

# Adaptive Capacity and Livelihood Resilience

ADAPTIVE STRATEGIES FOR RESPONDING TO FLOODS AND DROUGHTS IN SOUTH ASIA

Marcus Moench and Ajaya Dixit  
EDITORS

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# Executive Summary


## Disasters are the unfinished business of development (*Duryog Nivaran*)

Change is inherent to the human context. Whether the need is catalysed by extreme events such as floods, droughts and economic collapse or more gradual processes of change in environmental, technological or economic systems, we survive via adaptation. Strengthening the adaptive capacity of populations at all levels from the local to the global is, as a result, among the most important challenges facing development. The results of our research point, among other things, to the critical importance of trans-boundary flows of information, funds, goods, services, ideas and often people in determining the adaptive capacity of local populations. The ability to adapt to local problems such as floods and droughts often depends on systems and flows that connect to regional and global levels. Understanding this and addressing the inherent implications for trade, migration and other sensitive global policy arenas is, perhaps, one of the most significant challenges facing society in the coming century.

The Adaptive Strategies Project is the result of a unique collaboration between local grassroots organisations, regional non-government organisations (NGOs), academic institutions and international organisations working across South Asia. It represents an initial attempt to understand and disaggregate the factors which enable communities to adapt to floods, droughts and climatic variability *by examining the courses of action households actually take during flood and drought events* and locating the insights generated in a wider review of regional trends, government programmes and systems theory. Although focused on floods and droughts, many of the insights generated through the research have potential relevance for other contexts where livelihood systems are disrupted and adaptation is essential. Results of the study indicate that vulnerability and adaptive capacity in flood and drought contexts are heavily influenced by at least eight factors:



*In many localities communities have limited opportunities of diversifying livelihood.*

 Social capital and institutional checks and balances are important.

1. The nature of livelihood systems within a region; more specifically the extent to which individuals and households are able to diversify income strategies and incorporate non-farm components which tend to be less vulnerable to flood and drought than agriculture;
2. The ability of people to migrate or commute in order to obtain access to non-farm or agricultural sources of income outside of drought- and flood-affected areas;
3. The ability of information, goods and services to flow into and out of affected areas;
4. The social capital and institutional checks and balances that households have access to including education, community institutions such as self-help groups (SHGs), formal institutions such as government departments and banks, NGOs, the media and social networks;
5. Existing patterns of vulnerability created by gender, income and social position;
6. The nature of physical infrastructure (roads, houses, water supply systems, etc.), in particular:
  - a. the degree to which such infrastructure is vulnerable to

- disruption by floods and droughts; and
- b. the extent to which such infrastructure promotes the maintenance of livelihoods during drought and flood periods by serving as a point of refuge, helping to protect assets, and facilitating the movement of goods, services and people;
7. The ability of households in regions to obtain secure sources of water for domestic uses, whether from local or trans-boundary sources, water markets or rural supply schemes; and
  8. Natural resource conditions, particularly the degree to which ground and surface water systems have been disrupted. Specific indicators of disruption include:
    - a. Long-term decline in water level is a major warning signal to irrigated agricultural systems of increasing drought vulnerability;
    - b. The increased presence of structures (such as roads, bridges, railway and flood control embankments) that interfere with the existing pattern of natural drainage, an indicator of the potential for increased flooding.

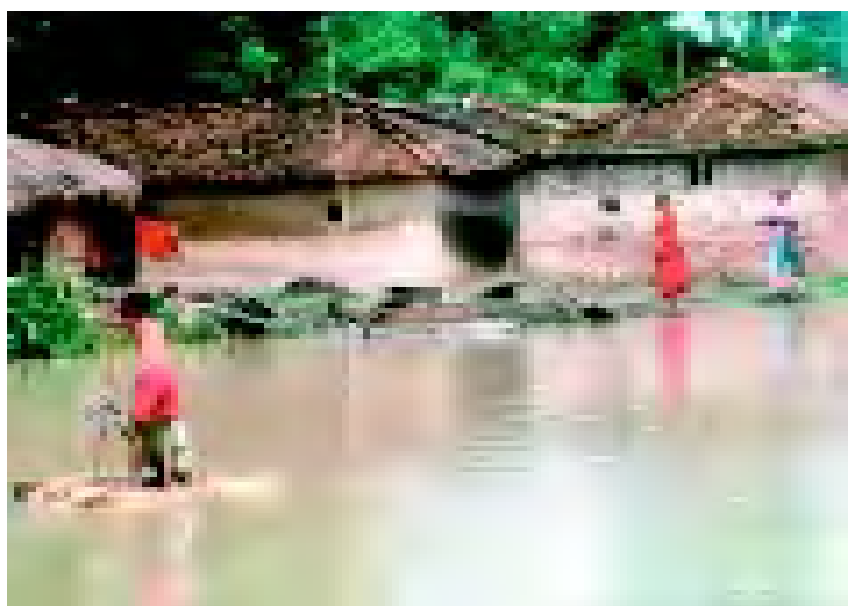
Case studies conducted in drought- and flood-affected regions of India and Nepal clearly indicate that income diversification, particularly the development of non-farm sources of

income, is the primary avenue by which households are able to maintain their livelihoods when floods and droughts occur. Whether this is achieved by establishing a business, securing outside jobs abroad or in cities or simply participating in regional labour markets, diversification provides access to secure income streams that can be used to maintain consumption, avoid debt, rebuild agricultural activities and retain or rebuild assets. Because agriculture is inherently vulnerable to flood and drought, diversification into non-agricultural activities is, in fact, often essential in order to 'ride out' bad years. The ability to diversify is, as a result, critical to the maintenance of rural agricultural livelihood systems.

The need to diversify income underlies the central role of migration and commuting in the adaptive strategies households follow to reduce the impact of extreme climatic events. Migration

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**The ability to diversify is critical to the maintenance of rural agricultural livelihood systems.**



*Flooding limits local mobility.*

and commuting help households obtain access to income streams that are unaffected by droughts and floods. They are a core strategy required to manage the risk. The fact that much migration is long-term and driven by a wide variety of factors (such as the growth and diversification of national economies, and the degradation of traditional livelihoods) only increases its role in flood and drought mitigation. As farmers in Western Rajasthan and Gujarat stated during our interviews: *'What is drought? It is always dry here...Drought is when my son in the city loses his job!'* This is not to say that all migration is good. Displacement caused by drought, flood or any other disaster often leads to impoverishment. Even so the role migration plays in maintaining the livelihood of rural populations cannot be disputed. The flow of people across rural and urban boundaries, districts, states and national borders provides access to a diverse bundle of livelihood strategies that are absent in many rural

areas. Migration, whether or not it is directly related to any given flood or drought event, enables people to adapt to change and extreme events. It is a central structural feature in global trends toward urbanisation and peri-urbanisation.

Flows of goods, services, finances and information are as important as flows of people in determining the adaptive capacity and the ability to manage risk. During the recent drought in Gujarat, for example, fodder moved to the rural areas whereas in the past people used to migrate to the fodder. The presence of regional markets, government programmes and large-scale co-operatives enabled people in rural Gujarat to obtain access to fodder produced in other areas. As a result, milk production in some areas actually increased, to some extent compensating for the loss of other sources of agricultural income. Income from non-farm activities such as, in the Gujarat case, diamond polishing also depends on regional trade and on the free flow of goods, services, finances and information into and out of rural areas. Systems which enable flows of this type, whether they be remittances from migrants, information regarding markets and weather or access to national financial markets through banks, are central to economic diversification *within* rural areas and thus to the ability of livelihood systems in such areas to adapt to climatic variability.

Adaptation is not only dependent solely on the presence of markets and other systems that enable flows to occur. The

Flows of goods, services, finance and information are as important as flows of people in determining adaptive capacity and the ability to manage risk.



*Climatological measurements provide a scientific basis to understand stock and flow of hydrological processes.*

social capital and institutional checks and balances present in rural areas are equally central to adaptive capacity. Unless people have the skills required to identify and take advantage of alternative income opportunities, their ability to adapt is limited. Access to capital and intangible goods like social organisation is key since many activities, however small, require both an initial source of financing and the assistance of others. The need for money and support underlies the critical role of self-help groups (SHGs) and formal institutions. Unless banks are present in rural areas and able to make the types of loans people require, flood- and drought-affected populations are forced to depend on local moneylenders and pay the extortionate rates of interest they charge. Since the formal banking system does not

provide loans to meet basic consumptive needs while travelling in search of work (despite the fact that obtaining access to outside work may be the best investment a family can make) alternatives are needed. Institutions like SHGs provide credit for whatever investments are essential for rebuilding livelihood systems and can create a critical formal check on moneylenders and other informal capital markets. Such institutions along with organisations (such as NGOs, the media and government departments) which provide education and access to information and critical services are central components of the social capital underpinning adaptive capacity. The presence of diverse, competing organisations and sources of information is essential both to 'keep such organisations honest' and to

---

■ Skill to identify and take advantage of alternative income opportunities reduces vulnerability.



*Pontoon bridge provides communication link in lower Tarai.*



*Diverse sources of information are needed.*

Specific factors within livelihood systems can increase or decrease vulnerability.

provide the diverse array of services required for adaptation to unexpected natural events, climatic variability and other similar types of change.

The presence of key organisations does not, however, imply that all sections of society are able to access them. Patterns of differential vulnerability clearly emerged in all our case study areas. Women and girls in all areas are particularly affected by floods and droughts and in some locations their vulnerability to abuse appeared to increase dramatically. In many cases, the poor also suffered more hardship. Poverty and gender were not, however, the only factors contributing to

vulnerability. In some cases, fairly prosperous groups, such as middle-income farmers, were among the most affected by floods and droughts due to their lack of diversification and, in the drought case, their dependence on unsustainable groundwater sources. As a result, specific structural factors within livelihood systems can increase vulnerability even for those in higher income groups. Overall, however effective society is in catalysing adaptation, actions that address gender and other forms of differential vulnerability are essential if major humanitarian disasters are to be avoided in the context of extreme climatic events.

As the situation above illustrates, natural resource condition and the nature of physical infrastructure can also magnify the risk to livelihood systems and thereby exacerbate the scale of humanitarian disaster. In many regions local hydrological systems have been altered by the overdraft of a regional groundwater aquifer or by the construction of roads, bridges, railway lines, and flood control embankments that fundamentally alter drainage patterns and water availability. These alterations, along with the inherently unpredictable weather patterns that are likely to emerge as a consequence of global climatic change, limit the ability of a society to regulate regional hydrologic systems. Forms of infrastructure that are themselves adapted to hydrologic variability, in contrast, enable social adaptation and thereby minimise vulnerability.



In flood-affected regions, for example, the flat roof of a house enables family members to move belongings out of harm's way and, because they can save household assets, families are able to maintain livelihood systems during flood events. Although the ability to benefit from a flat roof is dependent on the economic status of a family, its utility does not depend on society's ability to predict flow volumes or sediment loads. All that is required for its effective use is a rudimentary knowledge of flood levels and some degree of advance warning. This technology is robust in the context of considerable scientific uncertainty. Similarly, in drought-affected areas families who own cisterns can harvest rainwater and store water purchased on the market. With these and other similar forms of flood- and drought-adapted infrastructure, families can maintain their livelihoods during floods and droughts.

In addition to equitable access to social capital and suitable physical infrastructure, a reliable water supply is essential if communities are to be able to adapt. Unless they have access to clean potable water, households face major health problems and may be forced to migrate. In flooded areas, the nature of water supply systems can make a significant difference. Raised hand-pumps, for example, can supply good quality water for domestic uses even in the midst of contaminated flood waters. Similarly, in drought-affected areas, water harvesting, local water markets or rural water supply systems can


ensure that domestic water supply is available and affordable.

Environmental degradation, particularly of water supply systems, can be an advance indicator of flood and drought vulnerability. Long-term declines in groundwater levels during normal years are, for example, a key advance indicator of vulnerability to drought. Although the timing of a drought may be impossible to predict, the severity of its impact depends heavily on the ability of a local population to access groundwater. In areas where water levels are declining rapidly and regional hydro-geological conditions (such as the presence of hard rock or saline zones underlying productive aquifers) mean that water is available only to a limited depth, and communities will be highly vulnerable to drought. Areas where development activities have included the construction of structures that impede drainage are likely to be vulnerable to floods. Overall, as has been widely recognised in a variety of situations around the world, environmental conditions are central to determining the degree of disaster vulnerability.<sup>1</sup>

In addition to core results described above, our fieldwork highlighted five other key points:

*First*, because the ability of populations to adapt to floods, droughts and climatic variability is heavily influenced by the degree to which people, finance, goods, services and information can move across local and national borders, the factors governing

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 Long-term declines in groundwater levels during normal years are a key advance indicator of vulnerability to drought.

these flows are a critical area for policy research both within countries and at the global level. If global climatic change occurs abruptly, as some predict it may, the importance of migration and local to global flows of information, finance, goods and services to local adaptive capacities – and, indeed, to the very survival of local populations – raises critical humanitarian issues that extend beyond the provision of relief. How such issues are addressed may, in many cases, depend on global perspectives toward migration and the array of global institutions that moderate trade, information and financial flows. The critical issue is not food availability *per se* but the ability to maintain livelihoods, earn the cash required to purchase food and ensure that food and other basic necessities are able to flow to flood- or drought-affected populations.

*Second*, at present there is little information available to actors and decision-makers on the changing dimensions of vulnerability or on the effectiveness of systemic approaches to vulnerability reduction. Most disaster relief efforts assume that the poor and landless are the most vulnerable. As some of our case results illustrate, however, vulnerability depends on specific livelihood characteristics. The poor, who often have more experience with labour markets, may, in some

cases, be less vulnerable than other populations which are less experienced and lack the skills required for changing livelihoods. Overall, there is a need for better understanding of the factors that enable adaptation.

*Third*, it is essential to improve our understanding of the humanitarian implications of floods, droughts and changing patterns of climatic variability. Our field results indicate that basic humanitarian concerns such as violence against women and girls and the immiseration of vulnerable populations must be dealt with.

*Fourth*, given the dependence of adaptive capacity on migration, commuting and access to non-farm livelihoods, the importance of issues related to urbanisation and the quality of life in urban areas will increase.

*Fifth*, and finally, programmes such as India's work on watershed development in drought-prone areas may represent an initial tangible mechanism for linking development with disaster mitigation. Such programmes are not present in flood-prone areas. The potential for expanding watershed programmes and others like it and shifting their focus to include many of the factors central to adaptation should be explored.

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Local to global flows of information, finances, goods and services influence local adaptive capacities.



# Introduction

***Adaptation is, perhaps, the single most important mechanism human society uses to respond to change and the impacts that has on basic livelihood systems. Although our research here focuses on floods, droughts and climatic variability, many of the factors governing adaptive capacity have direct relevance to a much wider array of situations. Whatever the nature of the extreme event – whether caused by the sudden onset of conflict or economic collapse or more gradual processes of environmental degradation, technological evolution or systemic economic change – livelihood systems must respond at multiple levels from the individual household to the supranational in order to remain viable. The ability to adapt to local problems such as floods and droughts often depends on systems and flows that connect to regional and global levels. Understanding this and addressing the inherent implications for trade, migration and other sensitive global policy arenas is, perhaps, one of the most significant challenges facing society in the coming century. Recognition of the fundamental importance of adaptation underlies our efforts to disaggregate and understand the factors that contribute to or inhibit the ability to adapt to floods and droughts in South Asia. The results from this project are intended to contribute both to the identification of practical mechanisms for linking disaster mitigation with development and to a larger understanding of adaptive processes and their implications for abilities of societies to respond to much wider issues such as global climatic change and complex emergencies. Now to our specific focus.***

Floods and droughts are among the most important natural factors affecting rural livelihoods in South Asia. Unlike the temperate zones of Europe and North America, the climatic regimes of South Asia are, by definition, intemperate or extreme. In Bihar, for example, officially published data indicate that flood-related damage increased from 9.49 million rupees in 1989-1990 to 5,147.8 million rupees in 1998-1999. In Uttar Pradesh, the floods of 1998 destroyed 80,000 homes and caused approximately 1,500 deaths across 55 districts. Every year approximately 80,000 people living adjacent to the Kosi River migrate to Punjab and Haryana during the flood season.<sup>1</sup> In other parts of India, droughts have a similarly devastating impact. Approximately 33% of India's arable area (about 14% of the total land area) is drought-prone. In such

areas droughts are a frequent and inherent feature of life. Another 35% of India's area can also be affected by drought when rainfall is exceptionally low for extended periods. In 2003, over 40 million people in 40,990 villages were affected by drought in Rajasthan alone. According to UN Disaster Management Team Situation Reports, this drought, the culmination of four years of below average precipitation, forced a reduction in cropped area by over 30% and resulted in production losses of approximately 50%.<sup>2</sup> To meet survival needs, many families reduced food consumption and withdrew children from school to work as wage labourers or in other occupations.<sup>3</sup> The search for drinking water had a particularly adverse impact on women who were often forced to walk many kilometres to meet the daily needs of their families. Similar impacts occurred in Gujarat. The drought of 2000, for instance, had a major impact on drinking water supplies for 25 million people in 9,500 villages, 79 towns and four major metropolitan areas.<sup>4</sup> The hardship increased as the drought continued over subsequent years. By the summer of 2003, some villages, particularly those overlying areas where groundwater levels have been declining for decades, experienced dramatic decreases in agricultural production. This had a major impact on income levels and forced fundamental changes in livelihoods.<sup>5</sup>

While droughts and floods are an inherent feature of life in South Asia, they have been greatly exacerbated by human interventions that have changed

While droughts and floods are an inherent feature of life in South Asia, they have been greatly exacerbated by human interventions that have changed both hydrologic systems and the impacts associated with extreme events.



*New technologies improve efficiency but can debilitate traditional methods as well as the resource base itself.*

both hydrologic systems and the impacts associated with extreme events. Groundwater overdraft in arid regions and the construction of roads, embankments and other structures in flood-prone zones have fundamentally altered the hydrologic characteristics of many regions. In drought-prone areas, groundwater level declines have, as projected over a decade ago,<sup>6</sup> reduced the ability of the society to draw upon buffer supplies when drought occurs. At the same time, agricultural intensification using green revolution technologies has increased the dependence of agricultural systems on the reliability of a regular supply of water. As a result, droughts have a fundamental impact on the economic viability of rural livelihood systems. Similarly catastrophic impacts occur in the case of floods. Drainage congestion is, for example, now widely recognised as a major factor compounding the extent and duration of flooding in much of the Ganga basin.<sup>7</sup> In addition, greater investments in seeds, fertilizers and other agricultural production inputs have increased the potential for losses when flooding occurs. Despite the highly variable but relatively consistent levels of flooding over the last half century (Figures 1 and 2), the economic and social impact of floods have increased. Losses per hectare during the last Five-Year Plan for which data are available (1992-1997) are more than 50% higher than the levels common in the first and second Five-Year Plans (1951-1961) despite being substantially less than the levels common in the 1980s.<sup>8</sup>

Figure 1: Flood-Affected Area in India

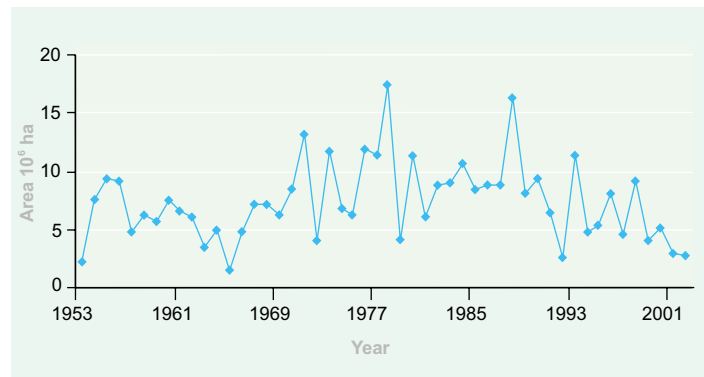
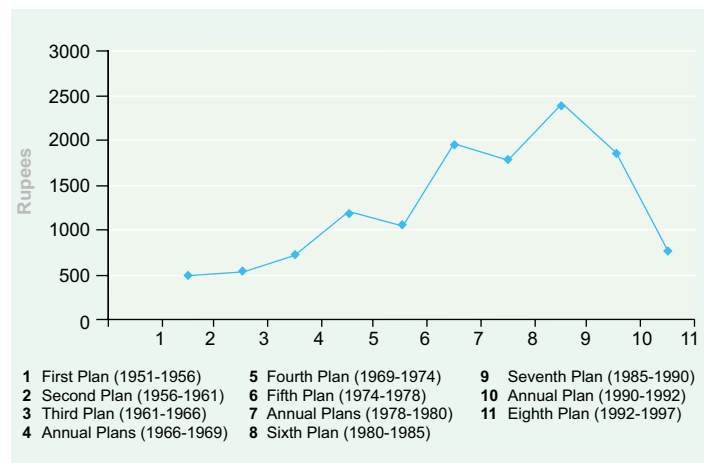


Figure 2: Impact of Flooding: Financial Losses per Hectare in India



The fact that losses due to flooding have increased is recognised by the government of India. As the Planning Commission notes in the chapter on flood management in the Tenth Five-Year Plan,<sup>9</sup> flood damage in India during the first three years of the Ninth Five-Year Plan exceeded allocations substantially and is related to the increasing amount of economic activity in flood plains. The willingness of local, state and national government entities to act on this recognition by addressing vulnerable forms of development is, however, limited. The Planning Commission, for example,

Groundwater overdraft in arid regions and the construction of roads, embankments and other structures in flood-prone zones have fundamentally altered the hydrologic characteristics of many regions.

notes a 'hesitation' on the part of state governments to enact flood plain zoning legislation and argues for 'other immediate steps such as differential insurance rules, additional surcharge by way of property tax on structures in risk areas, etc.' They go on to advocate permanent solutions based on 'the construction of storage, raising of villages, modification in cropping pattern (sowing crops which can tolerate waterlogging) and setting up of a nation-wide network of communication, forecasting and forewarning systems'.<sup>10</sup>

South Asia is, in many regions, changing from a rural society to one that could, perhaps, be described as peri-urban.

