvesting at Digvijaygadh school building
2. Well recharge structure and farm pond at Thoyona
3. Training of communities in water conservation and harvesting

Specific objectives were set by SEEDS for this initiative as shown in Table 7 below.

Table 7. Community Level Objective Setting

1. Generate awareness in the community regarding water conservation techniques for long term drought management and link it with the development perspective
2. Training of village community for execution of drought proofing work
3. Impact assessment of the implemented water harvesting structures for enhancement of the program
4. Awareness regarding how the community can solve their problems of drinking water as well as water for agriculture and other purpose
5. Awareness about mitigation measures to combat the effects of scarce rainfall in the intervention area, which is largely a farmer's community
6. Enabling community to formulate their own water model plan which can be implemented for their village based on their felt needs
7. Community involvement and participation right from identifying their needs and actual implementation

In order to achieve their goal and objectives, SEEDS began with organizing community meeting and Focus Group Discussion followed by community mobilization. After community members were mobilized, training as well as small scale workshop with participants were conducted during implementation

process. Following summarize the specific detail of initiatives in two targeted villages, Thoyona and Digvijaygadh, and their outcomes.

6.1.1 Initiative in Digvijaygadh

District: *Porbandar*
Taluka (Block): *Ranavav*
Village: *Digvijaygadh*
Location: *Digvijaygadh school building* (Figure 7)

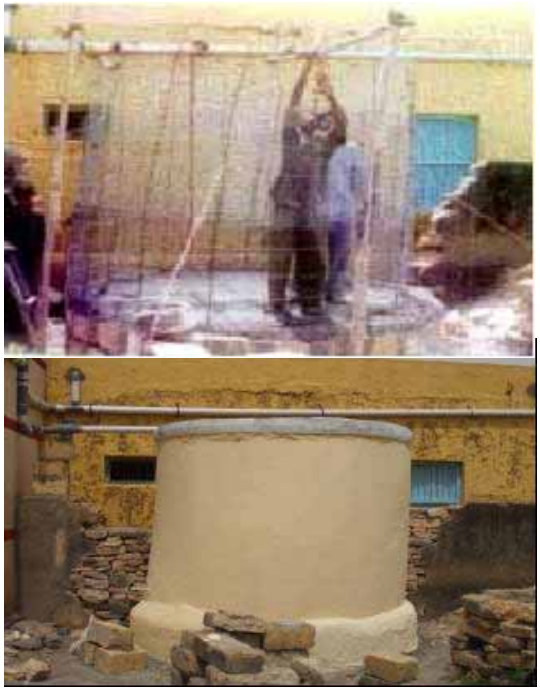


Fig. 7. Construction of rooftop rainwater harvesting system in the school buildings

6.1.1.1 Overview

Digvijaygadh is a labor class village with around 70 households from the Sager and Rabari community. It is socially and economically backward village. Once a village with good farms, the community has been reduced to labor class due to degradation of the natural resources. In general the community was enabled to recall right from the survey when they had cited drinking water problem.

6.1.1.2 Process

SEEDS began with holding community meetings participated by various stakeholders including children, Panchayat (local elected body) members, masons, women and teachers. During the meeting, discussion was about the water-harvesting principles, techniques, and advantages with specific focus on the roof top water harvesting. After more villages inspired by this technique, actual implementation began.

6.1.1.3 Community Involvement and Output

At Digvijaygadh, the villagers are mostly Maldharis or labors. It is socially and economically backward village. The villagers could not contribute in terms of finance but they contributed in terms of labor, transportation, water from the well, water curing etc. Most importantly, they were able to participate in the

program right from identification of needs, resource mobilization to the implementation. Some of the villagers have also shown interest as to how the water of the village can be collected collectively.

6.1.2 Initiative in Thoyana

District: *Porbandar*
Taluka (Block): *Ranavav*
Village: *Thoyana*
Location: *Thoyana Agriculture land*

Figure 8. Green agriculture land after interventions

6.1.2.1 Process

Numerous meetings were held at Thoyana during which the villagers were oriented about water harvesting techniques, well recharging, including different techniques, the costs and its benefits. During the first meeting a discussion was carried out to find water need for villagers, water need for irrigation, interventions to be carried out. Villager's support was sought and different methods for participation in work were explored.

6.1.2.2 Community Involvement

Because of the past experience, only two people were ready for the work instead of the 10, as originally scheduled. But once the work started and the on site interactions started and along with explanations, villagers were motivated to take up the work in their own farms. "Seeing is Believing" worked out for the villagers. Community involvement includes providing their manpower for labor work, their vehicle for material transportation, utilizing existing village fund etc. The villagers provided material help in kind to a maximum of Rs. 5000. Rest contribution (amounting in a range of 15% to 25%) was from the beneficiary. For farm pond construction, minimum 20% contribution was made by the community.

6.1.2.3 Output

Table 8 shows the estimated water harvesting practices in

Table 8. Annual water harvesting potential

Roof area of building A = 37.625 sq. m.
Roof area of building B = 68.025 sq. m.
Total Roof area of both buildings = 105.65 sq. m.
Average annual rainfall in this region = 450 mm = 0.450 m
Runoff coefficient for concrete surface = 0.7
Annual water harvesting potential
= Total Roof area x Average annual rainfall x Runoff coefficient
= 105.65 x 0.450 m x 0.7
= 33.27 cu. M. ***(33,279 Liters)***

the two buildings which implemented rain water harvesting system. Table 9 shows the change in water depth in the wells before and after the interventions (SEEDS 2004).

Table 9. Impacts of interventions

Sr. No.	Name of beneficiary	Year & month	Well depth (ft)	Water depth in well (ft)	No's of well in surrounding	Surface catchments area (Hector)	Water level in well after 1 rain (ft)
1	Devshi Giga Bhutia.	2004july	85	5	20	2	10
2	Rambhai Karshanbhai sindhal	2004july	70	25	10	41	65
3	Bharatbhai Mashribhai Bhutia	2004july	100	40	15	41	90
4	Bhanubhai Ramabhai Ratadia	2004july	90	5	10	32	80
5	Virambhai Rambhai Audedra	2004july	72	15	10	10	28
6	Parbatbhai Arjanbhai Audedra	2004july	80	10	10	6	25

6.2 Case Study: Kutch

The district of Kutch which comprises of 24% of the total area of the State of Gujarat falls in the arid tracts of the country and has a unique arid coastal climate. While Kutch has always been a drought prone region, the incidence of drought has become regular, and any 5 year cycle has 2 to 3 years of droughts.

Many communities of Kutch have not only lived through regular droughts for generations, but also represent a history, which is replete with drought management techniques and systems. However, in the last 30 years, there has been a gradual increase in the community's dependence on the Government for Drought Management, and decline in community methods of drought managements. Resources utilized in the drought relief works have sustained villages in the short term, with each affected village receiving, on an average, wages worth Rs.800,000 to 1 million in the scarcity period. However, while the resources have led to drought relief, it has not necessarily led to the mitigation of the effects of droughts. Therefore, local NGO, Abhiyan proposed to work on self-sustaining solution for their drinking water, agricultural and

livelihood problems. These activities will lead to an increase in the household income in good rainfall years, and a reduction in their liabilities in drought years. Following introduces two specific initiatives taken by Abhiyan, one focusing on water and another focusing on livelihood option. Specific objectives were set for initiatives as shown in Table 10.

Table 10. Objectives of Drought Proofing Project

1. *To bring an attitudinal and perceptional change within the communities*
2. *To encourage, in a drought year, communities to engage in works which have a long-term developmental impact in the village, and does not just create short term employment.*
3. *To create a model in the district to strengthen their traditional water resources.*
4. *To enable more dry-land farmers to undertake critical irrigation for one crop – the kharif crop*
5. *To undertake farmland treatment by increasing soil and moisture conservation, which prevents crop failure.*
6. *To increase the productivity of grasslands in the pilot villages, thereby improving grassland productivity and strengthening the grass reserves of the communities.*
7. *To arrest migration from the villages, thereby making it possible for the village to access, and stay integrated to other rural development and poverty alleviation programs, even in drought year.*
8. *To strengthen the partnership between the District Government, and the Network of NGOs, thereby increasing the potential for more sustainable rural development planning and implementation in the district*
9. *To build the capacity and abilities of the communities and the NGO workers to plan for, and implement drought proofing activities*

6.2.1 Water Related Initiatives

Drought Proofing Program

Implemented by: Abhiyan and other local NGOs

Supported by: Ministry of Rural Development, Government of Gujarat, UNDP

6.2.1.1 Overview

The Drought Proofing Program is being implemented in 31 villages spread across the districts of Kutch. These villages have been identified by 15 different NGOs working in Kutch district. The villages communities of these 31 villages have voluntarily agree to participate for the long-term drought proofing program. The initiatives was implemented, coordinated and monitored by Joint Cell under the chairmanship of District Collector, Bhuj, Kutch. The NGOs, responsible for implementing the project at the village level were coordinated by the central office of Abhiyan.

6.2.1.2 Process

Based on criteria set, targeted villages were selected. In order to maximize the outcome of the initiatives, the targeted villages were familiar to the NGO and vice versa, as a whole voluntarily agreed to the long-term drought proofing project, were willing to contribute 5% towards its own village maintenance fund, and nominated and formed drought proofing committee. After selecting villages, based on hearing from village people, engineers from NGOs determined the size and the location of the dame to be constructed.

6.2.1.3 Output

As shown in Figure 9, it was visible that they were able to collect rainfall water effectively. In order to secure their water, village members set own rules of using the water collected in the dam. According to NGO members, women are more motivated to construct the dam than at first. However, after a while, most of village members participated the work. In the end, both man and woman were more aware of and confident about long-term drought proofing activities and less depend on short-term relief by the government.

Figure 9. Water resulted from the drought-proofing program

6.2.2 Livelihood Related Initiatives

Implemented by: Kutch Nav Nirman Abhiyan, Nehru Foundation for Development

Supported by: Government of India

6.2.2.1 Overview

In the arid, drought prone district of Kutch, practice of handicrafts provides livelihood to over 40,000 families (Figure 10). One of the first steps in Kutch livelihood programs is identifying the local resource base – the skills, raw material, traditional knowledge, aptitude, or interest. Since Kutch is one of the most craft-rich areas in the country, it becomes the most visibly identified area of livelihood generation.

The various crafts practiced including weaving, ajrakh block printing, tie-dye, pottery, leather, bell making, knife making, silver and gold jewelry, rogan art and so on. However, to initiate craft programs, without a comprehensive understanding of the complexity of craft in artisans lives, its very niche markets, designs, and craft market, means that the initiating organization immediately runs into its first and primary problem – of having created expectations amongst artisans, before developing the marketing chain. More problems ensue- quality, designing with the artisan, markets, unsold stocks of produce generated in the initial enthusiasm to help, and the blockage of the fund flow. Crafts activities have led the NGOs to walk between the socio-economic developmental needs of the community, the arena of art and craft, and the world of business and that is a difficult and complex task.

Figure 10. Craft as one of the key livelihoods for women in Kutch

6.2.2.2 Activities

NGO supports workers involving handicraft work to provide followings to materials, secure constant incomes.

- Market Support, mainly to handicraft artisans
- Distribution of raw material and equipments for handicraft work
- Training & Capacity Building through vocational training programs for women and youth
- Infrastructure support in terms of work-shed reconstruction for craft artisans

6.3 Implementation Mechanisms: SETU

Two initiatives undertaken in Porbandar and Kutch have not only achieved desired physical goals such as saving water or generating income, but also created awareness of droughts and idea of long-term drought proofing among local people. However, in fact, there are hundreds of other villages, which still suffer from recurrence of droughts and need to implement long-term drought-proofing initiatives. In order to implement such effective initiatives

widely and effectively, a network established in Kutch after Gujarat Eathquake could be one option.

6.3.1 Establishment

With a long history of NGO activities in Gujarat, numbers of NGO networks has been established. Abhiyan which established SETU is one of them. The purpose of SETU was to establish the link between government, NGO and community (Figure 11). After the 1998 cyclone hit Kutch, twenty six local NGOs in Kutch had came together and established Abhiyan. Since its establishment, Abhiyan has taken an important role as local NGO network as each member NGO continues working in their specialized field. Soon after the earthquake, the member of Abhiyan realized the needs of coordination of efforts. Despite a great number of aids and effort came into Kutch, they were not distributed properly. Therefore, Abhiyan instituted a cluster level "sub-center" for every fifteen to twenty villages all across the district. This center became SETU. With its unique institutional structure, SETU focused on coordination between villages and government or aid agencies and information management to bring the most needed support to the communities during relief and rehabilitation process.