Overall, the root causes of vulnerability are related to human-induced changes in hydrologic systems, greater economic activity in vulnerable regions and patterns of development that are poorly adapted to the inherent variability of natural systems. All three factors increase the level of risk for livelihood systems. This situation and the responses proposed by governments are embedded in a much wider context of social and economic change. South Asia is, in many regions, changing from a rural society to one that could, perhaps, be described as peri-urban. Rural regions are increasingly well connected to urban areas through transportation, communication, market and labour networks. Villages are transforming into towns and towns into small- and medium-sized cities. Commuting, migration and non-agricultural economic activities increasingly represent important, if not dominant, components in the livelihood portfolios of rural farm households. This process, however, is nothing new.


The role of urban-rural interlinkages was recognised as a central feature in the rural livelihoods of Nepal over a decade ago.<sup>11</sup> More broadly, the *desakota* (a word derived from the Indonesian words for 'country' and 'town') model of urban-rural symbiosis for regions of space-economy transition<sup>12</sup> is being increasingly applied as a framework for understanding widespread patterns of socio-economic transition in Asia and many other parts of the world that combine features conventionally associated with either rural or urban regions. Instead of black-and-white urban versus rural distinctions, emerging patterns reflect a broad spectrum of situations that range from truly urban cores through many shades of grey to areas that, perhaps, remain truly rural. Urban and rural regions form part of a continuum rather than being dichotomous end points.

Preliminary results from the Adaptive Strategies Project indicate that vulnerability and the social impacts associated with floods and droughts are heavily influenced by the context described above. Field surveys conducted under the project provide a broad outline of flood and drought response patterns at local levels. Results indicate that vulnerability and the social impacts associated with floods, droughts and climatic variability are heavily influenced by at least eight factors:

1. The nature of livelihood systems within a region, in particular the extent to which individuals and households are able to diversify

- income strategies and incorporate non-farm components, many of which are less vulnerable to disruption from natural disasters than agriculture is;
2. The ability of people to migrate or commute in order to obtain access to non-farm or agricultural sources of income outside of drought and flood-affected areas;
  3. The ability of information, goods and services to flow into and out of affected areas;
  4. The differential social capital and institutional checks and balances that households have access to, including education, community institutions such as self-help groups, formal institutions such as government departments and banks, non-government organisations, the media and social networks;
  5. Existing patterns of differential vulnerability created by gender, income and social position;
  6. The nature of physical infrastructure (roads, houses, water supply systems, etc.) in particular:
    - a. the degree to which such infrastructure is vulnerable to being disrupted by floods and droughts; and
    - b. the extent to which such infrastructure allows the maintenance of livelihoods during drought and flood periods by serving as a point of refuge, helping to protect assets and facilitating the movement of goods, services and people;
  7. The ability of households to obtain secure sources of water for domestic uses (whether such water supply security is developed through local sources, long-distance transport through water markets or rural supply schemes);
  8. Natural resource conditions, particularly the degree to which ground and surface water systems are disrupted. Specific indicators include:
    - a. long-term declines in water level as a major warning signal of the increasing vulnerability to droughts of irrigated agricultural systems;
    - b. the increased presence of structures (such as roads, bridges, embankments for railways and flood control) that interfere with the existing patterns of natural drainage as an indicator of the greater likelihood of flooding.
- It is important to recognise that the ability of a population to adapt to or cope with floods, droughts and climatic variability depends heavily on a variety of factors that cross local, regional and national boundaries. Stable agricultural livelihoods in drought- and flood-prone regions often depend on the presence of multiple income sources – often including remittances sent by long- or short-term migrants – for use as capital

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 The ability of a population to adapt to or cope with floods, droughts and climatic variability depends heavily on a variety of factors that cross local, regional and national boundaries.

investment and to tide over the declines in income associated with drought and flood events in South Asia. Migration and commuting are, as a result, essential activities on which the viability of rural livelihoods depend. Similar findings are common in locations as diverse as Afghanistan and Africa.<sup>13</sup> This is not to say that all migration is good or desirable. Displacement in the context of a drought, flood or other disaster often leads to impoverishment. Recognition of the role migration plays in maintaining rural populations is, however, essential. The flow of people across rural and urban boundaries, districts, states and national borders can provide access to much more diverse livelihood opportunities than are present in many rural areas. Similarly, flows of information, goods, services and economic activity into and out of rural areas enable local populations to obtain access to key resources –

fodder, food, jobs and advance warning – when drought or floods disrupt local systems. All such flows are fundamentally important in determining the ability of populations to adapt to local climatic variations. Furthermore, as with water in a trans-boundary river, all of them have major trans-boundary implications for policy and practice.

Detailed information from our case studies is presented below in order to substantiate the above conclusions and explore their implications for development and disaster mitigation strategies. Before moving onto the details, however, it is important to provide a clear understanding of the purpose and objectives underlying this study and a definition of adaptive strategies as well as to discuss the conceptual foundations on which such strategies rest and the difference between adaptive approaches and conventional strategies.

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## PURPOSE AND OBJECTIVES

To be effective, approaches to addressing both long-term water management needs and the impacts of extreme events must reflect the context in which they are embedded. At present, most water management strategies focus primarily on hydrologic and water use systems *per se* and pay relatively little attention to the changing context in which these systems are entrenched and from which

they spring. Similarly, most attempts to respond to drought and flood events focus heavily on immediate relief and ignore opportunities to change long-term factors underlying different patterns of vulnerability.

The purpose of this project is to develop a broad-based understanding of the impacts floods, droughts and long-term water problems have on livelihoods



and how such impacts are influenced by the changing socio-economic and demographic context of rural South Asia. We seek to improve understanding of the incentives facing populations within the region, the opportunities they perceive and the constraints within which they must work as they respond to the immediate impacts of floods and droughts and the long-term effects of emerging water-related problems like groundwater overdraft. We also seek to improve our understanding of the implications such incentives, opportunities and constraints have for disaster mitigation and long-term development strategies.


The specific objective of this project is to identify points of leverage where investing resources in development support and disaster mitigation could assist communities in adapting to changing water realities<sup>14</sup> and, where possible, to improve options for the management of the water resource base. Philosophically, the project is founded on the belief that many water management and disaster mitigation initiatives have limited impact because they poorly reflect the aspirations and incentives local communities have and the wider processes of economic, demographic and social change in which local communities are embedded. Strategies that are adaptive, i.e. that identify and build on key contextual elements are, we believe, far more likely to be successful. In addition, much research on local water management challenges have emphasised the highly variable nature of water problems and the episodic

nature of change in response to them.<sup>15</sup> Floods and droughts affect different regions in different ways. They are times of crisis but also times of change and opportunity. As one review following the Orissa cyclone of 1999 commented: 'In many ways a disaster situation reduces the rigidity of a social system, and of transforming structures and processes. This provides opportunities for both understanding the systems in ways that are not normally available, and for changing the systems.'<sup>16</sup> Effective strategies for responding to long-term water problems and reducing vulnerability should, in themselves, be adaptive. That is to say, they should be capable of responding to changing conditions and to windows of opportunity while also addressing the inherent variability in local conditions. The larger objective of this project is to begin the process of outlining adaptive strategies that can help to bring together long-term development and vulnerability reduction. The end result will, we hope, be forms of development support that contribute substantively to the resilience of livelihoods in regions where droughts and floods are endemic.

The structure underlying our approach is similar to the logical structure developed over the last decade by *Duryog Nivaran*, the network of individuals and organisations advocating alternative approaches to disaster mitigation. This logical structure holds that:

1. Extreme climatic events induce stresses and often irreversible changes in both natural and

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 Adaptive strategies weave together long-term development and vulnerability reduction.

- social systems;
2. In the aftermath of such events, both systems begin the process of adaptation to new realities;
  3. Unfortunately, most conventional disaster relief is geared to restoring the *status quo ante*, a state neither nature nor society is willing to (or capable of) returning to;
  4. As a result, it is better to use resources to help people and places to adapt to the new context rather than attempting to return to pre-existing conditions;
  5. In a larger sense, disasters, can be seen as opportunities for development to be the way it really should be. Disasters it is argued, are the unfinished business of development.

## METHODOLOGY

The project on adaptive strategies for responding to droughts and floods was designed as a collaborative effort involving partners from both India and Nepal. Although academic research capacities were a consideration in developing the partnership, our approach emphasised the involvement of partners having an established presence and a solid track record of providing development support to local populations in flood- and drought-affected areas across South Asia. This approach was central to the project for three reasons:

1. The identification and analysis of adaptive processes in households and communities require in-depth familiarity with the livelihood systems, the patterns of change and the nuances of life at a local level. Unless partner organisations are solidly rooted in the areas where data collection and analysis are occurring, they are unlikely to be able to communicate sensitively and effectively with the involved communities. An established, long-term presence in the affected areas was central to understanding many of the processes of greatest relevance for the project.
2. We did not want the project to become too 'academic.' Although it is essential for all results to grow from solid conceptual and analytical foundations, it is equally essential for them to lead toward implementation. Furthermore, we believe that the process of analysis itself should contribute to the development of local capacity and strengthen the ability of local organisations to fulfil their own, already established missions.
3. We believe it is important for the results of the project to strengthen collaborative relationships both within countries and across borders. Floods, droughts and climatic variability are *regional* phenomena which have *global* as well as *local* implications. Unless

Floods and droughts are times of crisis but also times of change and opportunity.

insights cross borders and partnerships are established, responses remain fragmentary and partial. The establishment of new forms of regional and global collaboration is as important to the project as the generation of any specific analytical results.


To meet the goal described above, the project was designed as a layered initiative with local, regional and global partners each playing major roles. Core components included:

- A major global initiative to derive lessons from decades of research on disaster management, livelihoods, processes of social change and adaptive dynamics in complex systems;
- Regional studies on drought and flood mitigation policies and on the implications of climate change for extreme climatic events in South Asia;
- A series of field case studies in flood-affected portions of Nepal, Uttar Pradesh and Bihar complemented by parallel case studies in drought-prone areas in Gujarat and Rajasthan.

The overall conceptual framework and the survey instruments for the case studies were jointly developed by the full group of collaborating partners through a series of methodology workshops that integrated conceptual insights and methods from the global scientific community with the field experience of local organisations. Case studies were then undertaken by local NGOs or by research organisations using their own established field staff deriving support from regional and global expertise. These case studies were coordinated within the full research group but some of the details of surveys and elements of approach were modified by local organisations to reflect conditions in their field areas.

In framing the case study and regional approaches to data collection and analysis, substantial effort was devoted to defining what we mean by 'adaptive strategies'. This was an essential first step in order to ensure all involved organisations shared a common understanding of the questions the project intended to address. As it was for the study itself, clarifying the meaning we attach to the concept of adaptation is central to this report.

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 The overall conceptual framework and survey instruments for the case studies were jointly developed by the full group of collaborating partners.

## End Notes

<sup>1</sup> Chaturvedi and Saroch (2004)

<sup>2</sup> Wilbur Smith Associates (2003)

<sup>3</sup> Sivakumar and Kerbart (2004)

<sup>4</sup> VIKSAT, personal communication citing Gujarat Jal Disha (2000)

<sup>5</sup> VIKSAT – field report notes, 2004.

<sup>6</sup> Moench (1992)

<sup>7</sup> Mishra (1997); D'Souza (1999); Gyawali (2001) and Dixit, (2002)

<sup>8</sup> Data from Government of India cited in Chaturvedi, S. and E. Saroch (2004). 'Managing' in India: Realities, Perceptions and Policies. Boulder, Institute for Social and Environmental Transition: 54.

<sup>9</sup> Government of India (2001)

<sup>10</sup> *Ibid.*

<sup>11</sup> Gyawali, Schwank *et al.* (1993)

<sup>12</sup> McGee (1991)

<sup>13</sup> Benson and Clay (2002); Lautze, Stites *et al.* (2002); Pratt (2002); Lautze, Aklilu *et al.* (2003)

<sup>14</sup> Water reality is thought of in physical, institutional, political and entitlement terms. The physical realities are factors such as groundwater overdraft that cannot be reversed overnight or changed drainage patterns. The institutional realities are related with water use and demography built around them, e.g. Gujarat's groundwater dependent agriculture cannot go back to being totally rain-fed. The political factors are related with scale, e.g. one cannot register 30 million wells after they become operational. Lastly, the entitlement factor is related to water service that people aspire, e.g. urban residents expect flush toilets and running water in taps.

<sup>15</sup> Moench (2003); Moench, Dixit *et al.* (2003)

<sup>16</sup> IMM Ltd. (2001)





# The Meaning of Adaptive Strategies

*What do we mean by 'adaptive strategies'? Our meaning starts from recognition that variability and change are inherent, and as discussed further below, often desirable features of natural and human systems. Rather than attempting to fundamentally reduce or eliminate inherent change processes or variability, approaches need to work with them. This notion is closely related to growing recognition at the global level of the role of risk management and the need to integrate mitigation activities with development.<sup>1</sup> The need is for approaches to water management and disaster mitigation that are, in themselves, adaptive. Under this general philosophy, 'adaptive strategies' for responding to floods, droughts and long-term water management problems are defined as approaches that respond to variability and work with change processes to reach socially desired goals. While this philosophy sounds fine, it does not provide much practical direction. Translating it into more practical terms requires much greater specification.*

## KEY ELEMENTS IN OUR DEFINITION

What do we mean by approaches to drought and flood mitigation and water development that are ‘adaptive’? Core elements in our definition include strategies that:

- focus on the development of physical infrastructure that is adapted to (works with rather than attempts to control) the natural cycle of drought, flooding and other extreme climatic events in a given region;
- increase the resilience of economic and livelihood systems, spread risks and strengthen the ability of individuals, households and communities to adjust economically to extreme events and long-term changes in the water context;
- build off existing patterns of adaptation, i.e. what people are already doing, the perspectives they bring to drought and flood problems, and the opportunities they see for reducing vulnerability;
- are, themselves, adaptive (i.e. have in-built processes to respond to variability, to adjust as conditions

change and to build the capacity to learn);

- recognise and attempt to take advantage of the windows of opportunity for change created by floods, droughts and other fluctuations in water resources or other conditions; and
- reflect the incentives inherent in hierarchically structured organisations, the individualistic competition in the market and the more egalitarian focus of many social service entities and utilise the differing capacities each of these forms of organising brings to mitigate the impacts of droughts and floods.

Adaptive strategies for responding to floods, and drought and long-term water management problems are defined as approaches that respond to variability and work with change processes to reach socially desired goals.

Taken together the above elements imply a definition that, rather than attempting spurious precision, recognises the value of elegantly clumsy strategies. Such strategies are opportunistic, able to respond to contexts and draw on the mix of market, private sector, government and community and civic institutions which are the constituents of human society at all levels.

## CONCEPTUAL FOUNDATIONS OF ADAPTIVE CAPACITY AND LIVELIHOOD RESILIENCE

The conceptual foundations underlying the development of adaptive approaches for responding to droughts, floods and long-term water management problems grow out of the

expanding field of research on risk and the dynamics of ecological and social systems. This research provides deep insights into the concepts of resilience and adaptation and into the factors

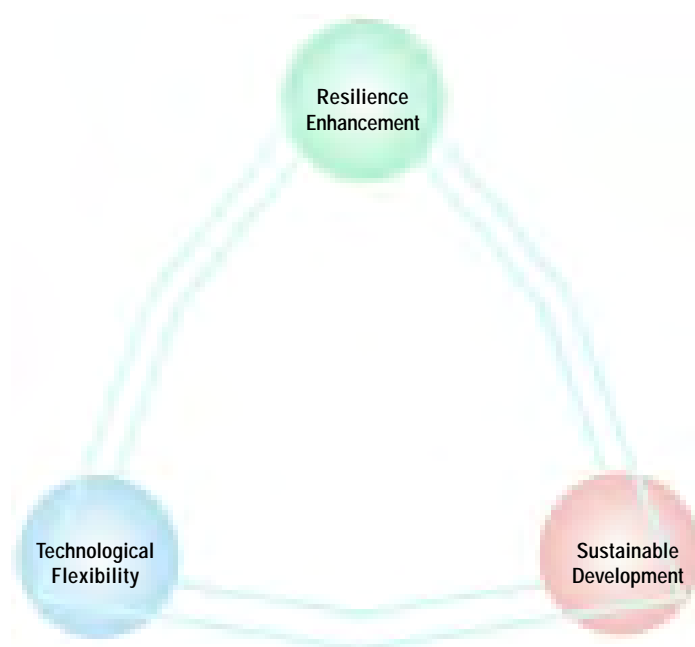
that contribute to their presence within complex systems. Before exploring the nature of resilience and adaptation, however, it is important to emphasise one element many studies of system dynamics lack: the concept of agency. Unlike most natural system components, humans are proactive and strategising agents of change. Agency, the ability to evaluate situations and act strategically gives humans the potential ability to direct patterns of adaptation in ways that increase the resilience of livelihood systems. Now to the question of adaptation and resilience: the Resilience Project, a collaboration of many individuals and organisations jointly contributing to the development of new conceptual insights on system dynamics, defines ecosystem resilience as:

“ the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a

different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Resilience in social systems has the added capacity of humans to anticipate and plan for the future. Humans are part of the natural world. We depend on ecological systems for our survival and we continuously impact the ecosystems in which we live from the local to global scale. Resilience is a property of these linked social-ecological systems (SES). ‘Resilience’ as applied to ecosystems, or to integrated systems of people and the natural environment, has three defining characteristics:

1. The amount of change the system can undergo and still retain the same controls on function and structure
2. The degree to which the system is capable of self-organisation
3. The ability to build and increase the capacity for learning and adaptation.”<sup>2</sup>

The ability to adapt to local problems such as floods and droughts often depends on systems and flows that connect to regional and global levels. Understanding this and addressing the inherent implications for trade, migration and other sensitive global policy arenas is, perhaps, one of the most significant challenges facing society in the coming century.



The concept of resilience enhancement is also dependent on technological flexibility and sustainable development. Based on Thompson (1994)

The conceptual foundations underlying the development of adaptive approaches for responding to droughts, floods and long-term water management problems grow out of the expanding field of research on risk and the dynamics of ecological and social systems.

All of the above points are important. Understanding the amount of change a system can undergo while still retaining its core functions and structure requires a combination of both social and natural science as well as a solid capacity to analyse system dynamics. To understand vulnerability we need to understand systems. Self-organisation is equally important. Resilient livelihoods are those that can first recover (self-organise) after disruption and following recovery are capable of learning and adapting; they have a strong ability to cope with surprises and change as conditions require.<sup>3</sup> This highlights the third point: that adaptive capacity is itself essential for resilience.

Much conventional development has eroded the capacity of communities to self-organise, even to the extent of robbing them of self-respect. Farmers, for example, lack the capacity to replace a cement concrete dam when a flash flood washes it away, but they are often able to replace structures that rely on locally available skills and resources. Reliance on the cement concrete dam, as a result, not only reduces the ability to self-organise when failure occurs but also induces dependency on higher level organisations. The outcome is resilience depletion.<sup>4</sup>

Studies on system dynamics, indeed, the above example of the dam, indicate that resilience and the ability to adapt are themselves dependent on disruption. High levels of stability are, in fact, often undesirable. In

ecosystems, increasing stability is strongly associated with increasing rigidity. As uncertainty and variability decline, systems become increasingly structured and, as long as conditions remain routine, efficient. Such systems are much more vulnerable to catastrophic failure when key parameters are exceeded than systems where inherent variability necessitates the maintenance of diverse (but less efficient) functional sources of support.<sup>5</sup> To put this another way, the ability to manage risk depends on the continued presence and experience of risk factors. When people are not exposed to risk on a regular basis, their ability to respond to surprise declines. Concrete dams may be more efficient than locally constructed brushwood dams but, because they require little routine re-building, local communities often do not have the capacity to repair them. Capacity is only maintained where it is in constant use. As Gunderson and Holling state: 'Variability in ecosystems is not merely an inconvenient characteristic of these productive, dynamic systems. It is essential for their maintenance'.<sup>6</sup>

What does this mean in the immediate context of floods and droughts in South Asia? The case of groundwater irrigated agriculture provides a clear illustration. Over the past five decades, increasing access to groundwater has been a major factor in increasing the reliability of agricultural production and reducing poverty in rural communities across South Asia.<sup>7</sup> Groundwater irrigated areas generally are more productive and generate more




income than areas irrigated using other sources.<sup>8</sup> Use of groundwater also reduces the immediate risk of loss.<sup>9</sup> These factors enable farmers to invest in fertilizers and other inputs and, consequently, to generate surpluses far more consistently than when they depend on rainfall or surface irrigation. Reliance on groundwater has fundamentally reduced the variability rural communities must cope with and allowed the spread of agricultural systems focused on the production of a narrow range of market crops. While this has had major economic benefits, it has also encouraged the development of much more rigid agricultural economic systems. Green revolution technologies utilise a relatively narrow range of crop varieties, all of which depend on assured water supplies. When inputs become unavailable or variety-specific diseases spread, the systems are susceptible to sudden collapse. In many agricultural areas, groundwater has served as the primary buffer against natural climatic variability and recurrent drought. As a result, when wells dry up suddenly due to a combination of long-term groundwater overdraft and drought (a situation which was common in rural Rajasthan and Gujarat during the drought period of 1999-2003), rigid livelihood systems that depend primarily on intensive agricultural production are forced to adapt suddenly and painfully. This situation is clearly illustrated later in this report in the case study on Satlasana, Gujarat.

Similar situations exist in many attempts to reduce the impact of floods, droughts and other natural disasters. Where flood and drought mitigation activities reduce the need for rural inhabitants to develop livelihood systems capable of responding to normal variability, livelihood systems become much more vulnerable to disruption when they are actually subject to major flood or drought impacts. If a family only needs to access a boat once every ten years when major levee (embankment) breaches occur, the boat is much less likely to be available and well maintained than if the same boat is required several times every year. The same dynamics apply to social networks and the diversity of livelihood strategies. Overall, attempts to reduce variability and increase security often have the unintended consequence of reducing the ability of livelihood systems to cope with or adapt to major changes in fundamental system parameters.

Beyond exposure to variability, studies of social and ecosystem dynamics provide clear conceptual insights into the factors that contribute to enhance resilience and adaptive capacity. In systems ecology, diversity and the presence of multiple pathways for energy and information flow are widely recognised as central to resilience and adaptive capacity. The ability to buffer energy stores is also central to the survival of plant and animal species in periods of low production, whether they involve predictable seasonal

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 Resilient livelihoods are those that can first recover (self-organise) after disruption and, following recovery, are capable of learning and adapting; they have a strong ability to cope with surprises and change as conditions require.

variations or less predictable fluctuations. Furthermore, generalist species, those that are able to fill many ecological niches, are often much less vulnerable to disruption than specialist forms that have evolved to fit narrowly defined niches.

Where livelihoods are concerned, the above insights from systems ecology suggest that the following factors are fundamentally important to resilience and adaptive capacity:

- Support systems (information, social networks, community organisations, markets, etc.) that allow people to migrate (or commute) and information and resources to flow through diverse channels and often across national and state boundaries when surprises occur or conditions change; and
- The presence of capital reserves and assets.

Studies on system dynamics indicate that resilience and the ability to adapt are themselves dependent on disruption. High levels of stability are, in fact, often undesirable.

- Access to diverse, independent income sources and income strategies;
- The general educational and other skills required to respond to constraints and take advantage of diverse income niches as opportunities emerge;

Vulnerable populations typically do not score well on evaluations of the above factors. The poor, for example, are often dependent on a very narrow set of income opportunities, such as agricultural wage labour. They lack the knowledge, education and other skills necessary to take advantage of new opportunities created by expanding or



*Drought conditions are also a function of climate.*


changing economies. They are also often physically isolated and lack the transport, communications and other infrastructure necessary to allow goods to flow to them and to enable their own assets (whether products or labour) to flow out and access wider economic opportunities. Where institutions are concerned, they generally lack access to formal organisations, such as banks, that provide support and may have weak social networks. Finally, by definition they lack substantial capital reserves or other assets. As a result, poor populations often lack the capacity to adapt when support systems experience even minor disruptions. Instead of developing adaptive livelihood systems that derive their resilient nature from the constant pressures and opportunities created by variability, the poor often experience such variability as 'waves of adversity'.<sup>10</sup> Each disruption or wave of adversity depletes the capital reserves needed both to build adaptive capacity and to buffer future disruptions.

The above said, it is important to recognise that poverty is not the only, or, indeed, necessarily the primary, factor contributing to vulnerability. Many middle-income groups have become vulnerable by specialising. Middle-income farmers, for example, often practice extremely intensive forms of agriculture that depend heavily on access to regular water supplies and on a narrow range of crop varieties. While such systems can improve living standards, middle-income groups are often unable to accumulate substantial

capital reserves. Because their livelihoods are somewhat buffered from normal fluctuations through access to resources such as groundwater, they often lack the incentives to invest in education and other forms of diversification. Furthermore, because they do not have to cope with serious fluctuations in income on a regular basis, they are often unfamiliar with labour markets and migrating to obtain work during periods of crisis. As a result, they can be even more vulnerable than the poor or other marginal communities when serious disruptions occur. Specialisation, while it can underpin highly productive income streams, is in itself an indicator of vulnerability if the factors on which that specialty depends are disrupted.

On a conceptual level, therefore, strategies for both long-term development and disaster relief need to enable populations to accumulate buffering resources but not remove the pressure created by variability to diversify and adapt. Furthermore, as a final theoretical note, it is important to recognise that the concepts of adaptive capacity and resilient livelihoods are layered. Resilience at the level of household livelihoods depends on the presence of larger systems (markets, information flow, political systems, etc.) that enable flows of information, materials and people at regional, national and global levels. This parallels the argument by Dreze and Sen that the impact of a natural disaster is closely related to its

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 Attempts to reduce variability and increase security often have the unintended consequence of reducing the ability of livelihood systems to cope with or adapt to major changes in fundamental system parameters.

political context. As they stated in 1989:

“ In countries with relatively pluralistic political systems, open channels of protest have also helped to direct forcefully the attention of the authorities to the need for preventive action without delay’.<sup>11</sup> It is, we have argued, no accident that the countries that have been most successful in famine prevention in the recent past have typically had rather pluralistic politics with open channels of communication and criticism. A relatively free newspaper system may be the most effective ‘early warning’ system a famine-prone country can rely on.”<sup>12</sup>

It is important to recognise that poverty is not the only, or, indeed, necessarily the primary, factor contributing to vulnerability.



Local scientific capacity helps to better understand natural variability.

Where political systems encourage the flow of information and protest, governments and other institutions that face or learn about crises are forced to respond. As Drez and Sen further argue; ‘the accountability of the Indian government to the electorate (combined with a relatively free press) has made the prevention of famines a political compulsion’.<sup>13</sup> Their point is directly parallel to our own argument about the critical role played by social auditors in water and other natural resource governance.<sup>14</sup> An alert civil society that uses the media as a forum and has the scientific and other capacities needed for investigating and raising early warning signals about impending problems is central to effective governance and the resilience of political and economic systems. It is not however, just information and political accountability that increase resilience. Where regional economies are narrowly based and the diversity of economic opportunities open to populations within them limited, vulnerability to disruption at all levels in the system is higher. Similarly, where policies discourage migration or attempt to return populations to the conditions existing prior to droughts or floods, the incentive and consequently the long-term ability to adapt is reduced. The development of resilient livelihoods requires strategies that recognise and build upon the incentives for change created by disruptions such as droughts and floods rather than viewing such disruptions as aberrations to which the appropriate response is an attempt to rebuild the *status quo*.

## CONTRASTS WITH CONVENTIONAL APPROACHES

The difference between conventional approaches to disaster mitigation and the perspectives we bring to the interlinked issues of disaster and development are summarised in the table below, which has been adapted, with some modifications, from *Duryog Nivaran*.<sup>15</sup>

The perspectives on which this report is based are not completely new, but we

seek to identify practical points of intervention that, by building upon existing patterns of change and social responses to floods and droughts, make it possible to translate these perspectives into concrete action. Our starting point in this endeavour is to outline key patterns in the wider process of socio-economic change. These patterns are the context within which detailed information from case study areas must be interpreted.

Table 1: Perspectives on Disaster Management

Dominant Perspective	Alternative Perspective
Disasters/conflicts viewed as isolated events.	Disasters/conflicts are part of the normal process of development.
Linkage between disaster and conditions in society during normal times is not analysed in detail.	Analysing linkages with society during normal times is fundamental for understanding disasters/conflicts.
Technical/Law and Order solutions dominate.	Emphasis on solutions that change relationships/structures in society. The objective is to reduce people's vulnerability and strengthen their capacity to respond and adapt.
Centralised institutions dominate in the intervention strategies. Participation of people, who are treated as 'victims', is relatively low.	Decentralised institutions dominate in the intervention strategies. Participation of people is paramount in intervention strategies; people treated as 'partners' in development and disaster mitigation.
Implementing agencies have little accountability and their processes tend not to be transparent to affected people.	Ensuring accountability and transparency emphasised in implementation.
Interventions are made after the event occurs.	Mitigation of disasters and conflict as an inherent part of the development process and the fundamental aim of relief.
The objective of intervention is to return to the situation before the event, i.e. to re-establish the <i>status quo ante</i> .	Disasters/conflicts viewed as opportunities for social transformation. There is recognition that neither nature nor society can, or should, return to the <i>status quo ante</i> following such a major stress. Disasters are opportunities to encourage 'good' forms of development rather than continued mal-development.

Events between two disasters also create or reduce vulnerability.

### End Notes

<sup>1</sup> Kreimer and Arnold (2000); Aalst and Burton (2002); Benson and Clay (2002); Freeman, Martin *et al.* (2002)  
<sup>2</sup> ([http://resalliance.org/ev\\_en.php?ID=1004\\_201&ID2=DO\\_TOPIC](http://resalliance.org/ev_en.php?ID=1004_201&ID2=DO_TOPIC)) Resilience Project web site accessed 1/28/04.  
<sup>3</sup> Glavovic, Scheyvens *et al.* (2002); Gunderson and Holling (2002)  
<sup>4</sup> Thompson (1994)  
<sup>5</sup> Gunderson (1999); Gunderson and Holling (2002)  
<sup>6</sup> Gunderson and Holling (2002)  
<sup>7</sup> Moench (2003)

<sup>8</sup> Dhawan (1990); Shah (1993); Meinzen-Dick (1997); Shah, Alam *et al.* (2000); Hernandez-Mora, Llamas *et al.* (2001)  
<sup>9</sup> Tsur (1990) and Tsur (1993)  
<sup>10</sup> Glavovic, Scheyvens *et al.* (2002)  
<sup>11</sup> Dreze and Sen (1989)  
<sup>12</sup> *Ibid.*  
<sup>13</sup> *Ibid.*  
<sup>14</sup> Moench, Caspari *et al.* (1999) and Moench, Dixit *et al.* (2003)  
<sup>15</sup> Disaster and Vulnerability in South Asia, Programme for *Duryog Nivaran*: A South Asian Initiative on Disaster Mitigation. ITDG, Sri Lanka, 1995



# THE CONTEXT: Patterns of Change and Continuity in South Asia

*The ability of local populations to adapt to floods, droughts and patterns of climatic variability is heavily influenced by the larger, changing context in which livelihoods are embedded.<sup>1</sup> As markets, communication technologies and transport infrastructure increase flows between regions, South Asia is undergoing a process of dramatic social change. These social changes are occurring in a context in which environmental degradation and global climatic change are fundamentally transforming the water resource base on which most agricultural livelihoods depend. India's case illustrates the changes well, so most of our analysis focuses on the transformations occurring there. Since the situation in Nepal is complicated by the on-going conflict between Maoists insurgents and the government, this complex process of change needs to be treated separately.*

## TRANSFORMATIVE CHANGE PROCESSES

The transformative nature of on-going processes of change is a central point to recognise in our analysis of the wider context. Because social and natural resource systems are evolving in ways that fundamentally reshape the context in which livelihoods exist, adaptation in livelihood systems is both an inherent, on-going process and an essential for survival.

### Peri-Urbanisation in India

India is undergoing a process of peri-urbanisation: from what was, as little as twenty years ago, a dominantly rural country, much of India has now become urban-linked. The changes are, of course, not all new. The development of railways across India in the nineteenth and twentieth centuries provided rapid connections between many rural and urban areas. Furthermore, rural and urban India has always been linked by flows of goods and people. Trade and the ever-fluid and diversified patterns of migration underlay a rural-urban dynamic of co-dependent livelihood and political systems that helped shape India's identity long before its emergence as an independent nation. At present these dynamics are changing in fundamental ways as the intensity of communication networks and the density of transport systems increase.

Where rural areas were once largely rural in character – distanced by the time required for travel and information flow – now urban areas are an hour bus ride away and

information flow is often instantaneous. Roads, television, radio, phone booths, power grids and, most recently, the ubiquitous cell phone have penetrated once isolated areas. In addition, many sleepy towns, once dominated by the slow pace of bullock carts, now rumble with trucks and the million voices of a business economy. With much of India's growth concentrated in small towns and cities, urbanisation has migrated to the countryside. Rural distances have been shortened as much by the increasing physical proximity of urban areas as they have by the speed of communication and transport. The change is fundamental. Where once access to non-farm urban jobs required migration – a fundamental change in the location of life and livelihood – now many individuals commute. Products and production are also no longer local. Milk, that most perishable of rural commodities, is processed and transported nationally. Markets that enable the bulk transport of many traditionally local resources, such as fodder and water, to be delivered economically to populations in what were once remote areas have developed. The traditional subsistence rural economy in which commodity flows were circular within a given area is now rarely found. The image of a fundamental and total dependence on local resources, never an accurate description of reality, is now more myth than ever.

Urban characteristics are gradually spreading out and reshaping rural hinterlands.

It is important to emphasise that the patterns described above are not new. Rural-urban inter-linkages have existed throughout history. Current patterns of change, however, while replicating existing ones, are qualitatively different. Historically, when droughts hit fodder could not be rapidly transported to distant rural areas. As a result, populations had to either migrate with their livestock or lose them. Now fodder can – and often is – transported to stricken areas. Although underlying patterns may have long historical roots, the dynamics of transport and communication have changed in fundamental ways.

Similar changes are also present throughout much of Nepal. Nepalis have always migrated outside the country for jobs. More than a million Nepalis are currently estimated to be working abroad, many just across the border in India, and remittance income is a major contributor to the economies of many rural areas. Flows are not just of labour. In the Nepal Tarai, many goods from market crops to industrial products, also come from India across the porous border. Information also flows. Small FM stations operating in local languages are increasingly common as are cell phones. Despite extreme poverty, local populations often have far more access to information and news than ever before.

All of the above changes transform the context in which floods and droughts occur and the options which local populations have for responding to the associated livelihood and other


impacts. Outlining the key elements of change in this macro context is, as a result, important.

### Demographic, Economic and Social Elements of Change

The external view of India often includes stereotypical images of a few mega-cities surrounded by a slow-moving, traditional hinterland of small villages where life proceeds at the pace of bullock carts. This image, while never truly accurate, is now a far cry from reality. Indians are not migrating in large numbers to urban areas and leaving rural areas depopulated. Data from the 2001 Census of India, for example, classify slightly over 72% of the population as rural residents and only seven per cent live in large urban cities of over one million inhabitants. The rural population declined from 77% in 1981 to 74% in 1991, but there has been no huge shift into urban areas.<sup>2</sup> Changes are more subtle: Instead of people migrating to urban areas, urban characteristics are gradually spreading out and reshaping India's once rural hinterlands.

Traditional images of a rural hinterland dotted by small villages are gradually being blurred. Villages have grown in size; many are small towns capable of supporting a diversified economic base. Statistics from the Census of India provide insights into the patterns of change.<sup>3</sup> There are approximately 981,864 habitations (villages) of various sizes in rural India. Approximately one-third of these have less than 200 inhabitants (and 15% of those have less than 100

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 The dynamics of transport and communication have changed in fundamental ways.



inhabitants) while only 16.4% have more than 1,000 inhabitants. Villages with more than 1,000 inhabitants, however, account for nearly 55% of the total population while the one third with less than 200 inhabitants account for only 5.6% of the population. Clearly most rural inhabitants now live in relatively large villages. The change has been gradual but consistent, as the chart below indicates.

Rural distances have been shortened by the increasing physical proximity of urban areas and by the speed of communication and transport.

The chart clearly indicates an on-going decline in the percentage of the population residing in small villages

(those with less than 1,000 inhabitants) accompanied by stable or increasing populations in villages having 1,000 or more inhabitants. Even the absolute number of small villages has declined significantly in the smallest (less than 500 inhabitants) size bracket. This has important implications for the structure of rural livelihoods. Villages with large populations are much more likely than small villages to support a diversified base of services and other non-farm activities. Similar patterns are present where urban populations are concerned. As figure 4 indicates, the percentage of the population residing in small towns<sup>4</sup> has been declining, while the percentage of the population in larger towns has been increasing.

Figure 3: Population Distribution in Rural Villages of India

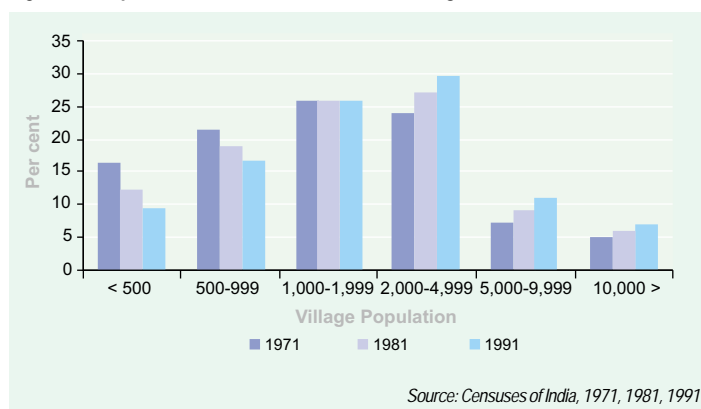
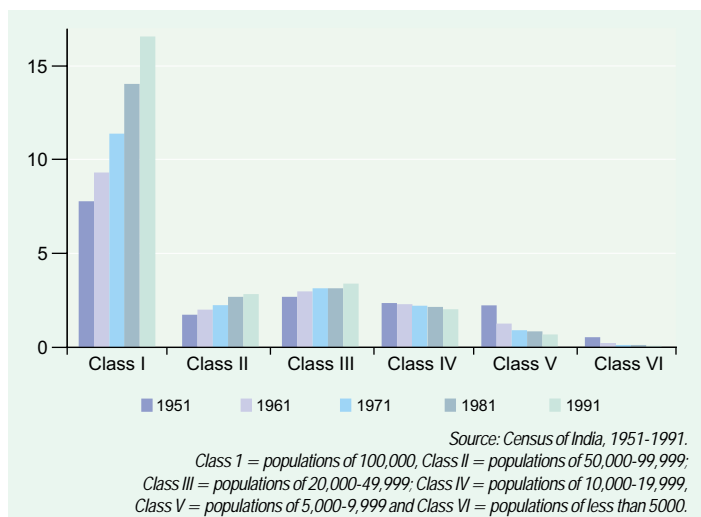


Figure 4: Change in Town Sizes in India



The increasing concentration of the population in large villages has been accompanied by other changes in basic infrastructure such as electricity, telecommunications and roads. As figures 5 through 7 clearly document, access to infrastructure has increased dramatically. The number of public call offices (a critical indicator of telephone access in rural areas, where most people cannot afford private phones), has increased from near zero to almost 350,000, and most of these are linked to the national network. Similarly, electrification has increased dramatically and is now levelling off as most villages are, at least nominally, connected to the national grid. Most are also linked to paved roads.

While the data underlying the above charts need to be interpreted with care (electrification, for example, indicates

connection to the grid, not the availability of power when users may need it), they do indicate a basic change in rural infrastructure.

Another feature is the reduction in times taken for commuting. Twenty years ago, the pace of a bullock cart travelling on unpaved roads often determined the travel times between villages and towns or urban areas. Under the best of conditions, such travel took substantial time and during the monsoon season many villages were effectively cut off. Now, the presence of all-weather roads has facilitated the extension of public and private buses and local taxi services far into once isolated areas.

Communication and transport systems are only cut during extreme flooding events. In many regions, the distance an individual farmer or worker can travel within a day to sell produce or search for a job has expanded from a few to many tens (or hundreds) of kilometres. Complementing the ability to travel, telephones and cell phones allow individuals to communicate with others in distant locations and to find out about a wide variety of factors (from jobs to market conditions) that influence their livelihood options and choices. Finally, with a power supply from the national grid and with access to transport, many non-farm activities that could not have been undertaken earlier are now possible in these areas. These changes are illustrated well by the situation in the Annur and Palladam blocks of Coimbatore District in Tamil Nadu (Box 1).

Figure 5: Growth in the Number of Public Call Offices

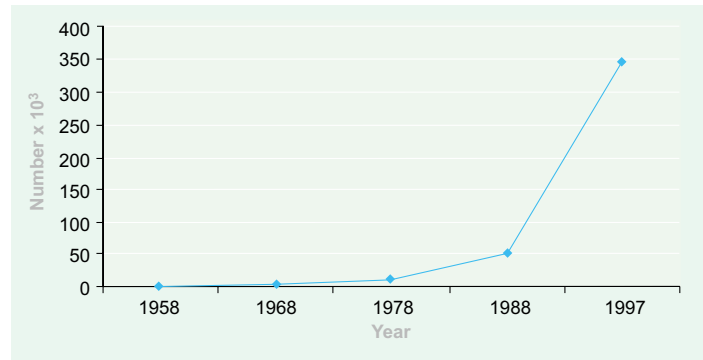


Figure 6: Expansion of the Road Network

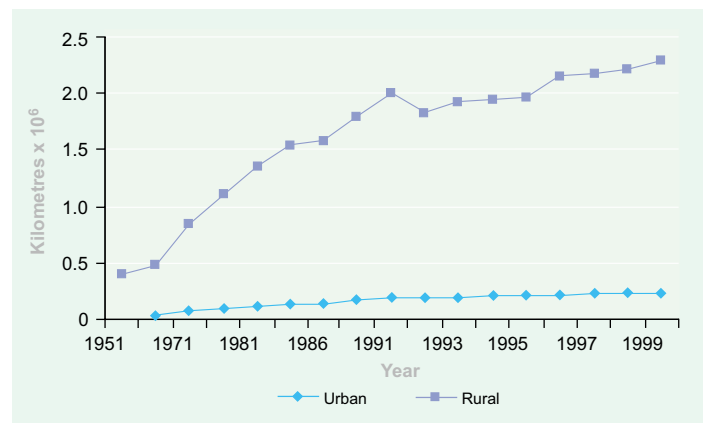
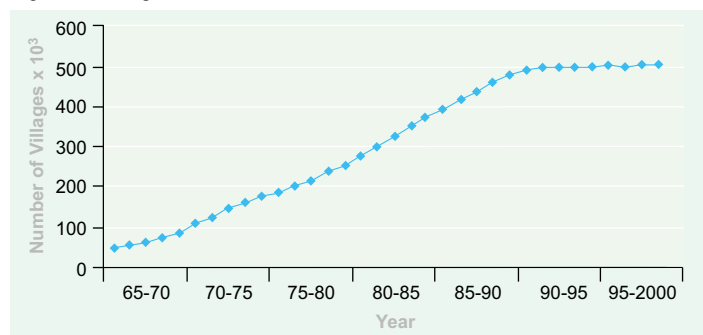


Figure 7: Village Electrification



The situation described in the box 1, while extreme in the extent of the economic shift out of agriculture, is typical of most of our case study areas. Overall, rural areas are much more closely connected to urbanised towns and livelihood options than ever before. Large towns and small cities are more numerous and, as a result, much less

## BOX 1 Livelihood Change: Annur and Palladam Blocks, Coimbatore, Tamil Nadu

Annur and Palladam blocks of Tamil Nadu have undergone a rapid process of economic change in livelihoods in recent decades. Both areas were dominantly agricultural as recently as the early 1990s. Now, although many families may still be classified as agricultural, income from non-farm related activities dominates heavily. This is made clear by data collected by Tamil Nadu Agriculture University on the income sources of two villages, Kodangipalayam and Kattampatti.