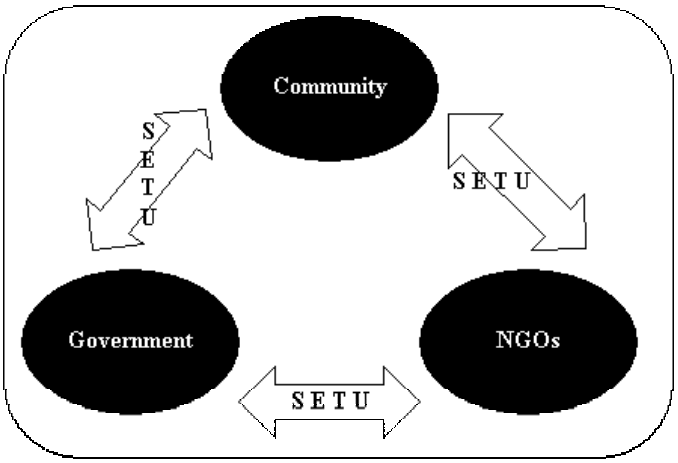


Figure 11. SETU as a bridge

6.3.2 In-House Structure

Originally twenty SETU was established. Along

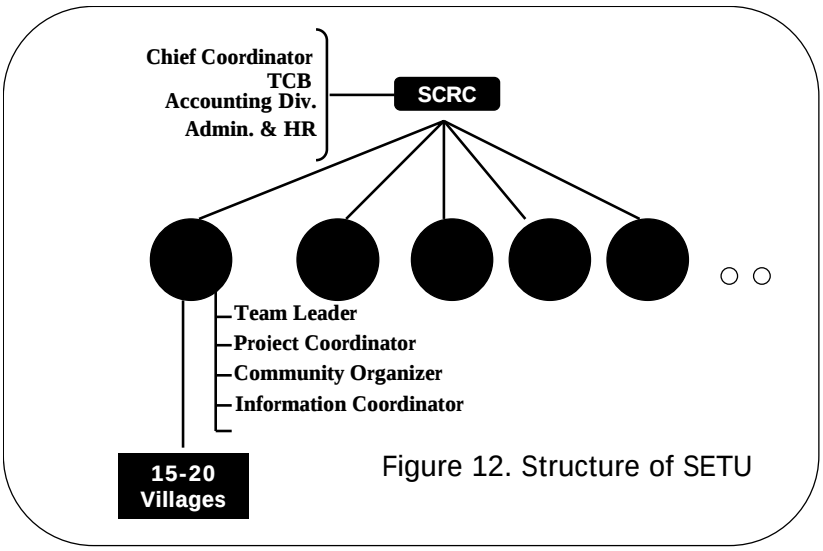


Figure 12. Structure of SETU

with needs, it increased the number to thirty-three in the rehabilitation period and currently eighteen SETU, that cover over two hundred villages, conduct activities. Each SETU consists of five to seven staffs, with specialized role as shown Figure 12. At the head of each SETU, team leader oversees its staff members as project coordinator plan and coordinate its projects within the cluster, community organizer specially work closely with villages, and information coordinator collect and distribute necessary information between SETU and villages and SETU and head office (SCRC). Although most staff members were from outside of cluster villages such as local NGO members, at least one person comes from villages with a hope that SETU or similar body will run by villagers.

Since these staffs live by the villages and communicate with local people in daily basis, they have gained trust from villagers and have understood their situation and needs accurately. This trust and understandings is essential to provide necessary support for local people and the community. Since they work with villages closely and independently, SETU has been able to work with a multi-sectoral grievance mechanism. It helps to create more equality and transparency in village community and its decision making process.

6.3.3 Network Structure

Unique characteristics of SETU is not only how closely they work with local people but also how they cooperate with other stakeholders such as government, non-government, and international organizations shown in Figure 13. The arrow in Figure 13 shows the way of support among stakeholders. It should be noted that K-link

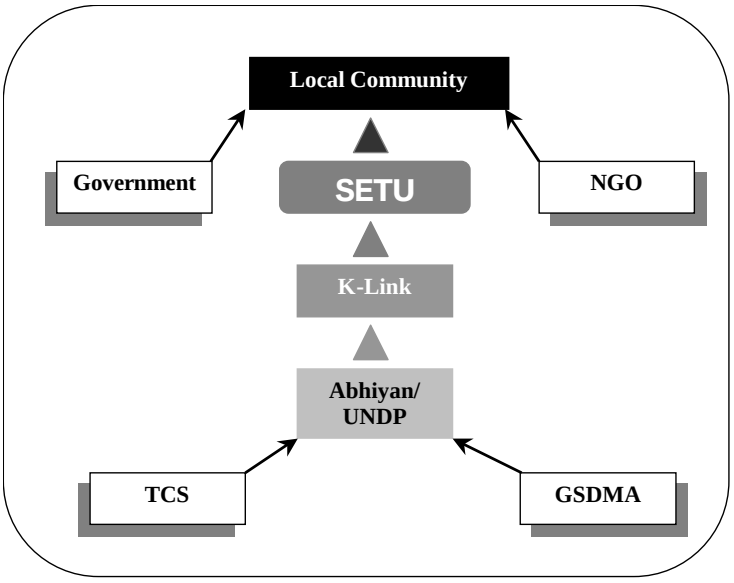


Figure 13. Multi-stakeholder cooperation scheme of SETU (GSDMA: Gujarat State Disaster Management Authority), TCS: Tata Consultancy Services)

(Kutch Local Information Kendra) is a body which also established after the earthquake to coordinate all the information such as damage of each villages and household. K-link collects information from each village by SETU, analyses it and distributed information to governmental organizations and other NGOs/private sectors, which works in villages.

6.3.4 Role of SETU

Because of its unique structure, SETU can work closely with local communities in located over a large area and outside organizations including government and NGOs. Like most rural villages of India, village community is the basic social system in Kutch. Each village community has decision-making body usually called Panchayat which make various decisions for the village economy and the self-governance. Traditionally it is dominated by people with power and it sometimes causes inequality or corruption. However, by involvement of SETU, Panchayat has been reestablished as a fair decision making body which considers vulnerable people.

In addition, with local communities, SETU helps them identify their needs and does not give them support unless they ask. By doing so, it prevents dependency among village people and community, which often becomes a problem with excess support from outside organizations. Although they work to provide necessary support for people and communities, their ultimate goal is to establish self-sustained mechanism in local communities.