### Income Sources of the Household, Kodangipalayam (%)

Land ownership size group	1990-91				2000-01			
	Own farm	Off farm	Non-farm	Total	Own farm	Off farm	Non-farm	Total
Marginal	47	28	25	100	18	10	72	100
Small	70	10	20	100	28	4	68	100
Medium and Large	88	0	12	100	45	0	55	100
Landless	0	81	19	100	0	22	78	100

### Income Sources of the Household, Kattampatti (%)

Size group	1990-91				2000-01			
	Own farm	Off farm	Non-farm	Total	Own farm	Off farm	Non-farm	Total
Marginal	55	29	16	100	36	19	45	100
Small	83	10	7	100	67	7	26	100
Medium and Large	88	0	12	100	65	0	35	100
Landless	0	77	23	100	0	47	53	100

The above tables clearly document dramatic increases in the reliance on non-farm activities as a source of income and the parallel declines in incomes from both farmers' own land and from agricultural labour working on land owned by others. In both villages, substantial declines in groundwater levels have caused farmers to reduce the intensity of cultivation and to increase the areas devoted to crops such as millets that, while they require less water, also generate far less income. At the same time, roads, power and communication systems have entered the villages, thereby enabling large and medium scale farmers to diversify into non-farm activities. The number of power looms has increased greatly and farmers have also switched into quarrying and other small businesses. With increases in these activities, marginal farmers and the landless, who once derived most of their income from off-farm agricultural activities, now derive by far the largest share of income from non-farm labour sources. Now, as the tables below document, the area devoted to irrigated crops has declined substantially and the area planted with sorghum or left fallow has increased.

### Changes in Cropping Pattern, Kodangipalayam

Year	Area (%)				Total area (ac)
	Cotton	Banana	Sorghum	Fallow	
1990-91	7	18.00	19	2	20.24
2000-01	0	0.04	40	22	20.19

### Changes in Cropping Pattern, Kattampatti

Year	Sugarcane	Vegetables	Sorghum	Fallow	Total area (ac)
1990-91	59.6	17.4	5.7	1.4	17.40
2000-01	25.4	9.8	20.9	20.9	18.11

The above shifts rest on a further change: most of the wells of smaller farmers no longer function, so almost all intensive cultivation is done by a few, relatively large, farmers. Landless, marginal and small farmers have little direct dependence on agriculture as a major source of income and their livelihoods are, in consequence, relatively insulated from the direct impact of drought. Instead of relying on agriculture they either work locally or even commute as much as 60 km per day to their primary work in factories or quarries. As long as drinking water supplies are available and the economy in general remains robust, their livelihoods will remain secure even in times of drought.

Source: Personal communication with K. Palanasami, Director, Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore, field work conducted for the British Geological Survey COMMAN Project.

physically distant from rural areas. At the same time, the radius of contact for individuals living in rural areas has expanded. Many rural areas are, from this perspective, peri-urban.

### Changing Livelihood Systems

Changes in rural infrastructure and demographics have fundamental implications for livelihoods. Data from the Census of India and National Sample Survey indicate that permanent migration has declined. As Mahindra Dev points out, however, 'both Census and NSS ignore or severely underestimate short duration (circular) migrants and commuting labour. The National Commission on Rural Labour (NCRL) estimates more than 10 million circular migrants in the rural areas alone'.<sup>5</sup> Commuting is part of a number of livelihood options in many sites studied by the partners in this project. Furthermore, micro-studies in other areas indicate that commuting is common; in fact, it is a major factor contributing to labour mobility.<sup>6</sup> Citing a study by Srivastava (1998), Dev points out that: 'increased labour mobility has contributed to breaking down the isolated nature of rural labour markets and greater integration between rural and urban labour markets. The overall impact of labour out-migration in the recent period has been to put an upward pressure on wages and accelerate changes in production relations'.<sup>7</sup> The depth and extent of changes in production relations may be limited by the low educational levels of much of the rural workforce,<sup>8</sup> but structural changes are clearly occurring.

Increases in commuting and short-term migration coupled with existing long-term migration have probably increased remittance income flows to rural areas. These remittance flows may, as in some other parts of the world, such as Vietnam,<sup>9</sup> represent a major source of capital for many of investments in education, non-farm businesses, housing infrastructure and agricultural intensification. In Nepal, remittance income flows were, according to official data, equivalent to NRs 22 billion in 2000; an amount nearly equal to that earned through exports.<sup>10</sup> This suggests that structural changes in rural areas may be heavily influenced by changes in the wider economy and by the remittance income flows that enable local investment. This said, in some cases the structural changes are driven as much by declines in water availability or other shortages as they are by wider socio-economic opportunities. Nepalis have migrated to India and other areas to work for centuries. The outflow of people has accelerated since 1997, when passports were made available in district headquarters and societal stresses increased as a result of the Maoist insurgency. In some case study villages in Gujarat, the stresses forcing diversification have included declining water levels. The situation in Bhanavas village described in the box 2 is illustrative.

Economic data for rural India show substantial diversification from solely agriculture to a variety of non-agricultural activities (Figure 8). As can be seen, the number of 'other

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Changes in rural infrastructure and demographics have fundamental implications for livelihoods.

In the village of Bhanavas of Gujarat, depletion of groundwater has led to drastic declines in the area under irrigation and in agricultural production. As with other villages in the study area, agriculture has nearly collapsed as a source of income. According to villagers, the drought situation was manageable until 1998 although groundwater levels were declining. The situation changed dramatically in 1999, when well depths reached hard bedrock and drought conditions intensified. The impact this had on the irrigated area cultivated with different crops is clear in the table below:

#### Decline in Production of Selected Crops, Bhanavas

Crops	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (%)
Groundnut	100	50	No cultivation	No cultivation	Crop failed
Cluster beans	100	30	No cultivation	No cultivation	Crop failed
Maize	100	50	No cultivation	No cultivation	Crop failed
Bajra	100	70	50	25	Crop failed
Wheat	100	50	25	10	5
Mustard	100	50	No cultivation	No cultivation	No cultivation
Tobacco	100	10	No cultivation	No cultivation	No cultivation

Source: Primary survey, focus groups discussions, 2003

The total cultivated area in the village is approximately 200 acres. The above table presents the area under various crops as a percentage of the 1998 cropping pattern. Focus group discussions conducted by VIKSAT indicate that irrigated production had dropped to approximately just 10 acres in 2002.

Declines in agricultural production have had major impacts on other activities. Animal husbandry, while still a major economic activity in the area, has declined due to lack of fodder. As local agricultural activities have declined, migration out of the village for work has increased. Data collected by VIKSAT indicate that migration has taken a variety of forms including:

- (a) Long-distance seasonal movement to places such as Banaskantha for sharecropping. Banaskantha is an adjacent district and still has some sources of irrigation water. In some cases, entire families migrate for part of the year and in other cases only adult male members sharecrops.
- (b) Migration or commuting to nearby towns in search of employment in the urban informal sector and in diamond cutting and polishing industry in Satlasana, Surat and Ahmedabad. In some cases entire families have migrated on a relatively long-term basis.

Migration and, to a lesser extent, commuting for wage labour have served as backup income sources for villagers in locations such as Bhanavas throughout history. Now, however, climatic and infrastructural changes processes and economic diversification have enabled the entry of activities such as diamond polishing to rural areas. Combined with the push effect of groundwater depletion and drought, the presence of new economic opportunities has catalysed major livelihood shifts at the local level.

Source: VIKSAT field survey

workers' has increased substantially and now exceeds both cultivators and agricultural labourers.

The above patterns conform to trends in India and many other parts of the world as well. As Daniel Start

indicates; 'recent surveys suggest that non-farm sources account for 40-45% of average rural household income in sub-Saharan Africa and Latin America and 30-40% in South Asia with the majority of this coming from local rural sources rather than urban migration'.<sup>11</sup>

The causes of this shift are subject to substantial debate, but a variety of push and pull factors are probably important. The size of operational landholdings in agriculture has, for example, been declining steadily. The number of marginal (less than one ha) holdings has increased dramatically over recent decades and the total area under large (> 10 ha) and medium (4-10 ha) landholdings has declined, as has the total agricultural area within large holding size classes (Figures 9 and 10). As a result, many farmers probably find themselves with insufficient land for cultivation. In addition, factors such as declining access to groundwater and declining groundwater quality in areas affected by over-extraction, drought and general degradation of the natural resource base represent substantial push factors.

Push factors are not, however, the only considerations at play. In most rural areas, non-agricultural wages are higher than agricultural wages.<sup>12</sup> Among other things, key results from Sundaram's analysis indicated 'widespread gains in labour productivity getting translated into equally widespread and significant growth in average wage earnings per worker and per capita' along with 'a reduction in the share and size of the workforce in agriculture'.<sup>13</sup> Casual wage labourers in agriculture received, on average, 25.48 IRs/day while casual workers in rural areas received 30.89 IRs/day on public works projects and 37.49 IRs/day in non agricultural activities. Urban casual workers receive slightly more – on average 39.75 IRs/

Figure 8: Rural Livelihood Change in India

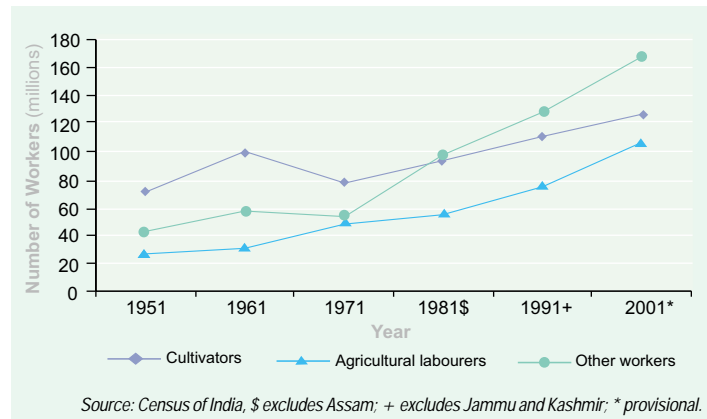


Figure 9: Landholdings by Size Class in India

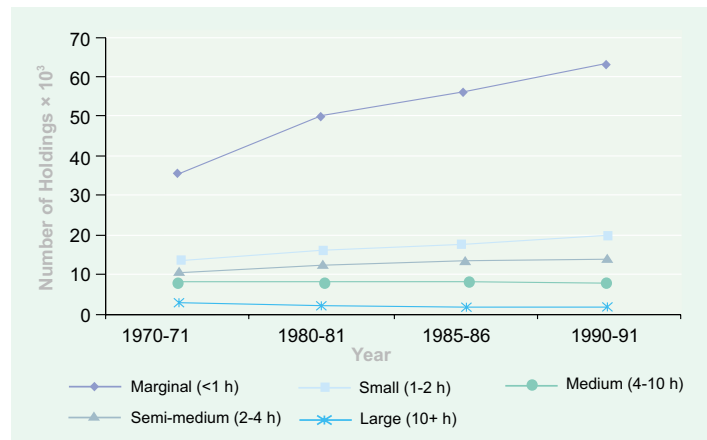
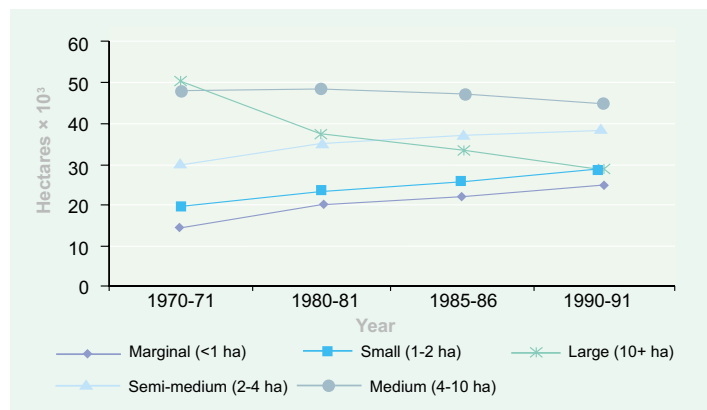


Figure 10: Total Area Under Different Landholding Size Classes



day.<sup>14</sup> Of all occupations, casual labour in the agricultural sector is the worst paid. While some individuals may chose to remain as agricultural labourers for a variety of cultural or

other reasons, it often represents the parking place for the poor. It is the primary source of work for those who have been unable to find jobs in other sectors. When other opportunities are available, the wage differentials represent a substantial factor pulling labour out of agriculture. Other pull factors are probably also important. These range from income diversification and reduction of exposure to the risks associated with agriculture to increased status and access to services, such as schools for educating children, that are often associated with employment in the non-farm economy.

Many of the advantages of engagement in the non-farm economy are now accessible to individuals living in some formerly rural areas, particularly larger villages and towns and small cities.

Many of the advantages of engagement in the non-farm economy are now accessible to individuals living in some formerly rural areas, particularly larger villages and towns and small cities. As already discussed, rural India is becoming peri-urban and is being penetrated by urban forms of communication, transport and power systems. As Start citing Bryceson (2000) comments: 'Straddling both rural and urban economic domains, rural people increasingly depend on urban labour markets, urban remittances, urban trade and urban social networks'.<sup>15</sup> Rural household economies are also increasingly diversified as Deb *et al.* found in a survey of Aurepalle village in Andhra Pradesh: 'in 1975, households were recorded in the survey as drawing on at most three sources of income. The majority of the farmers had one (37%) or two (55%) sources. By 2001, the number of income sources increased to five and no households except those in the non-farm category had only one

source of income. The majority of the farmers (59%) had between two and four sources of income. Sixteen per cent of the households had five sources'.<sup>16</sup> Similar patterns were found in another village surveyed by Deb and friends.

It is important to recognise that diversification, the growth of the rural non-farm economy and the higher wage rates found outside of agriculture do not, as previously emphasised, imply a one-directional process involving economic shifts away from agriculture. Where agricultural opportunities exist or can be enhanced, rural, and even urban, inhabitants often shift toward it as a primary source of livelihood. This is clearly evident in the case of work undertaken by Samaj Pragati Sahayog at Neemkheda and other villages in the Narmada Valley. There, investments in watershed treatment and drought proofing have catalysed substantial reductions in labour migration and increases in the intensity of agricultural activities and associated livelihood changes.<sup>17</sup>

Overall, the process of peri-urbanisation appears to combine increased interaction between rural and urban areas, growth in rural towns and villages, the growth of the rural non-farm economy and, even within the farm economy, diversification of livelihood systems both within and beyond agriculture.

### The Changing Nature of Community

As India becomes increasingly peri-urban and livelihood systems change, the nature of communities is changing as well.


Historically the diverse groups living within rural villages often depended on the same single agricultural system for livelihoods and survival. Their livelihoods were interdependent. In addition, most people had strong place-based identities. Society was neither totally mobile nor fluid and migration, while always technically possible, often was a limited option families could chose in response to livelihood or community constraints. As a result, villages were, in the most generalised sense true communities. Shared interests and needs cut across the boundaries of family, caste and religion. People, whatever their divisions, needed to interact and to maintain institutions, such as the traditional *panchayat*, to moderate their interactions within the geographic boundaries of villages and local areas. Village communities often really were communities representing groupings bound together by more than chance location.

In today's world, it is unclear how often villages remain as true, place-based communities. Many of the ties binding diverse groups within villages are now much weaker. Non-agricultural livelihood systems, for example, often depend on networks of contacts and relationships that extend far beyond (and may not include) others within a given village location. Furthermore, as the national economy diversifies and rural areas become increasingly peri-urban, it is far more possible for individuals or groups to opt out of communities by migration or, less drastically, by ceasing to maintain or observe the traditional institutions of

community. Shared rituals and the religious calendar are breaking down in urban and peri-urban areas. The *panchayat's* writ has been eroded and village elders can often do little if individuals within a village ignore their dictates or if, more subtly, the village as a whole gradually ceases to care. While rallying points often catalyse communities to organise around issues including water, such organisations often are terrains of actions.

A similar process is also occurring at the caste and family level. Almost two decades ago, roads, and the increased access to markets they enabled, were identified as a primary factor underlying the break-up of joint families in the Garhwal Himalaya.<sup>18</sup> As market access increased, nuclear family units became less and less dependent on larger joint family groupings for economic survival. Historically, key livelihood activities (in this case, the sale of milk and access to grasslands) required long-distance seasonal migration while others (maintaining subsistence crops) were village based. Both activities were essential for survival but individual nuclear family units lacked sufficient labour to maintain both livestock and agriculture. Access to roads changed this by enabling families to sell milk and new market crops as well as to remain limited within the village. As the requirement for seasonal migration decreased, so did the economic interdependence within joint family groups and, over a period of less than two decades, most joint families within the village ceased to function as single

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 Reduction of exposure to the risks associated with agriculture is often associated with employment in the non-farm economy.



economic units. This process is common. As roads, markets and communications increasingly penetrate through rural areas, dependency relationships within families and caste groupings change. In some cases, interdependence may increase (commercial agriculture for example, often requires capital injections obtained through urban jobs), while in other cases it decreases. In a general sense, however, the web of interdependent relationships is likely to be less and less bounded by location. Instead, people depend on networks of relationships within occupations or other groups that may or may not be influenced by physical location.

One way to think about changes in a community is through the density of interactions. In a traditional village, individuals interact with others in the village frequently to meet multiple needs. Ties often include kinship, the daily activities of farm operation, numerous shared household tasks, the maintenance of joint (village) infrastructure, and larger economic integration. Development often nibbles away at the density of interactions within a village grouping. A water tap in the house, for example, while minimising drudgery also reduces a woman's need to communicate and get along with the other women in her neighbourhood. The presence of a local bus service reduces an individual's dependency on others in his village for agricultural labour. Access to large markets reduces the mutual dependency between individual producers and individual traders. The presence of a

rice mill reduces the hours women traditionally had to share pounding and husking grain. A sense of community is often created through numerous shared tasks and regular interaction among a small, defined group. Development processes reduce the number of tasks and the frequency of interaction required within narrowly defined village groups. In a peri-urban village, while individuals may still know their neighbours, most do not need to interact with them on a daily basis to meet multiple basic needs. Thus, density of interactive ties declines.

Community continues to exist but it is more individualised and less defined than it was traditionally. Office, trade groups, markets, schools, temples and water taps become the paramount spaces of interaction for people rather than the village or housing cluster. As a result, as peri-urbanisation proceeds, villages may increasingly become place-based agglomerations of people that lack the density of cross-cutting relationships and sets of identities required to create a sense of community. The degree to which this is true, of course, varies greatly between locations but it is a central issue influencing the way in which all communities respond to droughts, floods and long-term resource management needs. Acting individually, people are capable of greater mobility and can see or take advantage of opportunities much faster. This said, they may become more vulnerable as the nature of social capital changes and the presence of some forms of local voluntary support networks, declines.

Community continues to exist but it is more individualised and less defined than it was traditionally.

## Rural-Urban Interlinkages in Nepal

In Nepal, recognition of urban-rural inter-linkages, the parallel to peri-urbanisation processes in India, is nothing new. Results from research conducted in Nepal over a decade ago on this are central and relevant to our project. This research, which was funded by the Swiss National Research Foundation, involved a four-year study between 1989 and 1992 and focused on rural-urban inter-linkages.<sup>19</sup> Its background was the debate within Switzerland in the late 1980s about overseas development policies, specifically with reference to Nepal. Switzerland had been providing rural development aid to Nepal in money, men and material for three decades. Concentrated exclusively on rural areas, the guiding objectives of the Swiss supports were to see that rural impoverishment was minimised and rural to urban migration was halted. Neither objective was satisfactory despite years of interventions. The above study was guided by the need to look at rural development anew and to answer whether swinging the pendulum to the other end of urban development was the answer.

The study concluded that rural and urban were the ends of a continuum and, that it was becoming more and more difficult to categorise an area or a family as purely rural or urban. The report drew heavily on a concept developed by researchers at the East-West Centre, Hawaii,<sup>20</sup> *desakota* (village-town in Indonesia) to understand this continuum in which

families spread their income baskets from farming in Bajhang in Nepal to urban jobs in Bangalore.

From this particular case of migration from the roadless Nepali hinterland to the (later) silicon valley of India, the study concluded that it was necessary to reconceptualise rural development by recognising the inevitability of migration, which subsistence farmers use as a survival strategy. Development strategies would not succeed if they attacked the idea of mobility as such; instead they had to consider options such as the following:<sup>21</sup>

- eliminating the physical and social stress of migration;
- shaping migration patterns by improving opportunities in nearby towns to reduce migration distances; and
- providing migrants opportunities to re-invest their skills and capital back home.

Looking at six socio-economic sub-systems of rural-urban inter-linkage (the exchange of goods and role of markets; technology diffusion; resource mobilisation and exploitation; migration and employment; information and value exchange; and external effects), the study generated the following conclusion:

- There are no clear-cut boundaries for rural and urban goods.
- Markets and the system of information flow are the interface between rural and urban areas.
- Imports to rural areas from urban or combined rural-urban areas always exceed rural exports,

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■ As market access has increased, nuclear family units have become less and less dependent on larger joint family groupings for economic survival.

Overall, study results emphasised the on-going nature of exchange between rural and urban areas and the fact that such linkages introduced continuous processes of change into livelihood systems.

the balance being maintained by remittances.