Another important role of SETU is the network structure shown in Figure 11. Often, in rural areas in India, there is lack of linkage between NGOs, local communities, and governmental organizations and necessary information from each sector is not passed onto others. Because of the establishment of SETU, which can work closely with local communities, government and NGOs, communication between each stakeholders done more smoothly.

6.3.5 Future Possibility of SETU

Although initially SETU was established for Earthquake responses, it has taken an important role in rehabilitation process and now is working well in development process. Because of its unique characteristics, establishment such local based network organization in drought prone area may work well.

The organization, of course, work closely with local communities as well as local government and NGOs so that necessary information for drought proofing both short term and long term will be disseminated in local communities more effectively and efficiently.

7. GROUND REALITIES FEEDING INTO POLICIES

It is a universal fact that not all can be addressed by means of policies. That too, it becomes more difficult when every body start asking for amendments in the existing policies on the matters that they think are important. Hence, we are not asking for yet another attempt of bringing out policy changes such that the communities adapt well to the growing threats related to climate change. However, there is a need to assess whether the existing policies of governments at various levels are flexible enough to accommodate, and facilitate to some extent, the responses of systems and people to the larger threats emanating out of climate change.

To facilitate smooth transition from a stage of understanding the current adaptation mechanisms to the stage where these understandings are feed into the policies, it is necessary that the past studies be consolidated, which specifically depicts various vulnerabilities and adaptation mechanisms, such that it helps the decision makers as a guide. Such a system should have to be dynamic and continuously link the field level learning into planning at different levels.

As of now, India lacks a clear policy on how the scarcity situations like drought are to be dealt with. Though the programmes and mechanisms are evolved over the time. the impacts of these programs are far from impressive to make any significant changes in the areas of their implementation. Welcome initiatives such as Hariyali guidelines for integrating different watershed development programmes into a single common umbrella are yet to show the impacts on the ground. In absence of a larger success, it is too early to say that these interventions are sufficient even in the climate change scenario.

The task is going to be impossible especially when there is no convergence between the players such as government, non-government and private sector and individuals. A seamless integration is possible only when all the players communicate on a common platform and understand well each other’s point of view.

Another area of significant impact could be empowering local communities with

relevant information that helps them take decisions with more confidence. One important area for improvement is carrying useful climate information to the community level along with value addition. Such value-added climate information with sufficient lead-time to react would certainly enhance the adaptive capacity of the communities. For this to happen, the weather forecasting, especially on medium to long-range scales, needs to be improved in its precision, which again highlights our limitation in understanding the climate phenomenon on a larger scale. In the context of India, owing to its diverse geography, forecasting for regional and micro levels is also an important proposition.

Based on the above observations and case studies, following summary can be made for different aspects of community level climate change adaptation:

Impacts of climate change (hydro-meteorological issues):

- Increase in temperature
- Variation in monsoon rain (extreme summer rainfall, decrease in number of rainy days)
- Continuation of dry days
- Decrease in runoff and water availability in arid and semi-arid area

Actions for adaptation and coping with drought (development issues)

- Water management
  - Deepen well, utilize water supply system properly
  - Construct check-dam, artificial damage, integrated water shed management, conserve water, rain water harvesting system
- Agriculture
  - Improve agronomic practice, drought tolerant seeds
  - Soil conservation, seeds conservation
- Animal husbandry
  - Migration, utilize fodder bank, cattle camp
  - Control livestock population, conserve fodder
- Local economy
  - Engage in non-agriculture labor work, relief work, loans
  - Secure income from other livelihoods, craft

Local Government Policy measures

- Focus on development oriented drought mitigation
- Utilize drought relief fund on regular development practice
- Incorporate future climate scenario in drought proofing plans
- Enhance climate prediction capability through link to the hydro meteorological organizations

Implementation Mechanism

- Establish SETU type set-up in several clusters of villages
- Provide development schemes and climate related information to SETU
- Institutionalize SETU through local government development budget

Figure 14 shows the model incorporating the above factors, and can be considered as the community based climate change adaptation model.