- The balance of trade between rural and urban areas can be reversed if the terms of trade change or if rural inhabitants are able to figure out creative ways to add value to good.
- Urban centres are the basic source of technology and innovations.
- Transport technology is a critical element in enhancing market linkages and urban-rural interactions.
- Time and roads (as transport development is currently defined) are required for technology diffusion, a necessary precondition for technological modernisation.
- Resource exploitation of rural areas occurs primarily because of the under pricing of rural goods and the overpricing of urban ones, which in turn occurs because national policies favour urban consumers
- Access to water and forest products is a crucial element for both rural and urban households in determining their capacity to innovate.
- Commercialisation of agriculture has led to new forms of travel and resource flow that often favour men rather than women and thus lead to gender exploitation.
- Where migration is a survival strategy, success from an equity perspective depends upon whether or not the migration is individual with a breakdown of the social

order or if it is internalised by the social system and hence able to provide its votaries social support.

- Information exchange, especially commercial, happens through intermediary institutions, such as middlemen (which, incidentally, farmers love and development experts decry). The state as a supra-institution has attempted to fill this role but, in most cases has failed. Success in development is highly dependent on this relationship and whether farmers are able to take advantage of it or it takes advantage of them.
- Education plays a crucial role in deciding who are the winners and who are the losers. This factor is also important in nurturing entrepreneurs.
- Development has been broadly defined as 'the increase in available options and decision-making capacity of persons and collectives in respect of their own lives'. Increasing this degree of freedom commensurately implies reducing potential risks, which villagers shrewdly calculate.
- Traditional state sponsored banking has failed villagers in many areas, they then fall back on informal arrangements.
- Land tenure issues are important since absentee landlordism stymies a villager's proclivity towards creativity.

Overall, the study emphasised the on-going nature of exchange between rural and urban areas and the fact that such linkages introduced continuous

processes of change into livelihood systems. If anything, such change processes have accelerated in Nepal as roads and communications have improved and out-migration, always present, has increased. Some have been pushed out of traditional livelihoods by resource limitations or by the continuing impact of the Maoist insurgency. Others are pulled by access to better resources and opportunities abroad. Whatever the cause, migration and the increased flow of people and goods between rural and urban areas are transforming the nature of life throughout Nepal much as they are in India and other parts of the world. The possibility of being able to return to pre-existing economic and social structures is slight. Similar processes of transformation are also present in natural resource systems.

### Transformative Change in Water Resources and Climate

Degradation of the environmental resource base on which much of the population in South Asia depends has been the subject of extensive analysis for more than three decades.<sup>22</sup> These changes are, in many cases, well known and it is beyond the scope of this paper to review them here. What is important to recognise, however, is the transformative nature of such changes, particularly in relation to our primary focus on water resources and climatic dynamics.

What do we mean by transformational change? The concept of irreversibility has been central to debates over environmental management and the


transformative impact of humans on environmental systems has been recognised for decades.<sup>23</sup>

Transformational changes take the concept of irreversibility one step further; they involve fundamental shifts in system function or dynamics that occur as a consequence of changes in individual parameters or aggregate changes in multiple parameters.

### Water Resources

Where water resources are concerned, human use and management practices alter hydrologic systems in ways that fundamentally transform their dynamics and consequently the roles such systems play in floods and droughts. Both groundwater and surface water systems illustrate the transformative nature of such processes well. In India, the number of energised wells has increased from a few thousand in the 1950s to over twenty million.<sup>24</sup> This has irreversibly changed the nature of agricultural systems and is having equally major impacts on the groundwater resource base. In some regions, water resources accumulated over thousands of years are used up in periods as short as a few decades. These changes are transformational; they do not just affect the volume of water stored in aquifers. Aquifer compaction or subsidence has long been known as a fundamental and often irreversible impact of extraction that changes the hydraulic properties of an aquifer. Beyond this, however, the impact of changing water levels has resulted in decreased base flows in surface streams, changes in patterns of recharge and discharge across broad

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 Many of the changes now taking place in water resource and climatic systems are transformational.

areas and, in some cases, changes in regional vegetative cover and the distribution of wetlands.<sup>25</sup>

In some cases, the impact of groundwater changes on surface systems has been evident for decades.<sup>26</sup> Such changes may affect surface flows even in situations, such as in the Ganga basin, where storage in aquifers remains huge.<sup>27</sup> Groundwater extraction often transforms the hydrologic system even where there is no threat of aquifer depletion in any quantitative sense. Last year in Rajasthan, despite the best monsoon in a decade, almost no flow has reached the renowned, but now dry lakes in Udaipur.<sup>28</sup> Similarly, many wells in rural Gujarat, including our field sites in Satlasana, remain dry despite highest levels of rainfall in years. This is, in all probability, the result of transformational changes in recharge patterns and flow systems within aquifers that reflect both the massive increase in pumping that has occurred over recent decades as well as more subtle effects from changes in vegetative cover, landuse and direct water management interventions such as the construction of water harvesting structures.

The situation is similar where surface water resources are concerned. Decades of efforts to control flooding in the Ganga plain have resulted in the construction of an extensive, though partial, network of embankments. These structures serve as much to block drainage as they do to retain flood waters within river

channels.<sup>29</sup> They are paralleled by an equally massive system of diversion structures, irrigation canal networks and municipal water supply systems that move water away from river systems to points of use. In addition to large water control structures, raised networks of roads, train tracks, field bunds, field level canals, local water harvesting ponds and other structures have reshaped drainage patterns in rural areas. In urban areas, reshaping of the natural drainage system is even more dramatic. Impermeable paved areas, urban drainage channels, buildings and the increasing presence of walls around everything from housing to industrial complexes have often changed the natural drainage system beyond recognition.

Recognition of the way embankments and other human interventions reshape surface hydrologic systems is nothing new, as the policy review section later in this report documents in detail. Overall, changes in regional landuse and drainage structure transform hydrologic systems in complex ways. The rate at which runoff occurs, the shape and timing of stream hydrographs in response to precipitation and the duration of flooding in specific areas, all change in ways either subtle or dramatic. In sections of the Ganga basin within both India and Nepal, our own field work indicates that areas once subject to brief intermittent flooding now remain underwater for many months at a time. As with the impact of embankments on flood drainage and on the increase in

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Recognition of the way embankments and other human interventions reshape surface hydrologic systems is nothing new.

the height of stream bed levels, many impacts are likely to become evident only in hindsight. Furthermore, transformative changes in water systems accompany equally fundamental changes in human settlement, livelihood and other systems. These changes are, in most cases, just as irreversible or transformative as the changes in the physical system.

### Climate

In addition to major changes in social and hydrological systems, South Asia is also likely to be affected by global climatic changes. Although the impacts of global climatic change on conditions within regions are difficult to predict, current research suggests that climatic changes in India and Nepal are likely to exacerbate both droughts and floods. Details related to climate change are discussed in Annex I and are briefly summarised below.

At a regional level, the rise in temperature associated with climatic change is believed to have already resulted in decreased evaporation and precipitation in semi-arid and arid regions as well as in retreats in Himalayan glaciers. Such changes may increase the frequency of droughts and reduce base flows during the dry season. At the same time, changes in stream flows introduced by the increase in temperature, changes in precipitation and changes in the form of precipitation in mountainous regions from snow to rain appear likely to increase both flooding and hot season

water deficits. Increasing rates of melting and shifts in the snowline to higher elevations are likely to change the hydrological balance. Precipitation which occurs as rain rather than as snow, which gradually during the dry season, will now immediately run off into streams. At the same time, declines in snow storage will affect the availability of water during the dry season. Mirza *et al.* (1998) investigated the effects of changes in precipitation resulting from global warming on future flooding in Bangladesh. Standardised precipitation change scenarios from four GCMs were used for the analysis. The most extreme scenario showed that for a two degree celcius rise in global mean temperature, the average flood discharge for the Ganga, the Brahmaputra, and the Meghna could be as much as 15%, 6%, and 19% higher, respectively.

Overall, the results of recent research on global climatic change, although far from conclusive, strongly suggest that climatic variability and climatic extremes in the form of floods and droughts are likely to increase. These changes are also transformative and are likely to reshape the basic weather patterns within which current agricultural livelihood systems have evolved.

### The Implications of Transformative Change in Water and Climate

The transformative nature of change processes affecting water and climate in South Asia has fundamental

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Although the impacts of global climatic change on conditions within regions are difficult to predict, current research suggests that climatic changes in India and Nepal are likely to exacerbate both droughts and floods.

implications for both long-term water management and disaster mitigation and relief. Four points are of particular importance to note:

**Surprise is likely to increase:** Because water and climate systems are changing as a result of many interacting factors, predicting the duration, intensity and location of floods and droughts may become increasingly difficult despite scientific advances.

**Parameters needed for prediction must evolve:** Although predicting change will be difficult, parameters for doing so must be developed. In the case of groundwater, for example, access to the resource has been a major factor stabilising agricultural production and enabling regional development for much of the last five decades in India.<sup>30</sup> Where changes in groundwater availability associated with overdraft and quality declines affect the ability of groundwater to play this role, droughts will have a much more impact than where resource availability remains high. Because groundwater conditions are highly variable and often depend on very localised factors, however, the precise location and timing of such impacts can only be determined if groundwater monitoring is reoriented in a way that allows for the incorporation of local information into drought warning systems.

**The ability to re-establish systems following disruption is likely to change:** The case of groundwater is again illustrative in showing that being able

to returning to the *status quo ante* is unlikely. In areas where drought and groundwater overdraft have forced reductions in irrigated agriculture, the re-establishment of intensive agricultural livelihoods faces major challenges. In many, if not most, situations, recovering of groundwater levels may require both reductions in pumping and a sustained period of precipitation above historically average levels. The re-establishment of agricultural livelihoods in the immediate post-drought period may not, as a result, often be possible.

**The design of effective water management systems will face increasing challenges:** As our ability to predict flows, extreme events, sediment loads and other basic hydrological parameters (never particularly robust to begin with) declines with climatic change, the ability of societies to implement water management approaches requiring precise data in order to operate will also decline. Embankments, canals and many social infrastructure systems for water management (such as volumetrically based water rights) require relatively precise information on the volumes of water available and the probability of specific flows or sediment loads. As climatic change and other transformations in water resource systems proceed, the ability of hydrological science to produce information with the degree of precision required is likely to decline.

The impact of transformational changes in water resource and climatic systems threatens the core worldview

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As our ability to predict flows, extreme events, sediment loads and other basic hydrological parameters declines with climatic change, the ability of society to implement water management approaches that require precise information on such parameters in order to operate will also decline.

on which most hydrological science has been founded – the assumption of stationarity. With climate change, the stationary hydrological cycle becomes dynamic. This introduces fundamentally a new dimension. Most hydrological analyses are based on statistics. Historical data on stream flows, the duration and intensity of precipitation, the hours of sunlight, humidity, evaporation rates and so on serve as baseline measures for predicting the statistical frequency of likely events in the future and for developing the design characteristics of water supply, irrigation and flood control infrastructure. A dynamic hydrological system implies changes in the characteristics of the above mentioned components. As a result, historical data are of little utility as a decision support tool. Transformational changes in the characteristics of climate system thus raise basic questions regarding the utility of historical data for projecting future conditions. Everyone from municipal water utility districts seeking secure water supplies for burgeoning urban populations to insurance companies trying to calculate risks have suddenly become far less sure of the foundations on which their activities are based. Kaczmarek *et al.* (1996) summarise the hydrological situation for large projects in the context of global climate change well:

“ For hundreds of years, people have adapted their habits and economic activities to what they assumed were the natural climatic and hydrological

conditions. Implicit in this assumption was that these conditions were stable. Despite the knowledge that, through dams, diversions, and water intakes, man has altered natural hydrological regimes, the fundamental assumption of stationarity of key hydrological processes still dominates the planning and designing of water resources development projects. This assumption may no longer be valid, because projected global environmental disturbances can cause serious alterations in the stochastic properties of hydrological time series. Moreover, the long time scales usually associated with large-scale water projects make them particularly sensitive to anthropogenic climate change.<sup>31</sup> ”

Whether or not the initial assumption of stationarity was justified, those involved in water management must shift from approaches based on bounded variability to approaches capable of responding to a much larger reality involving inherent uncertainty and the limitations of current knowledge systems. This shift has major political as well as scientific implications. Water resource development possibilities are directly linked to the politics of global finances. Greater variability implies that larger projects must be designed to accommodate a wider range of conditions. This, in turn, is likely to entail higher economic and social costs.<sup>32</sup>

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## THE INSTITUTIONAL LANDSCAPE: THE HISTORY OF GOVERNMENT AND NGO ACTION

The institutional landscape in which floods and droughts occur is a critical factor in determining how disasters are perceived and what responses to them are adopted. While a full review is beyond the scope of this report, targeted analysis of the evolution of flood and drought policies in Nepal and India along with insights on selected NGO activities serves as a foundation for discussion. In particular, this review emphasises how a long history of focus on water control has led to development of relatively rigid governmental approaches despite their acknowledged limitations. It also highlights the emergence of new approaches, particularly in response to drought that interlink the activities of governments, NGOs and local communities through watershed programmes.

### Nepal's Flood and Drought Policy

Over the last fifty years, Nepal has considered herself so rich in water resources that the subject of drought has been almost totally ignored even though much of the country falls in what can be called the 'semi-arid tropics'. While floods have spawned state intervention, much of the hope for flood control has been placed on the construction of high dams. While only the Kulekhani I has been constructed so far, twenty-nine dams have been proposed in the Nepal Himalaya by the Nepali government. Kulekhani-I was designed with a life span of 100 years, but lost its dead storage in just 13 years of operation. One major cloudburst in July 1993 alone accounted for half the sedimentation of the reservoir. Instead of high dams for flood control, Nepal has constructed weirs and barrages for irrigation that divert dry season flow.

The history of the intervention of the modern Nepali state in water resources in a meaningful way began fifty years ago, when the Department of Irrigation was established. In medieval Nepal the small *Baise* and *Chaubise* principalities provided state support for the construction of *raaj kulos*, but in the modern period, the state's role has been limited to classifying land into four categories – *abbal*, *sim*, *doyem*, *chahar* – and levying taxes accordingly. This categorisation was based primarily on the availability of water

The institutional landscape in which floods and droughts occur is a critical factor in determining how disasters are perceived and what responses to them are adopted.



The irrigation inspection bungalow did not fulfill its intended function because the irrigation barrage (shown in facing page) became defunct one year after its completion as the Tinau River changed its course.

for multiple crops as well as on land and soil type. Farmer groups construct and themselves manage irrigation systems called Farmers Managed Irrigation Systems (FMISs). It is estimated that there are about 16,500 FMISs through out the country.<sup>33</sup>

Most FMIS, are built, not on the major rivers but on their tributaries and small streams fed by base flow. These systems mobilise voluntary labour from their village support base in order to repair and maintain canals and intake structures on a regular basis. The same co-operative practices are used in response to floods. Villagers volunteer and contribute materials to re-build or rehabilitate damaged diversions, intakes and canals. Only since the entry of foreign aid in the 1960s, and more intensively in the 1970s, has the state started encroaching on community's based responses to flood-damage.<sup>34</sup>

The involvement of the Nepali state in irrigation schemes was a response to the interventions of British India in the United Provinces. The first example of such intervention was the Sarada Barrage, the agreement for which was concluded in 1920. The barrage itself became operational in 1928, but Nepal was able to use its share of the waters of the Mahakali River only in the 1970s after getting a loan from the World Bank. What was noteworthy about the agreement on Sarada was that irrigation water seemed to have no value for the Nepali state: Compensation from the British to Nepal was in the form of cash and land.<sup>35</sup> The events in India prompted nimesis in

Nepal as Rana rulers initiated the first state-supported irrigation schemes in Trijuga and Manushmara to grow commercial crops. This paradigm of state support for and intervention into irrigation systems grew in leaps and bounds after the overthrow of the Rana regime in Nepal in 1951.

The main instrument of state intervention in river regimes is the Department of Irrigation (DoI) under the Ministry of Water Resources. It's activities are guided by the Water Resources Act of 1992 and the Irrigation Policies of 1992 and 2003.

Handling drought is also implicitly part of the DoI's activities because the conventional definition of drought is simply the failure of rains to occur in an expected manner. The understanding is that drought is taken care of when irrigation waters are provided to areas that do not have them. Agricultural areas of Nepal that are physically not irrigable due to their

Over the last fifty years, Nepal has considered herself so rich in water resources that the subject of drought has been almost totally ignored even though much of the country falls in what can be called the 'semi-arid tropics'.



*The defunct Tinau Barrage in Butwal. Shortly after construction the main channel on the Tinau River shifted, bypassing the barrage. As a result, the new irrigation system never functioned.*

topography and physical limitations do not fall under DoI's mandate. If the rains fail, then areas that are rain-fed suffer, but this matter lies beyond the purview of the DoI. The DoI claims that the Department of Agriculture (DoA) should look into drought, but the DoA also claims not to be responsible and identifies the Prime Minister's Relief Fund as the proper source for assistance. In essence, in areas of rain-fed agriculture, it is farmers and their families that cope with drought in whatever manner they can. Often this entails extending seasonal migration for work (called *nimek garne*) by leaving earlier and staying out for a longer period.

Floods in the High Himalaya are different from those in the Middle Hills and the Tarai. In the mountains, a glacial lake can engender devastating floods when the moraine dam that holds the melt water of the lake bursts.

The rapid melting of glaciers in recent years has expanded many moraine-dammed lakes. When temperature increases in the summer, pressure from melt-water or piping also increases, and these dams give way with devastating consequences for settlements and infrastructure downstream. In the Middle Hills, the most devastating floods are caused by *bishyaris* (landslide-dammed lakes). The fact that Nepali language has a word to describe this phenomenon indicates that it has a long and natural history, and that landslide did not start with so-called deforestation.<sup>36</sup> It is the geological instability of Himalayan mountain slopes coupled with intense cloudbursts that cause these devastating floods. Floods in the Tarai are different from in the hills but similar to those in Bihar and Uttar Pradesh plains.

Nepal's Natural Calamity (Relief) Act was first formulated in 1982. The Act gave importance to relief and preparedness. It also made provisions for establishing the Central Disaster Relief Committee, under the Ministry of Home. The Act was amended last time in 1992, which broadens the scope of the previous instrument to include all disasters. The Act has been extended beyond natural disasters to include man-made calamities such as industrial accidents. The amended Act also encompassed the preparedness and rehabilitation aspects of disaster management. The Act can be operationalised before and during a calamity to prevent or mitigate its effect, and after a disaster to provide relief and rehabilitation. The Act envisages the formation of a hierarchy of committees

The involvement of the Nepali state in irrigation schemes was a response to the interventions of British India's United Provinces.



*Bishyari is a common but stochastic event in the Middle Hills of Nepal.*

Source: Dixit (2002)

for dealing with natural disasters. The topmost committee is the *Kendriya Daibi Prakop Uddhar Samiti* (Natural Calamities Central Relief Committee) which consists of the home, physical planning and health ministers as well as the secretaries of the finance, defence, home, foreign affairs, construction and transport, water resources, communication, forest, environment, labour and social welfare and supply ministries. The committee also consists of the secretary of the National Planning Commission and representatives from the army, police, Nepal Red Cross Society, Nepal Scout, Department of Mines and Geology, Department of Hydrology and Meteorology, Social Welfare National Co-ordination Council and representatives from affected districts. Other committees are Relief and Remedy Sub-committee; and Supply, Resettlement and Rehabilitation Sub-committee; regional committees, district committees; and local committees.

In addition to the above committees, a special disaster unit was created to function as the committee's secretariat. Along with the Natural Calamity (Relief) Act, long-term plans for disaster mitigation were enunciated in the Soil and Watershed Conservation Act of 1982. The provisions in this Act were never used. At the same time a Natural Calamities Assistance Fund was established under the chairmanship of the Home Minister.

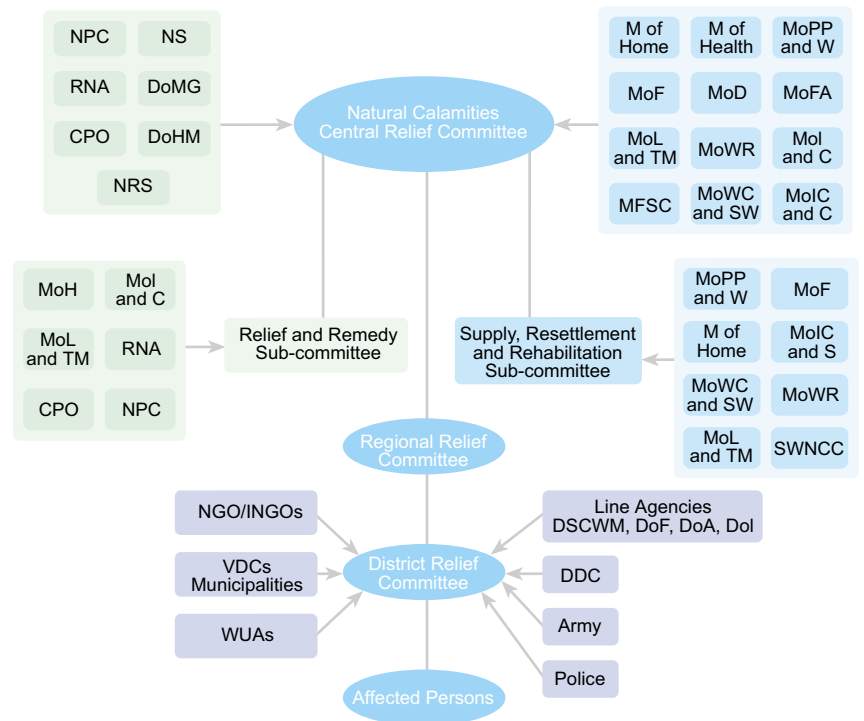
At present, depending upon the administrative unit area where disaster occurs, committees at various levels are

supposed to be activated. Overall, the Act does not seem very effective. It is outdated because the structure of the ministries included in the formation of the committees has changed and some ministries have been removed since the last amendment. In addition, the Act does not specify the functions, duties and operation procedures of the sub-committees or their linkages with other committees.

In addition to the above acts, following the declaration of International Decade

In the Mid-Hills, the most devastating floods are caused by *bishyaris* (landslide-dammed lakes).