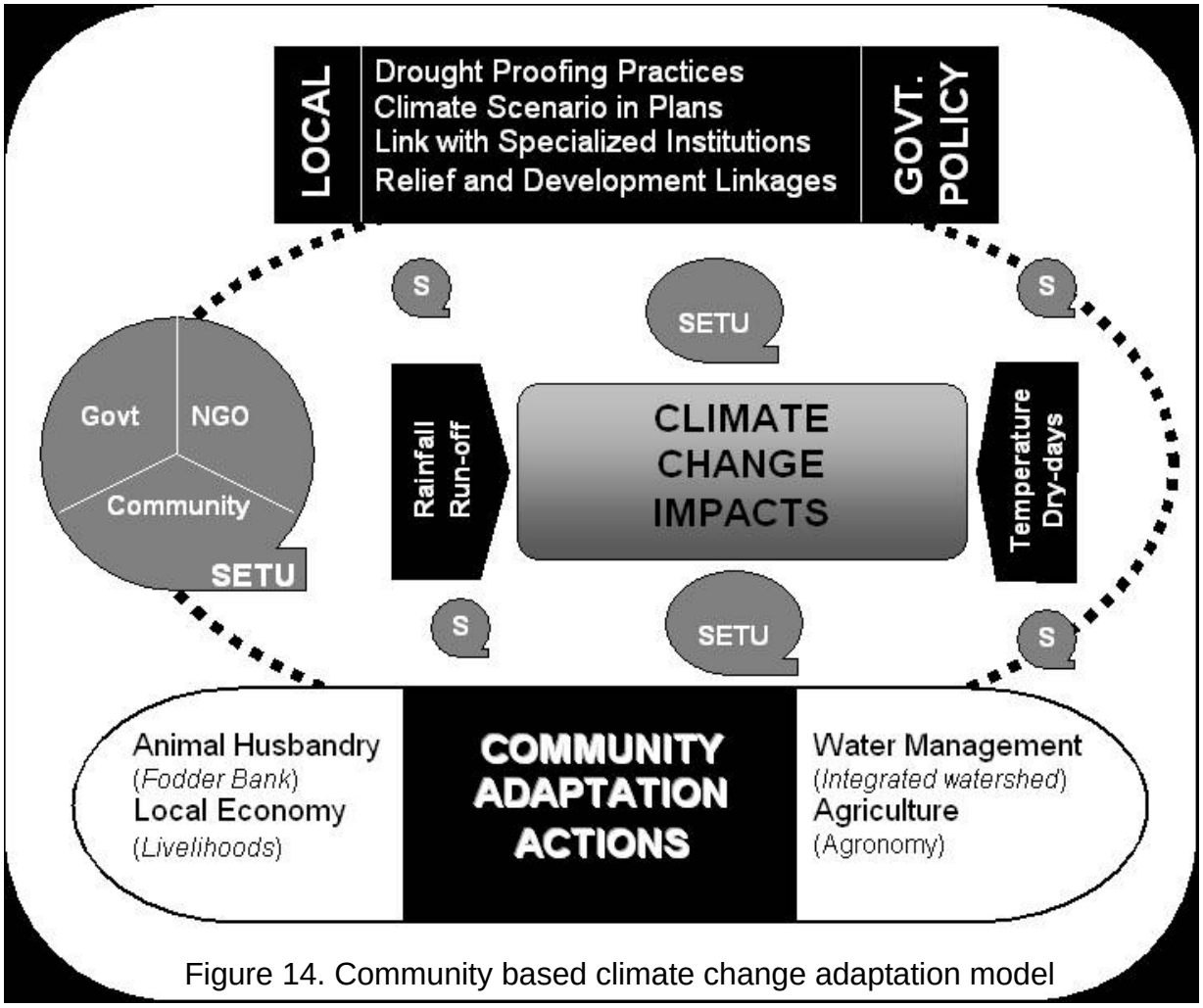


Figure 14. Community based climate change adaptation model

Although an attempt has been to link the climate change impacts to drought, and its adaptation actions at community and local government policy levels, however, it should be kept in mind that the study presents only the preliminary observations base don limited data. A detailed study should be undertaken on the following aspects to grasp the bigger picture and identify specific issues:

- Collection of available climate data on a regional level (including one or two states in the country or on a river basin), and analysis of data to obtain the trend of past climatic conditions
- Obtaining detailed climate scenario at a micro level, and correlate the past data and future climate projections
- Detailed analysis of the policies in two or three different drought prone states (at state and district levels)
- Documenting different drought proofing schemes in the country and states
- Documenting best practices on community actions at various levels
- Organize local workshops to facilitate discussions among the local stakeholders, including local NGOS, government, academic bodies etc.

8. REFERENCES

Carter, T.R. and S. Kankaanpaa. 2003. A Preliminary Examination of Adaptation to Climate Change in Finland. The Finnish Environment 640, Ministry of Environment, Finland.

DAC. Drought 2002: A report. Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi, India. 2004.

Hardy, J.T. Climate change: Causes, effects, and solutions. John Wiley, UK. 2004.

Helmore K. and Singh N. (2001): Sustainable Livelihoods

IPCC. Climate Change 2001: Impacts, adaptation, and vulnerability. IPCC, Cambridge University Press, UK. 2001.

Kerr, j. M., Pangare, G. and Pangare, V.L. 2002. Watershed development projects in India: An evaluation. Research Report 127, IFPRI, Washington.

Kothyari, U.C. and V.P. Singh, 1996: Rainfall and temperature trends in India. Hydrological processes, 10, 357-372.

Moench, M. and A. Dixit. Adaptive capacity and livelihood resilience: Adaptive strategies for responding to floods and droughts in South Asia. Institute of Social and Environmental Transition, International, Boulder and Institute of Social and Environmental Transition, Nepal.

NCDM. 2001. Manual on natural disaster management in India. National Center for Disaster Management, New Delhi, India.

Rupakumar, K., K. Krishna Kumar and G.B. Pant, 1994: Diurnal asymmetry of surface temperature trends over India. Geophysical Research Letters, 21, 677-680.

SEEDS, 2004: Report on orientation programs, SEEDS Report on Samta Project in Porbandar, Ahmedabad.

Singh, N. and Sontakke, 2001. Natural and anthropogenic environmental changes of the Indo-Gangetic Plains, India. Climate Change, (Communicated).

Someshwar, S., Subbiah, A.R. Institutional responses to 2002-03 drought in Rajasthan and Orissa: Potential of climate information for proactive drought management. IRI, ADPC, UNDP Report, 2003.

Timmermann, A., J.M. Oberuber, A. Bacher, M. Esch, M. Esch, M. Latif, and E. Roeckner, 1999: Increased El-Nino frequency ina climatic model forced

by future greenhouse warming. Nature, 398, 694-6.

ZENEB and UNDP. 2001. Proceedings of International workshop on measuring vulnerability to food insecurity Under the Conditions of Drought. 12-13 October 2001.

ANNEX 1

TEXT of MID-TERM Report Submitted on 27th December 2004

PREAMBLE

This report is the interim report prepared for the research of "Community-level Climate Change Adaptation and Policy Issues, Inter-linkages of environment, poverty and livelihood a case study from Gujarat, India" conducted by Kyoto University as a part of the Forum for Globally Integrated Environmental Assessment Modeling (GLEAM) initiated by United Nations University (UNU) and National Institute of Public Health and Environment (RIVM). This report summarized current condition of drought, initiatives taken at community level, drought related issues at community level and the current governmental policies at national, state, and regional level based on the field research conducted in August of 2004.

I. Background

1. Climate

The region bounded by desert fringe in the north and Arabian Sea with major tongues of Kutch and Cambay in the northern segment and lower in the southern districts. The maximum temperature varies from 36.7 C to 43.3 during summer, while the minimum between 2C and 18.3C from November to February. Topography and direction of winds govern the seasonal distribution of rainfall which is uneven and irregular in several segments of the region.

2. Rainfall

Gujarat receives much of its rainfall from the south-west monsoons during the period between June and September. The monsoons break in June, reach their maximum intensity in July, which is the rainiest month of the year and taper of towards the end of September. September is the month of marginal rainfall, while October is marked by very occasional showers. November to May is a dry period, though occasional cloudiness, thunder or a little rain may occur in any month. April is the driest month of the year with hardly any rains.

3. Agriculture and Irrigation

The natural vegetation of the State is restricted to areas which receive adequate rainfall and are at the same time agriculturally unproductive. Ruggedness of terrain and rocky thin soils have made some parts of the State unsuitable for cultivation. Like the general pattern in the country, Gujarat's economy is made up largely of agriculture, which provides employment to about 67 per cent of the working population of the State. Unsuitable climate conditions in some parts and rocky terrain with thin or no soils in others have limited the area suitable for cultivation. Low yields results from poor soils, inadequate rainfall, frequent droughts and floods, bad drainage and undeveloped irrigation facilities.

4. Cropping Pattern

The state produces a large variety of crops, and its cropping pattern reflects the spatial variations in climate and topography. In the order of importance, groundnut, cotton, jowar, bajra, pulses, rice and wheat are the important crops. Food crops command more than half the cultivated area of the State, while the acreage under cash crops is a little less than half the cultivated land.

II. Drought

1. Classification of Drought 1

In India various states and official commission have adopted different criteria for classifying droughts. Droughts are classified mainly in three types, which are meteorological drought, hydrological drought and agricultural drought. Meteorological Drought is a situation of significant decline in rainfall with respect to normal or long period average value over an area.

When decline in rainfall is between 26-50% drought is termed as Severe Drought.

Suggested criteria for Hydrological Drought is when the annual river discharge is 50-75% of long-term average annual discharge the situation is termed as Mild Drought and when it is below 50%, the situation is termed as Severe Drought condition. The National Commission on Agriculture considered agricultural drought if four consecutive weeks receive rainfall half of the normal during cropping season, which is from middle of May to middle of October or six such weeks during the other period.

Many of the states, follow the "annawary" system wherein the crop conditions are assessed through visual estimates. The criteria followed is

Crop Production	Drought Category
Above 75% of Normal	no drought
50-75	moderate drought
25-50	severe drought
Less than 25	disastrous drought

2. Classification of Drought 2

The rainfall pattern within season also varies greatly in the arid areas. It may occur erratically and some times in sudden spurts. In such situations, even if the annual rainfall is high, the productivity of various occupations, especially agriculture may not be high. Based on the time of occurrence of drought, droughts can be classified into five distinct categories as follows.

The early season droughts occur in association with the delay in commencement of sowing rains. Mid-season droughts occur in association with the breaks in the southwest monsoon. If the drought conditions occur during the vegetative phase of crop growth, it might result in stunted growth, low leaf area development, and even reduced plant population. Late season or terminal drought, which occurs during the reproductive storage there may be an increase in temperature, hastening the process of crop development to forced maturity.

3. Drought Impacts

Droughts give adverse impact to the affected area economically, environmentally, and socially. These include loss in production of crops, dairy and livestock and fisheries, income loss of farmers, decline in food production and increased food prices, unemployment (economical aspect), damage to natural living species resource, erosion, damage to plant species, effect on water quality, increase in salinity (environmental aspect), food shortage, conflicts relating to water, health problems, decline in living condition, population migration, and increase in crimes (social aspects).

4. Cause of Drought

The primary cause for the occurrence of drought is insufficient rainfalls. In addition to natural cause of drought, there are human causes of drought including land use practice, such as deforestation, over-cultivation, overgrazing, and mismanagement of irrigation that result desertification.

5. Drought in Gujarat

As per IMD, if drought occurs in 20% of the years in any area, it is classified as drought prone area and if drought occurs in more than 40% of the years, it is classified as chronically drought prone area. Indian arid zones fall in category of chronically drought prone areas. It covers an area of 320000 sq km of which 20% of the area is located in 8 districts of the Gujarat state.

6. Drought Prone Area

The state has humid and semi-arid to arid type of climatic conditions with highest rainfall about

2000mm in the south, which gradually decreases to about a low of 300m in Kutch while average rainfall of the states is 700 mm. While the northern part of the state is mostly arid/semi arid, the southern part is humid and sub-humid. Extreme of climate be it heavy rainfall or droughts are quite common in this region. The droughts are frequent in North Gujarat, Kutch and Saurashtra regions due to its rainfall behavior.

7. Drought Trend

In the past 40 years, Gujarat has experienced 11 years of drought and four major scarcity situations in 1972-73, 1985-87, 1992-93 and 1995-96. According to the existed rainfall data of Kutch, the average annual rainfall has been decrease gradually. Also it indicates that the number of occurrence of moderate and severe draught has been increased.

8. Drought Vulnerability

Dry areas of Gujarat are generally more vulnerable to drought. People who depend on rain-fed agriculture, livestock-dependent without adequate grazing land are more vulnerable. Those dependent on stored water resources or irrigation will be more vulnerable to water shortages and may face competition for water.

III. Drought Management in India

1. Partners

The Ministry of Home Affairs is a nodal authority for Natural Disaster Management. The other coordinating agencies are Ministry of Agriculture, Water Resources, Civil Supplies, Health, Science & Technology, Department of Space, India Meteorological Department, Relief Commission of State Government, and Non-Governmental Organizations.

2. History of Drought Management

Numerous strategies have taken to cope with drought over the years. The characteristics of drought management has changed from the crisis management approach in the pre-independence era to scarcity relief approach, to drought relief approach begun in sixties, and to recent drought management approach These changes in management approaches have increased in country's resilience to droughts.

3. Drought Relief Approach

Drought relief-approach with a monitoring system enables the government to intervene after the closure of the monsoon. The objective of the drought relief approach was to protect entitlement of the affected population by ensuring physical and economic access to food through relief projects and public distribution systems. For drought relief intervention, drought is declared based on various observed aspect such as crop loss, price rise, migration of people, and increased rate of petty crimes in addition to the rainfall monitoring.

The central government has permanent arrangements of Calamity Relief Fund (CRF) for reducing the impact and severity of droughts. Main governmental strategy to moderate the drought situation is by employment generation trough relief works, cattle conservation camps, fodder depots, proper animal health care, subsidized cattle feed for milk cattle, drinking water arrangements, augmenting existing or creation of new sources, medical and health arrangements. Some of current drought management practices in India as shown below

Operation of an early warning system:

Meteorological conditions, particularly the monsoon rains from June to September are closely monitored. Hydrological conditions such as reservoir and ground water levels, and agricultural production are also monitored. Early warning enables response to drought well before famine indictors occur.

Drought Preparedness measures:
Communities contribute to planning for drought management and relief. Institutions for health care, veterinary care, water resources and disaster assistance are ready to expand services in times of drought.
Conservation of water:
Water is budgeting during droughts. Additional water supplies were developed for drought affected areas and those with chronic shortages.
Stabilizing crop production:
Contingency crop planning involves trying to save crops from drying out, planting alternative crops, use of seed reserves, and measures to improve production in irrigated areas and in nontraditional seasons.
Assurance of access to food:
A national food security system makes grain available at a reasonable cost and stabilizes market prices. Food is distributed from surplus to deficit areas. Additional food supplies are provided to families with caloric deficiencies during drought based on nutritional surveys.
Preservation of farmer's assets:
Employment generation schemes are offered to the rural work force to stabilize incomes. To enable farmers to keep livestock, fodder is transferred from surplus to deficit area.