Organisations Related to Disaster Mitigation in Nepal



- NPC:** National Planning Commission
- NS:** Nepal Scout
- RNA:** Royal Nepal Army
- CPO:** Central Police Office
- NRS:** Nepal Redcross Society
- DoMG:** Department of Mines and Geology
- DoH:** Department of Hydrology
- MoF:** Ministry of Finance
- MoL and TM:** Ministry of Labour and Transport Management
- MoF and SC:** Ministry of Forest and soil Conservation
- MoD:** Ministry of Defence
- SWNCC:** Social Welfare National Coordination Council
- DSCWM:** Department of Soil Conservation and Watershed Management

- MoPP and W:** Ministry of Physical Planning and Works
- MoFA:** Ministry of Foreign Affairs
- MoWR:** Ministry of Water Resources
- MoI and C:** Ministry of Information and Communication
- MoIC and S:** Ministry of Industry, Commerce and Supply
- MoWC and SW:** Ministry of Women, Children and Social Welfare
- VDC:** Village Development Committee
- WUA:** Water User's Association
- DDC:** District Development Committee
- DoF:** Department of Forest
- DoA:** Department of Agriculture
- Dol:** Department of Irrigation
- I/NGOs:** International/Non-government Organisations

for National Disaster Reduction (IDNDR) by the United Nations, a National Action Plan for Disaster Mitigation was also prepared. In 1994, Nepal established the National Committee for the IDNDR under the chair-personship of the Home Minister. However the committee faced teething troubles particularly due to lack of co-ordination in implementation. Subsequently, in 1995 the plan was modified. The following year, the government approved it, by renaming it the National Action Plan for Disaster Management in Nepal, which also included a disaster preparedness action plan, a disaster response plan, a disaster reconstruction and rehabilitation plan, and a disaster mitigation plan.<sup>37</sup> The plan prioritised activities, delineated responsibilities, and stipulated time frames for monitoring and evaluation. It specified (a) priority activities to be undertaken in the fields of disaster management (including flood mitigation), (b) responsible agencies, and (c) time periods for completion of mitigation activities. The absence of an institutional basis, however, has resulted in lax monitoring and meagre application of knowledge.

### Organisations

Beyond planning and legal structures, organisations provide support at both local and national levels. The formal agencies are of two types – support and implementation. The first type provides financial, material and technical support, which is *post facto*. Agencies of the second type are responsible for implementing field-based programmes.

The central-level organisations are responsible for policy formulation, planning and development of water resources. The National Development Council (NDC) is the highest body that reviews plan and programmes (including the water resources development plan) prepared and submitted by the National Planning Commission (NPC). Headed by the Prime Minister the council has representation from all sectors. Created to discuss national development issues and secure consensus on national development, the council has political orientation. The NPC allocates resources, reviews progress of plans, monitors and evaluates departmental performances. Though the concept of central planning is being questioned, this hierarchic mode persists.

**Ministry of Home Affairs:** Ministry of Home Affairs is the central agency in relation to disaster management. The Ministry mainly formulates the national policies on disaster management and implements them. It also carries out immediate rescue and relief works in the event of natural disasters through the Department of Narcotics Control and Natural Disaster Management. The main function of the department is to carry out disaster management activities with the concerned agencies and it co-ordinates in the matter of disaster-related programmes with related organisations.

**Ministry of Water Resources:** At a more operational level, the Ministry of Water Resources (MoWR) is mandated as the agency responsible for overall

With the insurgency, the central authorities face far more difficulty in taking effective action to mitigate disasters.

planning, policy-making and implementation of the country's water resources. It receives support and advice from Water and Energy Commission (WEC) and its Secretariat (WECS). The WEC/WECS was recognised on January 4, 1999 to provide better services to the government by entrusting the agency with wide range of tasks.

*Water and Energy Commission Secretariat (WECS):* WECS is a multidisciplinary institution engaged in the development of water and energy in a co-ordinated way. It also supports the government in formulating water-related policy and strategy. The functional approach of this Secretariat is to accomplish studies, surveys and investigations and to render opinion on issues relating to the development of the nation's water and energy resources.

*Department of Water Induced Disaster Prevention (DWIDP):* The Government of Nepal established the Department of Water Induced Disaster Prevention on 7<sup>th</sup> February 2000. Now, this department is implementing the disaster rehabilitation and management activities in the country. The main strategies and policies of the department are as follows:

- Prepare and implement a water induced disaster management policy and plan;
- Carry out hazard mapping and zoning;
- Strengthen the disaster networking and information system;
- Establish disaster rehabilitation system;

- Carry out disaster related public awareness programme at community level;
- Prepare and implement a flood plain action plan;
- Strengthen institutional set-up and capacity;
- Implement disaster reduction measures; and
- Develop disaster database, GIS and DIS systems.

In organisational terms, flood control was the responsibility of a section under the DoI which was primarily concerned with gabion building and embankment protection along streams that threatened villages or urban settlements. In the 1990s, the Japanese Aid Agency, JICA provided support to this unit. In 2000, the unit was separated from DoI and became the full-fledged Department of Water Induced Disaster Prevention (DWIDP). In pursuit of country-wide mandate, DWIDP has set the following targets:

- To identify potential disaster zones and to stock emergency relief material in all five regions of the country by 2007;
- To establish warning systems all over the country and to put in place infrastructure for mitigating predictable disasters by 2017; and
- To make sure that social and economic losses are reduced to the levels experienced in developed countries.<sup>38</sup>

The department's current portfolio of projects includes the following:

- A river management policy and a disaster mitigation policy are under preparation

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Over recent decades the Government of Nepal has essentially used a hierarchic approach to respond to floods.

Systematic efforts by the government to ameliorate the impacts of flood in Nepal started only after 1980.

- A risk vulnerability mapping and zoning programme is underway
- In most high risk areas, a disaster networking and information system programme will be developed
- On the non-structural side of disaster awareness, a community level disaster preparedness programme, which will also include relief and rehabilitation measures, is being developed
- An important feature of the DWIDP is the international inundation committee that, through dialogue, aims to mitigate the effects of inundation of Nepali villages and agricultural land by interventions such as embankment building across the border in India.
- A GLOF and landslide debris flow management programme aims to identify high-risk areas and examine to determine any economically viable actions that can be used as mitigating measures.

*Department of Irrigation (DoI):* The Department of Irrigation under the Ministry of Water Resources was previously responsible for flood mitigation and river control works in Nepal. Now, it deals with disasters likely to affect government-built irrigation systems. It carries out flood control works by constructing small dykes on riverbanks to save irrigation systems.

*Department of Hydrology and Meteorology (DHM):* Another organisation with important role in flood mitigation is the DHM. It also

has critical role from the perspective of water resources planning and development. The department maintains a network of climatic and rivers flow gauging stations. Lack of sophisticated instruments for hydro-climatic data collection and insufficient budget are its main problems. The department was shifted to the Ministry of Science and Technology from Ministry of Water Resources in 1997. The DHM played a co-ordinating role in the project that lowered the water level of the Tsho Rolpa Glacier Lake to minimise the hazard of its breach. The DHM is currently working on flood forecasting based on a real time data collection and transmission system by satellite and GIS tools.

*Department of Soil Conservation and Watershed Management (DSCWM):* This department is one of the main divisions of the Ministry of Forest and Soil Conservation (MFSC), which has relevance to floods. By improving land management and increasing agricultural productivity through conservation and utilisation of watershed resources the department focuses on conservation to help community meet their basic needs. The aim is to link forestry, agriculture, livestock, water, and landuse with the objective of helping the community conserve and manage land and water. The department gives importance to mobilising local community and raise their awareness to implement conservation measures by forming user groups.

Many agencies work independently. They collect materials, funds, and distribute them directly to the communities affected by floods. Efforts to create a panel of institutions have been *ad-hoc* and show lack of commitment for change. The current approach has been dominated by the centralised state and its agencies while local governments and community-based institutions receive less focus.

### Policies of the Indian government regarding drought mitigation<sup>39</sup>

The 20<sup>th</sup> century has been marked by frequent droughts in India. Eighteen large-scale droughts occurred, (1903-05, 1957-60, 1966-71, 1984-87, and 1997-99) with some extending over periods of three to six years.<sup>40</sup>

According to Government of India estimates, there are one or two years of drought every five years in the semi-arid and arid regions of India.

Over recent decades the Government of India has essentially used a two pronged strategy to respond to droughts. The first element of this strategy emphasises relief to reduce the impact of drought on affected human and livestock population. Development of grain reserves, the public food distribution system, massive food and cash for work programmes, the Calamity Relief Fund, programmes for fodder distribution and well drilling etc... are all State relief measures designed to ensure income streams and the ability to purchase food when regions are affected by drought. Longer-term programmes focus on

mitigation primarily through structural activities intended to 'drought proof' regions. These programmes, because they reflect long-term initiatives intended to help people adapt to drought-prone regions (or, in contrast, adapt the regions to the people) are the primary focus of our analysis below.

### History

Systematic efforts by the government to ameliorate the impacts of drought in India only started after national planning for economic development was initiated. In Rajasthan, the establishment of a research centre at Jodhpur in 1952 was the first step toward developing of systematic responses to drought. This centre was intended to focus on key issues in desert areas such as sand-dune stabilisation, shelterbelt plantation and afforestation. In 1959, this centre was named the Central Arid Zone Research Institute (CAZRI) and given full responsibility for developing drought mitigation strategies. In the Second and Third Five-Year Plans, the government sought to address problems in drought-affected areas through dry farming techniques like moisture and water conservation measures developed by CAZRI research.

In 1970-71 the government launched the Rural Works Programme with the objective of creating jobs and assets in areas with low and uncertain rainfall. Its intention was to establish infrastructure such as irrigation systems, rural roads, soil

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Systematic efforts by the government to ameliorate the impacts of drought in India only started after national planning for economic development was initiated.



conservation, projects, afforestation, and pasture development and to simultaneously generate employment for the rural population. This programme evolved into the Drought Prone Area Programme (DPAP), which emphasised an expanded set of development strategies based on labour intensive schemes such as medium and minor irrigation, road construction, soil conservation and afforestation.<sup>41</sup> The Fourth Five-Year Plan continued to put emphasis on dry land farming technology and the 'All India Coordinated Research Project for Dry land Agriculture,' later renamed the Central Research Institute for Dry land Agriculture (CRIDA) was set up. Initially, 24 pilot projects were started to serve as training and demonstration centres for technologies relating to soil management, water harvesting, improved agronomic practices and drought-resistant crops.

The programme in the Fifth Five-Year Plan followed the strategy of integrated area development laid down by the Planning Commission Task Force under the chairmanship of B. S. Minhas, then member Planning Commission in 1971.<sup>42</sup> The Task Force recommended that the programme be based on an analysis of the resource endowment of and the potential for the development of the project areas. It recommended that the programme focus on the integrated development of agriculture through conservation, development and optimal utilisation of land, water, livestock and human resources. The need to provide stable income and employment to the weaker sections of the rural society was also emphasised. In 1977-78, a new programme the Desert Development Programme (DDP) was started on the recommendation of the National Commission on Agriculture to look into the problem of desert areas including the cold desert areas of Jammu and Kashmir and Himachal Pradesh. Overall, the DPAP and the DDP were aimed at drought proofing through the adoption of an integrated area development approach that would stabilise both production and employment.

A task force was set up by the Ministry of Rural Development under the Chairmanship of M. S. Swaminathan in 1982 to review the DPAP and the DDP and suggest modifications in the approach followed. As a result of its recommendations, the emphasis on agricultural productivity in dry as well as irrigated areas and on vegetative cover was increased. The Task Force emphasised the need for planning the

The need for new approaches with conceptually clear goals, capable planning, strong methodologies of implementation and the involvement of people's institutions became clear in the 1980s.



*In dry land regions groundwater is the main source of water.*

programmes on a watershed basis in an integrated manner. The objective was ecological restoration through proper land and water management. The task force recommended providing subsidies for land improvement irrespective of the size of holding and implementing schemes such as farm forestry and water harvesting, which involve community participation. The main thrust of the DPAP and the DDP in successive plans continued to be on income generation and infrastructure schemes but with an ever-widening focus. In the process the programmes deviated considerably from the objective of ecologically integrated development through drought proofing and control of desertification and were widely perceived as having an inadequate impact.

Because of their inadequate impact, the Central Sanctioning Committee (CSC) reviewed the programmes closely in 1987. This review found that continued expansion, which brought in activities that were poorly integrated and focused, was responsible for the poor results. Initially, programme activities had been confined to employment generation; later, scarcity mitigation in drought prone areas was added as an objective. In the Fourth Five-Year Plan emphasis shifted from employment generation to durable asset creation and in 1971 the Fifth Five-Year Plan the Task Force had recommended addition of integrated development in drought affected areas as a goal. The latter was a complex addition, under which the programmes could implement a very wide range of activities to restore the ecological

balance of areas through integrated watershed development in the hope that it would insulate them from the effects of recurring drought.

The CSC also observed that low levels of investment in widely dispersed areas, implementation of schemes without proper feasibility studies, diversion of funds to unapproved schemes and high administrative expenditure had diluted the focus of the programmes. In May 1988, another National Committee under the Chairmanship of Y. K. Alagh emphasised the need for new approaches with conceptually clear goals, capable planning, strong methodologies of implementation and the involvement of people's representatives. As a result of the reviews there was greater conceptual clarity in the Seventh Five-Year Plan since it clearly spelled out drought proofing and control of desertification as the main objectives of the DPAP

Although a financial breakdown of the actual investments in different types of treatment under the watershed programme is unavailable, experience suggests that most of the expenditure has been on structural activities.



Rainwater harvesting anicut in Alwar, Rajasthan.

and the DDP. The government also decided to reduce the range of activities undertaken through the DPAP and DDP and to focus on soil conservation, land shaping/development, water resource conservation/development, afforestation and pasture development. In addition, micro-watersheds were identified as the primary unit for planning and development. Annual plans for the DPAP and the DDP were prepared for each district and after approval from state and central governments, implementation is initiated. The role of voluntary organisations in identifying and articulating peoples' needs was also identified.

Although the restoration of the ecological balance continued to be the main objective of these programmes, especially during later years, evaluations found that the sharp focus on drought-proofing and desertification control had not been effectively articulated leaving ample scope for activities that did not directly contribute to drought mitigation. As a result the direction of the programmes was diluted. Factors such as the perceptions of state governments, spending capabilities of government departments and the pressure of interest groups also played a major role in determining actual implementation. Activities were often isolated and the concept of the watershed as a development unit was never realised. Furthermore, despite programme guidelines stipulating that DPAP and DDP activities be integrated with other

development programmes most were implemented independently resulting in duplication and waste. In some cases, state governments reduced normal allocations for DDP areas and used the programme to fund regular development activities. Reviews also indicated that the bureaucracy generally gave low priority to these programmes.

The above factors meant that asset creation was poor and that the maintenance of the water harvesting and other structures suffered. Beneficiaries were not motivated to assume responsibility for maintenance even when the benefits were substantial and government departments did not have sufficient funds for maintenance in their budgets. As a result, most water harvesting structures were filled with silt or damaged within three years after completion. Furthermore, in some cases despite the official emphasis on participation, beneficiaries are sceptical or even hostile to project activities. Farmers, for example, demolished structures such as bunds on private fields. Where people had been motivated to participate from the planning stage, however, their enthusiasm appeared visible and they protected the structures. The problems related to water harvesting structures were mirrored with respect to the larger goals of the programmes. As the CSC review stated:

“ The review committee finds that despite these programmes, ecological degradation is continuing especially in drought-prone and desert areas. Water table has gone down. Drinking water problem has not been solved. Forest

By 1987 the DDP and the DPAP were seen as having failed to neutralise the adverse impact of environmental degradation underway in drought-prone areas.

cover has been depleted. Severity of drought has increased. Thus ecological degradation in the dry land areas in the country today appears greater than a few decades ago. <sup>43</sup>

In sum, by 1987 the DDP and the DPAP were seen as having failed to neutralise the adverse impact of environmental degradation underway in drought-prone areas. Despite attempts to improve performance, this did not change in subsequent years. The programmes failed not so much because of the wrong identification of the problem or inadequate allocation of funds, but mainly because of (a) poor and *ad-hoc* planning without any serious respect for the watershed approach; (b) the almost complete lack of people's participation and (c) weak coordination and lack of integration among activities undertaken by the different agencies involved in the projects' operation. As a result of these programme failures and the occurrence of widespread drought in 1997 (which affected 93 million people) the government decided to initiate a new programme of Integrated Watershed Management (IWM).

### The Current Approach: Integrated Watershed Management

The IWM programme was launched throughout India with substantial financial and technical support. Its objective was to manage and rejuvenate depleted natural resources on a watershed basis. Under the National Watershed Programme for Rainfed Areas, implementation has taken place in a large number of

watersheds across the country. In Rajasthan, watershed development is the state's primary area of activity for natural resource regeneration and groundwater recharge. The budgetary allocation for IWM, which is the largest for any department, is shown in table 2. Since the programme has yet to be seriously reviewed its outcomes are unknown.

Although a financial breakdown of the actual investments in different types of watershed treatment under the watershed programme is unavailable, our own review and direct experience suggests that most of the expenditure was on structural activities. The main costs of the IWM programme comprise the construction of check-dams and other water harvesting structures of various sizes. The physical treatment of watershed areas through, for example, the digging of contour bunds is another major expenditure. Direct investments in changing vegetative cover (planting trees or sowing different grass varieties) are low, as are investments in improving the efficiency of water use in agriculture. Although the participation of local populations in watershed programmes is heavily emphasised, social investments in organisation, for example the creation of watershed management groups and the building of their capacity, represent an extremely small fraction of the total amount expended.

In sum, the long-term response to drought by the Government of India has focused on programmes for drought-

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 The perceptions of governments, the spending capabilities of government departments and the pressure of interest groups play a major role in determining quality of implementation in watershed schemes.

Table 2: Watershed Development in Rajasthan: Physical and Financial Achievements from 1974 to 2002

Year	NWDP*		Special Plans		Outsider Helping Plans		Total	
	Area (ha)	Rs (10 <sup>6</sup> )	Area (ha)	Rs (10 <sup>6</sup> )	Area (ha)	Rs (10 <sup>6</sup> )	Area (ha)	Rs (10 <sup>6</sup> )
1974-75	-	-	59,681	0.627	-	-	59,681	0.627
1975-76	-	-	54,582	4.858	-	-	54,582	4.858
1976-77	-	-	18,248	0.07	-	-	18,248	0.07
1977-78	-	-	8,299	0.672	-	-	8,299	0.672
1978-79	-	-	16,303	6.73	-	-	16,303	6.73
1979-80	-	-	35,649	9.276	-	-	35,649	9.276
1980-81	-	-	32,356	23.631	-	-	32,356	23.631
1981-82	-	-	46,530	21.945	-	-	46,530	21.945
1982-83	-	-	41,840	31.566	-	-	41,840	31.566
1983-84	-	-	36,086	37.508	-	-	36,086	37.508
1984-85	-	-	17,368	12.428	-	-	17,368	12.428
1985-86	-	-	29,677	58.108	-	-	29,677	58.108
1986-87	1,329	0.843	66,249	166.907	-	-	67,578	167.750
1987-88	11,597	9.077	30,870	87.78	-	-	42,467	96.857
1988-89	9,645	9.020	26,638	102.356	-	-	36,183	111.376
1989-90	11,763	12.098	31,460	109.135	-	-	43,223	121.234
1990-91	9,000	83.364	24,057	142.074	-	7.1	33,057	232.538
1991-92	24,633	75.082	22,485	111.016	1,407	36.512	48,525	222.610
1992-93	95,555	146.401	28,281	137.883	5,431	87.207	1,29,267	371.491
1993-94	1,04,882	208.687	46,942	128.498	14,146	127.189	1,65,970	464.374
1994-95	77,879	245.200	38,581	243.069	25,568	139.799	1,42,028	628.068
1995-96	96,087	350.050	97,468	236.052	25,614	251.568	2,19,169	837.670
1996-97	1,16,015	354.827	36,355	118.366	29,700	290.641	1,82,070	763.834
1997-98	75,950	257.87	26,459	266.715	36,105	240.015	1,38,514	764.600
1998-99	89,459	381.449	79,872	408.024	13,500	147.379	1,82,831	936.852
1999-00	85,792	393.271	69,910	426.227	1,102	18.234	1,56,804	837.732
00-2001	1,19,518	389.582	51,463	574.889	247	8.209	1,71,228	972.680
01-2002	60,783	365.488	25,576	432.366	-	-	86,359	797.854
<b>Total</b>	<b>9,89,887</b>	<b>3,282.310</b>	<b>10,99,285</b>	<b>3,898.776</b>	<b>1,52,820</b>	<b>1,353.853</b>	<b>22,41,992</b>	<b>8,534.939</b>

Source: Watershed Rajasthan Annual Report 2001-2002, pp. 16-17.

\*National Watershed Development Programme

proofing and economic development in drought-prone areas. Most of the activities under these programmes have focused on physical interventions, such as the building of water harvesting structures. This focus on structures is duplicated in the governmental responses to flood.

**Public distribution system:** The public distribution system (PDS) in India, which started as an *ad-hoc* war time measure to mobilise food supplies to prevent undue rise in price with a network of 0.474 million Fair Price Shops (FPS), is now one of the largest systems in the world. The

concept of PDS has evolved in the wake of critical national level food shortages of the 1960's, as a major policy instrument to distribute essential commodities to the people, particularly the weaker section of the society, on an assured and regular basis at reasonable prices. It also works as an effective anti-inflationary measure and makes significant contribution in raising the nutritional standard of the poor. In the earlier period following its inception the PDS had an urban bias. Gradually, however, coverage in the rural areas increased. Radhakrishnan and Subbarao (1997) argue that the PDS has played a limited role in providing food grain access for the poor despite operation for four decades. The Impact of PDS on poverty and nutritional status was seen by them to be minimal and at an exorbitant cost.<sup>44</sup> In contrast, Sagar (2003) argues that PDS has proved to be the cornerstone of the food security in Rajasthan.

From a drought mitigation and management point of view the PDS networks have been playing a significant role through the distribution of 17,451 thousand tonnes of foodgrain annually through fair price shops all over India.<sup>45</sup> The strength of the system can be judged by total grain flowing through the fair price shops. Today the agricultural situation in the country is completely different from what it was when the PDS was established. Large stocks of foodgrain, much in excess of that required for strategic purposes have been accumulated. PDS

allotments have not been utilised in the states with the highest concentration of poverty because the issue price is close to the market price. But the network is available for relief work, at the time of natural calamities in any part of the country. As drought is recurrent phenomenon the system turns out to be effective in distribution of essential commodities to affected populations during times of crisis.

**Rural development programme:** In addition to the PDS programme there are many target oriented rural development programmes intended to improve the economic condition of rural households and their ability to cope with natural calamities. These programmes can be broadly categorised into three categories, namely: (i) Area development programmes, (ii) Employment generation programmes, and (iii) Poverty alleviation programmes. The current list of programs under these broad headings is as follows:

The PDS was designed to address local level food shortages by distributing essential commodities to the people.



Use of mechanised pump in a dugwell in semi-arid region.

*(i) Area development programmes:*

1. National Watershed Development Programme for Rainfed Areas (NWDPRA) and Integrated Watershed Development Programme (IWDP)
2. Drought Prone Area Development Programme (DPAP)
3. Desert Development Programme (DDP)
4. Tribal Area Development Programme (TADP)
5. Special Area Development Programme such as Mewat area, Dang area and Border area in Rajasthan

in the country. Although these schemes were initially intended to provide a minimum off-season employment guarantee of one hundred days to landless agriculture labourers, at present the schemes could only provide 10-15 days employment to each household in target groups annually. Therefore, these schemes have in fact failed to make any tangible impact on the livelihood of targeted groups

*(iii) Rural poverty alleviation programme and individual beneficiary programmes:* It started with SFDA and IRDP and now;

- i) Swaran Jayanti Gram Swarozgar Yagna (SGSY)
- ii) Indira Awas Yojna (IAY)

*(ii) Employment generation programme (EGP):* There are four rural employment generation schemes

PDS networks have been playing a significant role in the distribution of food.



Rajasthani women in food for work programme.

iii) Pradhan Mantri Gramodya  
Yojna - Rural Housing (PMGY)

(iv) Rural infrastructure development:

- i) Rural electrification
- ii) Rural roads
- iii) MP Local Fund Development Programme
- iv) MLA Local Fund Development Programme
- v) Accelerated rural Water Supply Programme (ARWSP)

Rajasthan has made steady progress in poverty reduction. The major impact of these efforts has been that during periods of serious droughts, large-scale migration of human and cattle population does not take place to the same extent, the capacity of the system to respond to the needs of the population has increased, and a certain amount of resilience has been developed. Nevertheless, during periods of severe drought vulnerable populations including, landless agricultural labourers and marginal farmers still require government support for provision of employment, fodder, drinking water etc. This is because agriculture still remains a gamble in the monsoon and the sustainability of agriculture-based livelihoods remains an issue. Recurring droughts have a major impact on development. Burgeoning human and cattle populations are putting increased pressure on natural resources and negating developmental efforts. As a result, rural development strategies need to be reevaluated.

## Government Responses to Floods in India

“ Floods being natural phenomena, total elimination or control of floods is neither practically possible nor economically viable. Hence, flood management aims at providing a reasonable degree of protection against flood damage at economic costs.”<sup>46</sup>

The above quote captures government perceptions regarding the nature of drought in India. Conspicuous for its absence is an acknowledgement that the vulnerability of livelihoods and ecosystems to floods can be reduced by engaging with variability and change rather than attempting to control and regulate these systemic processes. Rather than using socio-economic transformations in both urban and rural landscapes, natural resource variability and human mobility and adaptability as starting points, conventional wisdom treats both the environment and the populations it is home to as fixed in time and space, thus limiting the scope for innovation and adaptation. The extent to which the official perceptions and policies of government agencies in India are both *willing* and *able* to go beyond the structural approach and respond to the dynamic and changing nature of both society and water resource conditions deserve scrutiny.

## Colonial Perceptions and Policies

Towards the latter half of the 18<sup>th</sup> century, the East-India Company made its maiden large-scale attempt to insulate the rivers of the Bengal Delta,

Agriculture still remains a gamble in the monsoon and the sustainability of livelihoods for people dependent on agriculture remains threatened.



in the process drastically reordering existing modes of revenue and property collection and the codes of social administration. In consequence, the traditional and flexible responses to natural patterns of inundation practised by the inhabitants of the delta were systemically undermined by the colonial perceptions of natural phenomena as 'calamities'. Moreover, once floods were seen as adversely affecting the fields that were the main source of its revenue, the government changed its official perception about floods. Floodwaters were now to be controlled, regulated and subsequently brought under absolute subjugation. In other words, the imperatives of rule and administration were decisive in determining and organising an agenda for flood control. Embankments were the first structural measures adopted as flood control measures to prevent flood waters from submerging revenue-generating land.

The policy of embanking rivers proved counter-productive. As experience was gained, it rapidly became apparent that embankments not only clogged drainage systems and magnified flood heights, but also were a substantial drain on the resources of the colonial government to construct and maintain. As a result, in the early decades of the 20<sup>th</sup> century, the colonial government began abandoning its approach to flood insulation. Such a shift not only marked a significant departure from the initial colonial flood control strategies, it also highlighted the geomorphological fact that any flood control structure obstructs the natural

working of a river. This change in the colonial policy from maximum to minimum intervention is best encapsulated by the famous report of the 1928 Flood Committee. This committee was constituted in 1927 to inquire into the nature and causes of the devastating floods in Baitarni, Brahmini, and Mahanadi. The report made some subtle observations:

“ ...the problem that has arisen in Orissa is due, in the main, to the efforts which have been made towards its protection. Every square mile of country from which spill water is excluded means that intensification of floods, means the heading up of water on some one else's land.... The problem in Orissa is not how to prevent, but how to pass them quickly to sea. And the solutions lies in removing all obstacles which militate against this result.... to continue as at present is merely to pile up a debt which will have to be paid, in distress and calamity at the end.”<sup>47</sup>

The committee proposed that the majority of embankments be gradually phased out. Only those which did not hinder the journey of floodwater to the sea were to be retained. The only ecologically viable, socio-culturally adaptable and economically appropriate policy was to remove all obstacles to nature's working and thereby improve the drainage of the river. The recommendations of the committee were never, however, implemented as the continuation of the embankment policy served certain

The policy of embanking rivers proved counter-productive. As experience was gained, it rapidly became apparent that embankments not only clogged drainage systems and magnified flood heights, but also were a substantial drain on the resources of the colonial government.

vested interests. As rightly put forth by Rohan D,Souza:

“ A century of tampering with the natural drainage and reconfiguring the topography and agrarian production regime to suit exigencies of rule and administration had led to the creation of several ‘protected enclaves’, substantially insulated from flood-spill. These protected zones, surrounded by embankments, were now decisively committed to the continuation of the embankment system as many of them had sunk below the beds of the rivers.<sup>48</sup> ”

The construction of embankments persisted due to pulls and pushes from protected enclaves. In addition, those staying in unprotected enclaves and semi-protected areas feared the fury and brunt of floodwater once the construction of embankments stopped, and thus were in favour of the embankment policy. The colonial rulers were thus caught in a whirlpool of various interests as they attempted to undo the flood strategies of the past. When the British left India, there were some 5,280 km of embankments along rivers. Thirty-five hundred kilometres were in the Sunderbans in West Bengal and 1,209 km were along the Mahanadi in Orissa, together they protected a total of about three million ha.<sup>49</sup> Despite the continued construction of embankments, the general consensus until the 1940s was that policy and implementation activities should focus on improving the drainage of rivers rather than on impeding their way by constructing structures.

### Post-Colonial Institutional and Policy Landscapes: Continuity and Change

In post-Partition India, the immediate and delicate mission of central leadership was to keep the country united; in fact, the agenda for integration transcended all other concerns. The construction of the temples of modern India, centrally-planned multi-purpose dams, became a symbol of prestige. Their construction, projected as the harbinger of future development at a time of high expectations, brought political legitimacy to the new leadership in the eyes of the masses. Three years after independence, the First Five-Year Plan (1951-56) emphasised the construction of multi-purpose dams (the Damodar Valley Corporation, the Kosi dam at Barahkshetra, Nepal and the Mahanadi Hirakud dam) not only for controlling floods but also for harnessing floodwaters for hydro-electricity and irrigation. The construction of these projects was also inspired by developments in the West, where the success of project like the Tennessee Valley Authority (TVA) in the US, a front-runner in the flood controlling technology, originated the idea that harnessing river systems for hydro-electricity, irrigation and flood control was necessary step for development of all nations worldwide.

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The devastating floods of 1954, particularly all the northern rivers that marooned Bihar, UP, West Bengal and Assam, exposed the limitations of flood control measures, in particular multipurpose dams, which were the focal point for implementation during the first Plan. As a result, the Rashtriya Barh Ayog stressed the need for integrated sets of measures.

dams. Thus, to control the menace of floods a three-phased programme was proposed in the Second Plan (1956-1961) which emphasised both short-term and long-term measures like building of embankments, channel improvements, increasing the level of villages and protection of towns and the construction of dams as long term measures. It was also proposed that Central and State flood control boards be established in order to implement plan activities. In addition, with water as a state subject, the primary responsibility of undertaking flood control measures was given to the State governments. By the end of Third Plan (1961-1966) over 7,000 km of new embankments, 8,700 km of drainage channel, 164 town protection schemes and 4,582 villages raising projects were constructed.<sup>50</sup>

The Fourth Plan (1969-1974), recognising that flood control, drainage and anti-waterlogging works are closely related to irrigation, formulated schemes in an integrated manner so that the measures taken up in one place did not accentuate the problems in neighbouring areas. The Fifth Plan (1974-1978), again shifting emphasis to the raising and strengthening embankments, states: 'first priority will be given to the raising and strengthening embankments and other connected flood protection works'.<sup>51</sup>

In 1976, the Government of India decided to set up the Rashtriya Barh

Ayog (National Flood Commission) (RBA) to evolve a coordinated, integrated and scientific approach to flood control problems in the country and to draw up a national plan fixing priorities for implementation. After conducting a comprehensive analysis of the flood control measures already adopted, RBA, in its report of 1980, stressed the need for implementation of an integrated set of measures, both structural and non-structural, including dams, embankments, flood forecasting and warning. In the absence of any viable protective measures, the commission recommended flood plain zoning, adjusting cropping patterns and raising villages. The report also assessed the area vulnerable to floods as 40 million hectares. Unfortunately, most of the recommendations of the RBA have remained on paper. Little that was agreed upon has been implemented. For instance, the Review of the Sixth Five-Year Plan (1980-1985) clearly indicates that the states have not been accountable for or efficient in implementing the recommendations of RBA. The Working Group on Flood Control for the Tenth Plan (2003-2007) also recommended setting up a new Integrated Flood Management Commission to review the follow-up action taken on the recommendations made by the RBA in 1980.

The Seventh Plan pointed out the poor performance of earlier initiatives and placed emphasis on implementing structural measures. In addition to protecting towns and important installations, it proposed the implementation of anti-erosion

measures to stabilise the benefits from existing schemes. Seventh Plan documents pointed out that the maintenance of flood control works had been hampered due to the inadequate allocation of funds and recommended that states provide adequate budgets for maintenance on the basis of the recommendations of the Eighth Finance Commission.


The Eighth Plan proposed that the government continue making substantial investments in maintaining embankment and flood control works and use maintenance to provide job opportunities. By linking maintenance with employment generation programmes such as the India Jawahar Rozgar Yojana, the twin objectives of flood protection and rural income creation could be fulfilled. In the Eighth Plan schemes for flood proofing including the construction of raised platforms, assured communication systems, drinking water supply systems, post-flood relief systems and so on were taken up in North Bihar. The Eighth Plan also recommended that flood-proofing measures be implemented in areas which suffered from repeated flood damage. This scheme continued in the ninth plan and in the tenth plans. Expansion of the scheme to other flood-affected areas has been proposed and is currently under consideration.

In the Ninth Plan (1997-2001), it was observed that, in addition to the progress made in implementing structural flood protection measures, flood forecasting and warning systems had played a great role in mitigating

the loss of life and enabling the protection of movable property. As a result, resources and attention were shifted toward strengthening these systems. Now there are 159 flood, 134 level and 25 inflow forecasting stations on major dams and barrages. This represents the beginning of a gradual shift away from purely structural measures toward other forms of non-structural mitigation. This change was also accompanied by recommendations for flood plain zoning and other, similar activities to reduce vulnerability. The Tenth Plan highlighted the limited success attained through non-structural measures and emphasised the apathy within the states with regard to flood plain zoning legislation. It also emphasised the need to develop long-term and permanent solutions to flooding through a variety of measures, including constructing storage, raising villages, modifying cropping patterns (sowing crops which can tolerate waterlogging), setting up a nationwide network of communication, forecasting and forewarning systems, and ensuring people's participation in the maintenance of embankments. Although the 10th Plan contained both structural and non-structural elements, the focus remained dominantly structural and focused toward flood control.

According to official statistics, the flood management measures undertaken so far have provided a reasonable degree of protection to an area of 15.81 million ha across India. There has been little attempt, however,

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 The Ninth Five-Year plan saw the beginning of a gradual shift away from purely structural measures toward other forms of non-structural mitigation.

In many, if not most, cases the allocation of responsibility among key agencies within each state and between states and the central government is both highly politicised and far from clear.

to evaluate whether or not this has actually reduced people's vulnerability to flood hazards or the scale of vulnerability and marginalisation among those affected by floods. The flood policy situation is also complicated by a lack of clarity regarding 'who decides what for whom?' In many cases it is unclear who the policy makers at the central and state levels are. Areas of responsibility and degrees of accountability are unclear. Since flood management is under state control, flood control schemes are planned, funded and executed by state governments themselves, using their own resources and according to their own priorities. The formal role of the central government is to render technical assistance that is catalytic and supportive in nature. The central institutions involved include the Central Water Commission, the Ganga Flood Control Board and the Brahmaputra Board. At the state level the institutions responsible for planning and implementation of flood protection schemes are the state water resource ministry, the relief and rehabilitation department and the irrigation departments. In many, if not most, cases the allocation of responsibility among these three agencies within each state and between states and the central government is both highly politicised and far from clear. The brief assessment of Bihar's policy response to floods provided below reveals how the broader and deeper geo-political dynamics of centre-state relations in the Indian federal system continue to

influence both official perceptions of and policies towards flood management.

### State Responses to Floods: Perspectives from Bihar

In spite of repeated acknowledgements both inside and outside official circles that there are serious limitations with the structural paradigm of constructing embankments and levees, the shift towards non-structural approaches has been slow and hesitant. A total of 3,465 km of embankments have been constructed along rivers in Bihar. Parallel to the embankments, a massive network of roads and railway lines were built east to west, cutting across and disrupting natural drainage systems. According to the Barh Mukti Abhyan, investment in the construction and maintenance of embankments up to 1989-90 totalled Rs 5,300 million. Since 1990-1991, the government has constructed only 11 km of embankment but it has spent approximately Rs 2,700 million rupees on embankment maintenance. Between 1955, when flood control works was initiated, and 1998 the Bihar government has invested approximately 7,460 million rupees on the construction and maintenance of 3,454 km of embankments.<sup>52</sup>

Despite this massive investment, Bihar, the most flood-affected state in India, accounts for 56.5% of the nation's flood victims.<sup>53</sup> According to the Tenth Year Plan (2002-2007), thirty out of the thirty-eight districts of Bihar are flood-prone. The flood-prone area of Bihar has increased from 4.2 million ha to

Table 3: State-wise Physical Achievement of Works Under Flood Management (as of March 3/2000)

Sl. No.	State/ UT's	Length (km)		Towns/Village (Nos.)		Area benefited in ha (10 <sup>4</sup> )
		Embankment	Drainage Channels	Protection Works	Protected	
1.	Andhra Pradesh	2,100	13,569	68	21	0.54
2.	Arunachal Pradesh	2	-	-	-	-
3.	Assam	4,454	851	660	-	1.6357
4.	Bihar	3,454	365	47	-	2.949
5.	Goa	10	12	4	6	0.0001
6.	Gujarat	104.12	271	805	30	0.4827
7.	Haryana	1,144	4,385	448	98	2.0
8.	Himachal Pradesh	58	11	-	-	0.0097
9.	Jammu & Kashmir	230	14	12	5	0.2173
10.	Karnataka	-	-	-	-	0.0008
11.	Kerala	116.7	29	4	6	0.0555
12.	Madhya Pradesh	26	-	37	-	0.0040
13.	Maharashtra	26	-	26	-	0.0010
14.	Manipur	360	126	1	1	0.130
15.	Meghalaya	112	-	8	2	0.0011
16.	Mizoram	1	1	-	-	-
17.	Nagaland	-	-	-	-	-
18.	Orissa	6,515	131	14	29	0.4800
19.	Punjab	1,370	6,622	3	-	3.19
20.	Rajasthan	145	197	25	-	0.0816
21.	Sikkim	7	12	6	-	0.002
22.	Tamil Nadu	87	19	11	4	0.1220
23.	Tripura	133.30	94	64	-	0.0251
24.	Uttar Pradesh	2,681	3,593	48	4,511	1.599
25.	West Bengal	10,350	7,129	-	-	2.2005
26.	A&N Island	-	-	-	-	-
27.	Chandigarh	-	-	-	-	-
28.	Dadra & Nagar Haveli	-	-	-	-	-
29.	Daman & Diu	-	-	-	-	-
30.	Delhi	83	453	-	-	0.0780
31.	Lakshadweep	-	-	-	-	-
32.	Pondicherry	61	20	2,337	-	0.004
	<b>Total</b>	<b>33,630.12</b>	<b>37,904</b>		<b>4,713</b>	<b>15.8091</b>

Note: These are the figures as furnished by the State Government. Wherever there are significant changes noticed with reference to 1993 and 2000, the States have been asked to reconfirm these figures.

Source: Ministry of Water Resources (2000)


6.9 million ha (Ganga Flood Control Commission, Master Plan, Vol. I).<sup>54</sup> Seventeen per cent (nine million ha) of Bihar's land area is permanently waterlogged. According to the report of the Eleventh Finance Commission of Bihar in 1999, flood-related damage

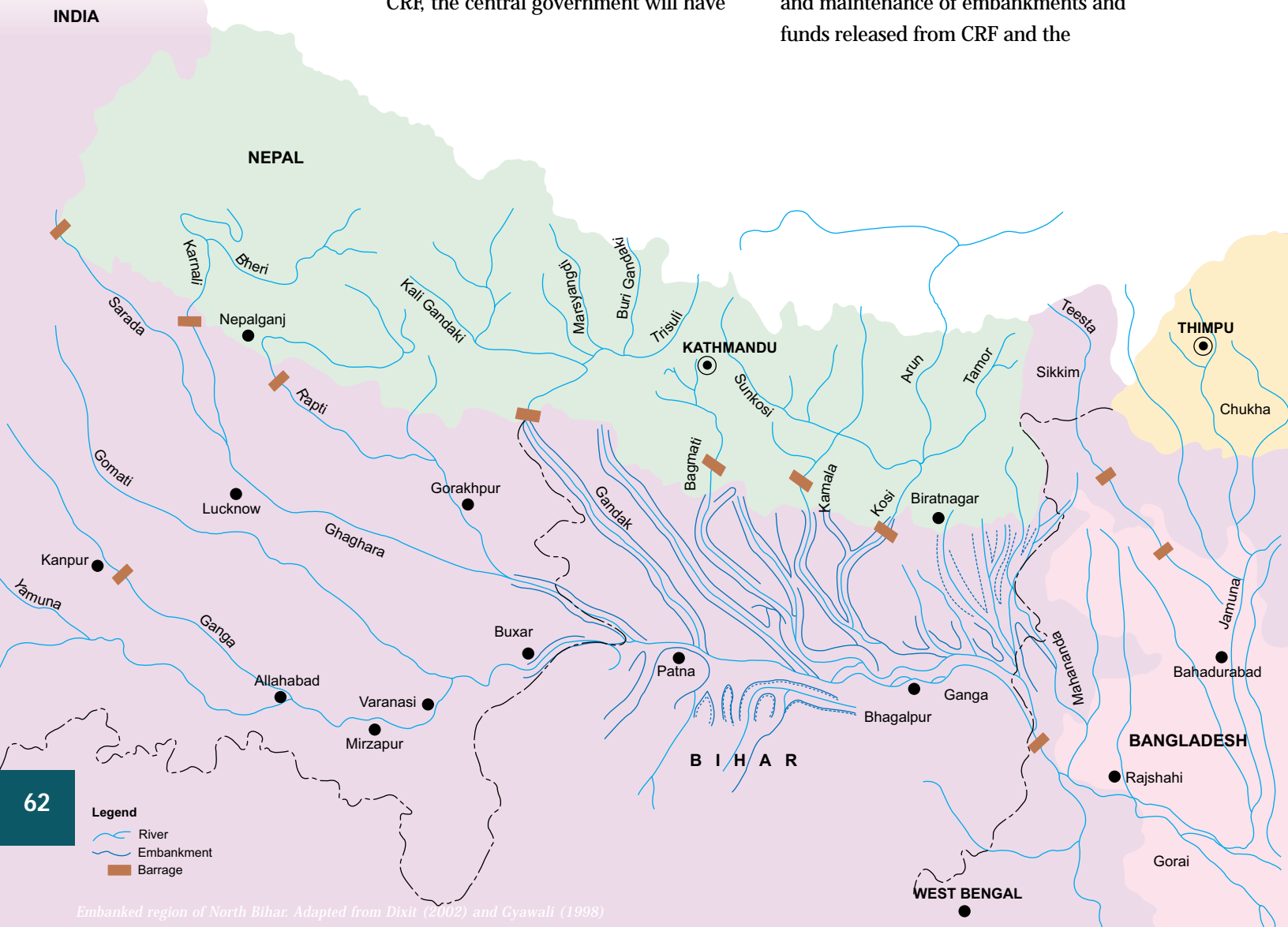
rose by 54 times during Laloo Prasad Yadav's tenure, from Rs 9.49 million in 1989-1990 to Rs 5,147.8 million in 1998-1999.<sup>55</sup> In 2001 flooding in Bihar covered 24 districts, affecting more than 600,000 people, 11,000 cattle and inundating 1,700 thousand ha of land.<sup>56</sup>

As damages have increased, so has expenditure on rehabilitation. The share of the central government's Calamity Relief Fund (CRF) released to the state of Bihar was IRs 337.9 million during the year 1999-2000; IRs 502.2 million in 2000-2001 and IRs 263.65 million in 2001-2002. Additional assistance to the tune of IRs 381.8 million in 1999-2000 and 296.7 million in 2000-01 was provided under the National Fund For Calamity Relief (NFCR)/National Calamity Contingency Fund. Once the government of Bihar has completed the formalities for the release of the pending instalment of the CRF, the central government will have

provided Bihar a total of IRs 540.5 million of its second instalment of CRF support for the year 2001-02 and of the first instalment of additional funds for 2003.<sup>57</sup> These figures suggest that the central government alone will have spent at least IRs 2,322.75 million on flood relief in Bihar from 1999 to 2003. If the amounts spent by the Bihar government are added, the total probably far exceeds the amount invested in the maintenance of embankments over the same period.