4. Monsoon Management Approach
Ministry of Agriculture had prepared a pro-active methodology of monsoon management in 1979. The Monsoon Management model is an alternative approach that will gradually reduce relief while increasing capacity of affected areas to withstand droughts on their own. Basically it had three components:
1. train people at different levels to conserve and manage water,
2. develop contingency plans to suit different rainfall patterns and
3. work out a compensatory production program

VI. Drought Management in Gujarat
1. Drought Management System
The state of Gujarat has a well-organized administrative system to meet the severe drought conditions. A state level relief committee has been constituted under the chairmanship of chief minister and a cabinet sub-committee has been set up under the chairmanship of the revenue minister to review relief operations

2. Drought Forecasting
The parameters which are systematically monitored to detect signs of the onset of drought conditions include rainfall, reservoir and water management, and monitoring of crop prospect.

3. Counter Relief Measures for Drought
The drought relief focuses employment generation, water supply, agriculture, animal husbandry, health and nutrition. They are supply of fodder, supply of drinking water including drilling of deeper tube wells to meet water demands, water supply through tankers, provision of relief assistances to affected population, drought relief works.

V. Community Based Initiatives
1. Project in Porbandar
Implemented organization: SEEDS
Supported by: GSDMA
In Porbandar, semi-arid area in Gujarat, SEEDS selected villages to improve their rainfall agriculture. After conducting research of conditions of aquifer and wells of the areas, they have completed a pilot project which constructed wells and waterways to collect rainfall effectively. The cost of project is about $150-200 per well and about 8000 Rs to 10,000 Rs including every

expenses to complete for one villages with 300 wells. After one rain season, the data has shown that the water level has increased. Currently, SEEDS is trying to extend the project area to 155 villages in Porbandar.

2. *Project in Kutch 1*

Drought Proofing Program
Implemented by: Kutch Nav Nirman Abhiyan
Supported by: Ministry of Rural Development, Government of Gujarat, UNDP
The Drought Proofing Program is being implemented in 31 villages spread across the districts of Kutch. These villages have been identified by 15 different NGOs working in Kutch district. The villages communities of these 31 villages have voluntarily agree to participate for the long term drought proofing program.
One objective of this project is to construct dams to prepare for a drought season. Based on hearing from village people, engineers from NGOs determined the size and the location of the dame to be constructed. According to NGO members, women are more motivated to construct the dam than at first. However, after a while, most of village members participated the work.

3. Project in Kutch 2

Livelihood Program
Implemented by: Kutch Nav Nirman Abhiyan, Nehru Foundation for Development
Supported by: Government of India
In the arid, drought prone district of Kutch, practice of handicrafts provides livelihood to over 40,000 families. The various crafts practiced including weaving, ajrakh block printing, tie-dye, pottery, leather, bell making, knife making, silver and gold jewelry, rogan art etc.
NGO supports workers involving handicraft work to provide materials, market and standard to secure constant incomes.

4. Other Household Resource in Kutch

The southern part of Kutch district of Gujarat has a long costal line and fishery is one of main occupations of who live along the coast. Almost of all members of fishery communities, mostly Muslims, engage this occupation because it is their hereditary occupation for decades.
*Issues among Fishery Communit*ies
Because they only have limited access to outside of their resided areas, their health and educational status are very low. As many of them have not received basic education, their illiteracy level is very high. This causes them suffer from exploitation by middlemen and being in debt. Their standard of living is very low and backward though fish and fishery products have a good value. Additionally, there are issues such as low awareness about coastal regulation, no recognition in the government records, impact of industrialization, and impact on the coastal ecological system.
Rainfall and Fishery
Among fishermen, it is said that they have good fish catches during and after a good rain season because rainwater washes insects and warms into the sea. They are good food for fish and fish come closer to the coast.

VI. Climate Change and Drought in Gujarat

As stated above, in past forty years, Gujarat has experienced 12 years of drought, and four major scarcity situations. However, the intensity and return period of major drought events have increased substantially in last two-three decades, and it is often correlated to the climate change impacts. Traditionally, Gujarat has a drought cycle of 5 years, where in 2 years there is moderate rainfall, 2 years less rainfall, and 1 year of good rainfall. Consecutive 2 years of less rainfall makes it difficult for the communities to sustain their livelihoods. It becomes worse, when there is 3 years of consecutive less rainfall. Statistical data show that in last two decades, the intensity of the 3 years of consecutive less rainfall is increasing, and thereby creating severe drought

situation, leaving the communities unprepared. Although there is still a need to study systematically the impact phenomenon, the fact is that the rural masses are highly affected in terms of their livelihood. Two workshops will be organized in Gujarat in February 2005 to review our understanding on the current linkages of climate change and drought.

ANNEX 2

<Project Concept Note>

Climate Change Adaptation And its Implication to Disaster Management

Focus on South Asian Experiences

Climate change is real now. It has happened, is happening and will continue to happen for some foreseeable future, until all human beings get their act right. This is what the Third Assessment Report of the Intergovernmental Panel on Climate Change has all to conclude. In order to 'manage' the climate change and its impacts, the Intergovernmental Panel on Climate Change (IPCC) suggests two important approaches. One is to curtail the greenhouse gas emissions (as per the Kyoto Protocol, 1997). Second is to initiate various **adaptation mechanisms** to cope with the climate change that has already taken place. In order to monitor the progress on these fronts, UNFCCC established national reporting requirements for all Parties regarding the emissions, potential vulnerabilities and adaptation options. The first solution is commonly referred as mitigation measures aiming at reducing the greenhouse gas emissions to a pre-agreed reference level by the Parties through controlling the sources or by enhancing the carbon sinks and various other mechanisms identified in the Kyoto Protocol, which entered into force from 16th Feb 2005. The second solution, an important one for many countries for the reason that the greenhouse gas emissions will continue for some more time, of adaptation to the climate change is entirely a different proposition altogether. Adaptation, in its meaning and sense, needs to be initiated at all levels of governance and community actions. Many countries have already started acting on these fronts.

Problem Statement

Climate change means more climate related extreme events as the climate change specialists warn about the future possible extreme events globally. These extreme events include higher temperatures, extreme rainfall and runoff leading to floods on one had and extreme droughts on the other hand due to a shift in the hydrological balance. Hence, much before adaptation, it is important to understand what climate change means to common people in general and for disaster managers in specific.

In the above context, dealing with climate change impacts is not different from dealing with disasters. **Disaster risk management**, from a common man standpoint of view, would have to take into consideration the future climate change scenario especially in the context of water related disasters like floods and droughts. Few important questions arise, which this project will try to address:

- *Does climate change has any implications for disaster management and if so what are those?*
- *Are the existing disaster risk mitigation policies and plans sufficient to address the future increase of climate related threats?*
- *Is the current community preparedness planning and strategies are sufficient to address the future climate related problems?*
- *How to link the community preparedness plans and policies in a changed scenario (where exactly the community preparedness links with the government policies)?*

The review of past works and discussion with the climate change and community development professionals suggest the following:

- Climate change will affect **communities,** though it is not clear what kind of changes are possible at a sub-regional levels
- There is adequate work on methodologies for assessing the vulnerability of communities to climate related events

- Many works related to adaptation to climate change at community level didn't differentiate much on the **spontaneous adaptation** and **planned adaptation** which are important for planning purposes
- There is very little or no work done the implications of climate change for disaster managers who work closely with the communities. It is important that the disaster managers are aware of these implications for **planning purposes**
- There is little or no understanding on the exact linkage between community adaptation mechanisms and local level **planning and policy measures**
- There is very limited understanding on assessing the future **vulnerabilities** of communities considering the general development happening irrespective of reference to disaster management. Assessing the future vulnerabilities in various climate change scenarios is an important task to bridge the gap between what is there and what is required

Hence, the uniqueness of this proposal is that it goes beyond the understanding of vulnerabilities and adaptation mechanisms of the communities to past climate change events and link with the disaster management.

Goal and Objectives

The goal of this project is **to assess the climate related impacts on communities** and finding ways to reduce the identified impacts. To achieve these goals, specific objectives are as follow:

- To **analyse the past climate data** to identify the climate change events in that region
- To **identify different climate change related impacts** on the communities and study how they cope with the past climates
- To **analyse the past and existing local plans and policies** that govern disaster management for their compliance to increased climate related threats and how these systems could respond over the time in relation to the past climate change related events
- To identify **gaps in the capacities of the communities and policies** in various adapted climate change scenarios available for the selected regions to arrive at a suggestive framework for building the capacities at various levels

Expected Outcomes

The project is mainly aimed at understanding some of the questions posed in the problem statement. Hence, the project aims more at understanding the processes which would help further in solving the identified problems. The following are the expected outcomes:

- Past climate related extreme events identified and documented
- Capacities of the communities and governance systems at various levels, including past disaster management interventions, understood and documented in the light of climate change
- Gaps in the existing capacities are assessed in relation to the future climate change scenarios
- A roadmap is generated to build the capacities of the communities and local governance systems for better managing the future climate change related events

These outcomes would help in finding the answers to the questions raised in the Problem Statement and further help in **identifying future intervention areas** where in the above-identified framework would be implemented on a pilot basis at the selected regions.

Methodology

Project Duration

The project will be completed in **one year** commencing from **September 2005**.

Location

In order to have a complete set of representative climates, it is proposed to select different

locations in **India, Bangladesh, and Sri Lanka** with at least two locations in India and one each in Bangladesh and Sri Lanka. Based on the historical record, the sites would be selected covering a range of climate related extreme events. Emphasis would be given to **drought** (western India and Sri Lanka), **floods** and **cyclones** (Eastern India, Bangladesh and Sri Lanka). The selected sites should have disaster management systems established for quite some time. This is important, as one of the objectives of the study is to assess whether existing preparedness and mitigation measures are sufficient to deal with the possible future climate change scenarios.

Partners

Project would be carried out in collaboration with the local **non-governmental organizations** having experience in disaster management and community development. The indicative list includes **SEEDS** in India and **BDPC** in Bangladesh and **Sarvodaya** in Sri Lanka.

	Partner	Role
1	Graduate School of Global Environmental Studies, Kyoto University	Project planning, execution, data analysis, technical support
2	SEEDS, India	Project implementation, data collection, local level planning and liaison
3	BDPC, Bangladesh	Project implementation, data collection, local level planning and liaison
4	Sarvodaya, Sri Lanka	Project implementation, data collection, local level planning and liaison

Implementation modalities

The project will be implemented by the local NGOs and Autonomous organizations listed above with technical guidance from the Graduate School of Environmental Studies, Kyoto University. A close cooperation with the national and local governments will be established.

Indicative Budget

Description	Location	Units	Unit Cost (US $)	Total Cost (US $)
Project Personnel				
Program Focal Point	India, Bangladesh and Sri Lanka	3	4,000	12,000
Travel				
Local travel	India, Bangladesh, Sri Lanka	10	100	1,000
Project execution travel	India, Bangladesh, Sri Lanka	3	5,000	15,000
Workshop	India	1	8,000	8,000
Data collection & analysis	India, Bangladesh, Sri Lanka	3	2,000	6,000
Documentation	Kyoto, Japan			5,000
Sub Total				47,000
Administrative support cost	**(5%)**			2,350
Total (in US $)				**49,350**

About the Implementing Organization

***Kyoto University**, one of oldest university of Japan has been actively involved in the field of education for last 107 years. Over last so many years of experiences, the university felt the need of pro-active and implementation oriented studies and research, and consequently established the Graduate School of Global Environmental Studies in the year 2002. **Graduate School of Global Environmental Studies** focuses on pro-active and field-based education for sustainable development. The graduate school is organized flexibly so as to meet the various needs of research and education on inter-disciplinary topics. The research field of **International Environment and Disaster Management** targets to reduce the gap between knowledge and practice*

through pro-active field-level, community-based project implementation. Working closely with the governments, non-governments (NGO/ NPO), international organizations (United Nations and other bilateral and multilateral development agencies) and regional bodies, this research field is developing a unique process-oriented participatory approach of environment and disaster management through direct involvement and ownership of the community.

For further details on the report, please contact

Rajib Shaw
Associate Professor
Graduate School of Global Environmental Studies
KYOTO UNIVERSITY
Yoshida Honmachi, Sakyo-ku,
Kyoto 606-8501,
JAPAN
Tel/ Fax: 81-75-753-5708 (Direct)
Fax (Office): 81-75-753-9187