The mismatch between the total amount of assistance sought for the construction and maintenance of embankments and funds released from CRF and the

 The shift towards non-structural approaches has been slow and hesitant.



Embanked region of North Bihar. Adapted from Dixit (2002) and Gyawali (1998)


damage reported raises serious questions regarding the approaches to flood management of the state and central governments. As is clear from its Tenth Five-Year Plan 2002-2007, the state government of Bihar continues to frame solutions to the problem of flooding largely in terms of the viability and vitality of structural measures. According to the plan, long-term structural solutions to flooding lie in the construction of dams in Nepal, while short-term measures focus primarily on building embankments along the rivers of Bihar. The Government of Bihar's Tenth Five Year Plan (2002-2007) illustrates this well. According to it:

“ The long-term solution of flood problem in Bihar lies in the provision of reservoirs in the upper reach of main rivers and their tributaries. Unfortunately, most of these rivers originate in Nepal and flow through it for the considerable length before entering Bihar. All suitable dam sites fall in that country. Only with the sincere co-operation of the HMG Nepal and Central Government, construction of dams in Nepal territory is possible. Sites on the tributaries of Kosi river have been investigated and a high dam at Barahkshetra is proposed which would moderate the maximum probable flood of 42,475 cumecs (15 lakh cusecs) to a flood of 14,000 cumecs (5 lakh cusecs) at Barahkshetra. It will also trap the bulk of coarse and medium silt carried by the river which in turn help stabilise the river and reduce the meandering/ braiding tendency of the river.

However, before such measures come into reality, the State will have to depend on short-term measures including the construction and maintenance of embankments along the rivers. Flood management works so far implemented comprise construction and maintenance of 3,454 km. of embankments, revetment in selected portions of river banks, land spurs-367 nos. (284 in Kosi, 30 in Mahananda, 18 in Ganga, and 35 in Gandak) and such others flood protection works.”

Despite the failure of all embankments to control floods, government authorities continue to rely on them as their primary flood control measure. The government of Bihar has, for example, submitted a list of 19 schemes, including five for anti-erosion works and 14 for raising and strengthening or constructing embankments to the Ganga Flood Control Commission. The total estimated cost of their implementation is about Rs 542 crores (5,420 million rupees).<sup>58</sup> The growing size of flood-prone areas, the massive expenditure on flood control measures, the mounting costs of flood damage and the continued expenditure on flood relief raises important questions regarding the government's approaches to flood management. The official perception of the causes and the consequences of floods must be questioned, as must the effectiveness of structural measures, especially dams and embankments. In Nepal, less than 50% of precipitation falls above locations in the Himalaya where dams could be constructed. It is, as a result,

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 The state government of Bihar continues to frame solutions to the problem of flooding largely in terms of the viability and vitality of structural measures.



physically impossible to fully control flooding by constructing dams there. Overall, state investments in embankments, drainage and protective works have been highly skewed. Bihar, for example, has constructed 3,454 km of embankments but only 365 km of drainage canals, while UP in contrast, has constructed 3,593 km of drainage canals and only 2,681 km of embankments.<sup>59</sup> No villages in Bihar have been raised but 4,511 in Uttar Pradesh have been. The total investments in flood protection across India are summarised in the table 4.

### Village Perspectives

The official understanding of flood issues, as revealed through government policies and pronouncements, fails to acknowledge the experiences of communities affected by floods or the grass root expectations vis-à-vis government agencies responsible for flood mitigation and management. Insights garnered from field reports on sixteen villages in Bihar and Uttar Pradesh located in the Rapti/Rohini River basin of Uttar Pradesh and the Bagmati River basin of Bihar, reveal for example, a far more complex picture of ground reality than perhaps assumed by policy-makers.

Interviews conducted as part of this study, reveal that many residents in the villages of both Bihar and UP perceive floods as a natural-social phenomenon and feel that the overall condition of their villages was better before embankments were constructed than it is now. Before embankments were

raised, they explained floods often drained quickly and deposited a thin fertility enhancing layer of silt on their fields. Now, many villages face serious problems: Where flood flows are concentrated, sand casting prolonged, flooding and waterlogging plague villages. In places where embankments reduce shallow flooding groundwater recharge is limited and drought-like impacts lower soil moisture. In brief, villagers often see themselves as caught in a flood/drought cycle, with far-reaching implications for agriculture, livelihoods, health and migration flows.

### Government Flood and Drought Response Synthesis

The response of governments to floods and droughts are remarkably alike. While Nepal's plans remain dominantly on paper, they are broadly similar to those in India. In both cases investment strategies focus on structures and other physical interventions designed to increase control over water availability and flow. In the case of droughts this investment emphasises water harvesting and to a lesser extent, improving vegetative cover in watersheds. These investments are intended primarily to increase the physical availability of water during dry periods. In the case of floods, most investments are directed toward the construction and maintenance of embankments and other flood control structures. Both floods and droughts are, at least in the practical sense of investment, seen as external events that can be controlled through the construction of physical structures. Concepts of flood and

Despite the failure of embankments to control floods, government authorities continue to rely on them as their primary flood control measure.

Table 4: State-wise list of Central Assistance Released from National Fund for Calamity Relief/ National Calamity Contingency Fund for weather-related calamities (1999-2000 to 2001-2002)

State	Calamity	Assistance Released IRs (10 <sup>6</sup> )
<b>1999-2000</b>		
Andhra Pradesh	Drought	753.6
Bihar	Flood/cyclone	381.8
Gujarat	Drought	545.8
Jammu and Kashmir	Drought	734.2
Karnataka	Drought/flood	170.9
Madhya Pradesh	Drought/flood	388.6
Manipur	Drought	49.3
Mizoram	Drought	60.0
Orissa	Drought/cyclones	8,281.5
Rajasthan	Drought	1,029.3
Tripura	Drought	53.4
West Bengal	Flood	295.2
<b>Total</b>		<b>12,743.6</b>
<b>2000-2001</b>		
Arunachal Pradesh	Flash floods	20.0
Bihar	Rains/floods	296.7
Chhattisgarh	Drought	400.0
Gujarat	Drought	850.0
Himachal Pradesh	Rains/floods	82.9
Madhya Pradesh	Drought	350.0
Meghalaya	Cyclone winds	10.0
Orissa	Drought	350.0
Rajasthan	Drought	850.0
West Bengal	Rains/floods	1,032.5
<b>Total</b>		<b>4,242.1</b>
<b>2001-2002</b>		
Andhra Pradesh	Rains/floods	304.4
Chhattisgarh	Drought	189.4
	Floods	239.4
Gujarat	Drought	270.0
Himachal Pradesh	Flash floods	250.0
	Rains/floods	175.0
	Drought	189.8
Jammu and Kashmir	Drought	232.0
Madhya Pradesh	Drought	227.2
Orissa	Drought	146.2
	Floods	1000.0
Rajasthan	Drought	789.7
<b>Total</b>		<b>4,013.1</b>
<b>Total 1999-2002</b>		<b>20,998.8</b>

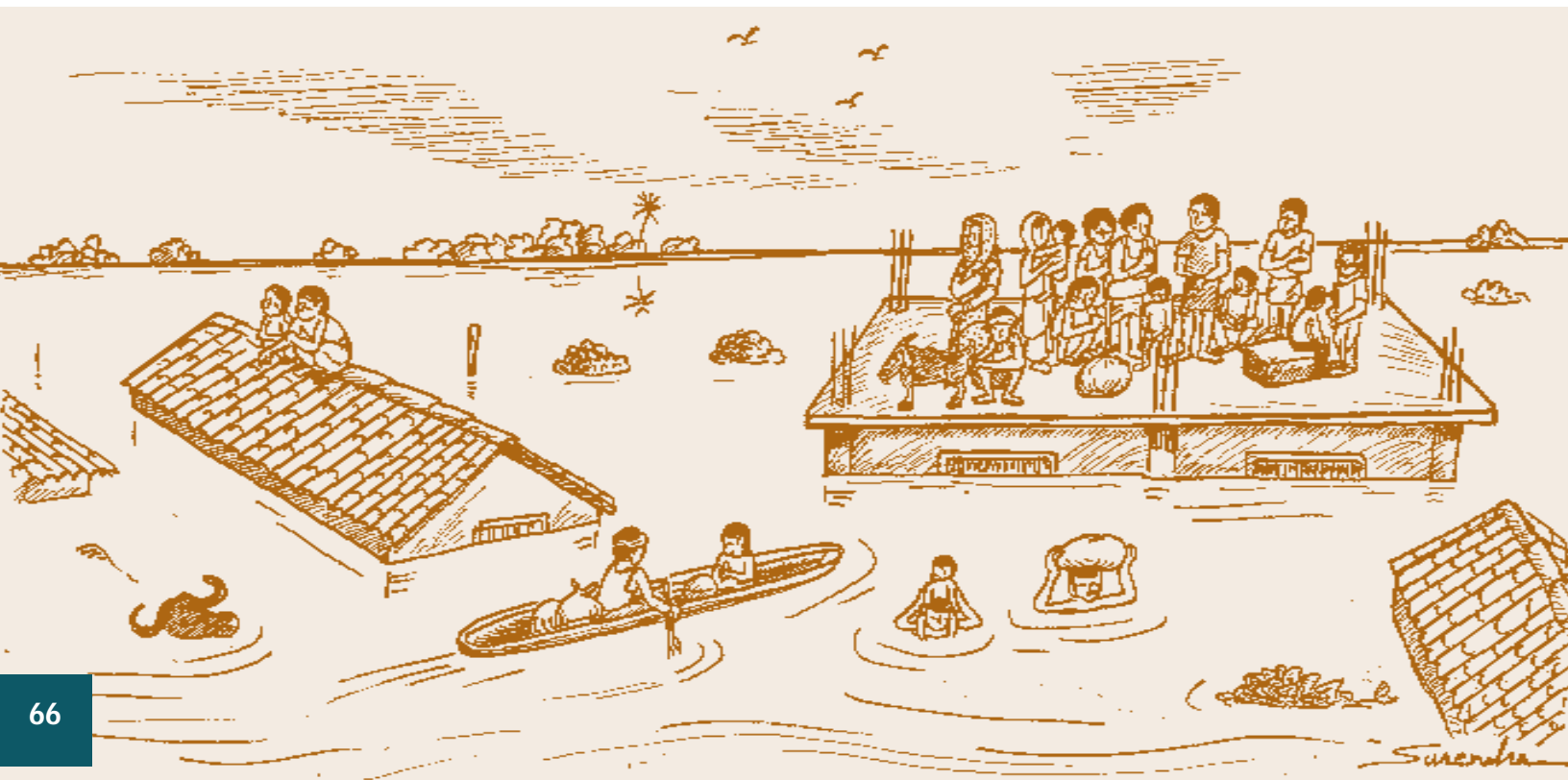
Source: Lok Sabha Unstarred Question No. 3324, dated 06.08.2002 - www.IndiaStat.com

drought-proofing exist and do include the recognition of wide measures related to the vulnerability of livelihoods. Translating such concepts into governmental programmes that actually direct significant investment into something other than the construction of water control structures has, not however, occurred on a widespread basis.<sup>60</sup> As the guidelines for watershed project investment allocation present in table 5 clearly indicate, even in watershed development activities most funds are allocated for hardware and relatively little is spent on the development of social capital or livelihood-focused activities.

Investments in water control structures, whatever their relative costs and benefits, have not ameliorated the impacts of floods and droughts. In fact,

as early insights from colonial efforts toward flood control indicate, conventional courses of action often increase long-term vulnerability. Whatever the specific cause, expenditures on flood and drought disaster relief through central mechanisms such as the Calamity Relief (CR) and the National Calamity Contingency Fund (NCCF) and at the state level have been increasing. With the exception of the Gujarat earthquake, virtually all funds spent on disaster mitigation are for floods, droughts and other climate-related disasters. Over the period from 1999 to 2002, the total expenditure Indian resources on disaster relief was over Rs 20,999 million. Most of these funds have been spent on immediate humanitarian relief and, in the case of droughts, civil works programmes

Both floods and droughts are, at least in terms of investment, seen as external events to be controlled through physical structures.



designed to provide immediate employment and income. Such expenditures, however, do not reduce vulnerability to future droughts or floods in any substantive manner.

Aside from governmental interventions to reduce flood and drought impacts, the primary organised response at a societal level has been through NGOs, which have played a major role in drought and, to a lesser extent, flood mitigation and relief activities. Their roles are explored in detail below.

### Responses to Floods and Droughts by NGOs

Across India and Nepal, NGOs have played a major role in flood and drought relief and mitigation activities, largely by assuming responsibility for implementing governmental relief and mitigation programmes. In the case of drought NGOs have, for example, served as the interface between the government and local communities for implementing many watershed development programmes. These programmes invest substantial amounts of government funds in what are in effect, drought mitigation measures, as part of normal development investment. As documented in the discussion of governmental roles in drought mitigation above, in Rajasthan alone approximately Rs 8,534.9 million have been invested in watershed activities. NGOs' lead role in watershed programmes has contributed to the sustained presence of NGO activities in many rural areas. No parallel programmes of watershed investment exist in flood-prone areas

Table 5: Fund Allocation Guidelines: Watershed Development

S. No.	Activities	Percentage
i)	Watershed treatment/development works/activities (hardware)	80
ii)	Watershed community organisation including entry point activities	5
iii)	Training	5
iv)	Administrative overheads	10
	<b>Total</b>	<b>100</b>

Source: Ministry of Rural Development (2001)

where most protective measures, such as the construction of embankments, are implemented directly by government agencies. NGOs are, however, often involved in long-term development activities in flood-affected regions. They have also been at the forefront in the delivery of flood and drought relief. In the case of drought relief, NGOs often run rural employment schemes and are responsible for organising watershed treatment schemes and constructing water harvesting structures financed through government and donor relief programmes. Where floods are concerned, NGOs are active in the delivery of food, medical and other services for the affected populations.

A complete review of NGO activities in response to floods and droughts is beyond the scope of this report. Our main focus here is on the points where such activities substantively differ from or extend beyond the focus and types of activities currently being implemented by the government. We focus on the following three:

1. The role of asset building and watershed programmes in drought mitigation;

Across India and Nepal, NGOs have played a major role in flood and drought relief and mitigation activities, largely by assuming responsibility for implementing governmental programmes.

2. Local activities to reduce flood vulnerability; and
3. The links between these activities and the growing debate in NGO circles on appropriate approaches to disaster response.

Now, to the initial focus on asset building and drought mitigation.

### Asset Building and Watershed Development Programmes in Drought Mitigation

Sustaining the livelihoods of an increasing population in the drought-prone arid and semi-arid regions of India, where natural resources are highly degraded, is an enormous challenge. Lack of precipitation in many regions of Gujarat and Rajasthan, two states that were severely affected by drought in the year 2000, led to massive crop failures and forced people to migrate to other areas in search of livelihoods. In the midst of this drought-stricken landscape, however, there are locations where the daily lives of certain communities appear to be relatively undisturbed. Often these are communities that have undertaken water harvesting and watershed management activities, which have enhanced their livelihood asset base. This asset base primarily comprised of five types of capital – social, natural, physical, financial and institutional – has helped them develop resilience to drought.

This section synthesises the findings of the report of Winrock International India (WII) entitled 'Learning Enhancement Exercise on Rainwater

Harvesting'. The project was carried out with support from Ford Foundation under its Community Asset Building Programme.<sup>61</sup> The project areas selected for the purpose of this review included the areas of interventions of four partner NGOs: SKTGSM and SEWA of Gujarat and PRADAN and Seva Mandir of Rajasthan. All the areas witnessed three to four consecutive years of drought, starting from 1999.

The four cases offer an important opportunity to understand what kind of investments made in specific situations would produce desirable impacts in terms of drought proofing, livelihood augmentation and gender and social equity.

Methodologically, the exercise involved reviewing literature related to water harvesting and watershed activities, and fieldwork in the single 'best' village from each of the four intervention areas. This field work was performed using participatory research techniques involving focus group discussions and interviews of key informants, followed by debriefing sessions with the partner NGOs. The intervention areas of these NGOs were diverse in their socio-economic and natural resource systems both hydrological and geo-hydrological. Table 6 provides an overview of the selected intervention areas of the four NGOs chosen.

As can be seen from the above table, the period of intervention in three out of the four partner NGOs was eight to nine years. Seva Mandir, at 17 years, was an exception. Three areas of

NGOs' lead role in watershed programmes has contributed to the sustained presence of NGO activities in many rural areas.

Table 6: NGO Interventions in Watershed Management

NGO (year of establishment)/year of initiation of water harvesting and watershed activities	Ecological zone (arid/semi arid)	Average annual rainfall (mm)	Occurrence of drought
Shree Kundla Taluka Gram Seva Mandal (SKTGSM), Savarkundla, Amreli, Gujarat (1955/1994)	Referred to as the Saurashtra region; Semi-arid area	533 (1990-2002); During 1990-2002, seven years were below normal rainfall, while only in three years (1994, 1998 and 2001) the rainfall was more than 30% of the average	The last three years 2000-2003 (summer) were drought-affected
Self Employed Women's Association (SEWA), Ahmedabad, Gujarat (1972/1995)	Santalpur taluka of Patan District located in Northern part of the state; Arid area	398 (1986-2002)	The drought has continued in the project area for the third successive year from 2000
Professional Assistance for Development Action (PRADAN), Alwar, Rajasthan (1983/1994)	Kishangarh Bas block of Alwar District located in North-eastern region of the state; Semi-arid area	650	Drought from very severe to light intensity has occurred in 45 years during 1901-1999. The drought of summer 2003 is the fourth
Seva Mandir, Udaipur, Rajasthan (1966/1986)	Jhadol block of Udaipur District located in the southern region of the state; Semi-arid area	614	Drought from very severe to light intensity has occurred in 44 years during 1901-2002. The drought of summer 2003 was an extension of drought of 2000

intervention were in hard rock regions with groundwater conditions ranging from moderate to poor. Though groundwater availability in the fourth project area that of SEWA, was good, alluvial formations, which make the water extremely saline, prevented it from being of much benefit. Variations across the four partners were also evident in the profiles of the target communities; they ranged from significantly tribal to non-tribal and from relatively homogeneous to multi-caste composition. The diversity in caste structures reflected diversity in livelihood options as well.

One major difference between the partners in the two respective states was their source of funding. The NGOs in Gujarat receive government funding, while those in Rajasthan receive foreign

aid. This difference determined the manner in which they provided support to communities for creating social assets. All four received supplemental support from the Ford Foundation to develop social capital.

Other elements of diversity across intervention areas involved the type of interventions and the distribution of investments to the development of private, group, and community assets. Investments in private assets included farm bunds and levelling on private land; investments in group assets consisted of building checkdams, *paals* and anicuts which benefited a small group in the vicinity of the structure. Investments in community assets comprised the treatment of *panchayat* land by fencing, plantation, the construction of loose stone checkdams

 Sustaining the livelihoods of an increasing population in the drought-prone arid and semi-arid regions of India where natural resources are highly degraded is an enormous challenge.

and *nala* plug and the rehabilitation of tanks (in which case the cost is incremental in nature) which benefited the village community as a whole.

In the next few sections we provide an overview of the investments made by partner NGOs in natural, social (including institutional) and human capital prior to drought periods along with the type and the extent of the returns from these investments during drought years.

**Natural capital - investments and returns:**

The proportion of watershed investments in private, group, and community assets, and their returns varied greatly across partners, as shown in the table 7.

The figures indicate that in terms of economic viability, the performance of PRADAN (Ratakhard) was the best. Net annual returns from agriculture for example, reached as high as 80% of the total project investment. The fact that all this investment was non-incremental (resting completely on new structures and not involving the rehabilitation of existing structures) makes the figures even more impressive in comparison to those for interventions in other villages. Though the net annual return as a percentage of total investment for PRADAN (Ratakhard) is higher than it is for SKTGSM (Dedakdi), the net annual return is one-third of that achieved in SKTGSM (Dedakdi). In both cases, the high proportion of benefits is explained partly by

**Support involved building private, group and community assets.**

Table 7 : Watershed Investments and Returns

Particulars	SKTGSM (Dedakdi)	SEWA (Barara)	PRADAN (Ratakhard)	Seva Mandir (Shyampura)
Area benefited due to treatment (ha)	480	451	157	160
Total area of village (ha)	1,200	1,254	893	267
Treated area as % of total area of village	40	36	18	60
Investment in community assets IRs (10 <sup>5</sup> ) (%)	0.32 (1)	3.84 (23)	1.36 (21)	4.88 (27)
Investment in group assets IRs (10 <sup>5</sup> ) (%)	23.91 (89)	0 (0)	4.08 (61)	11.38 (62)
Investment in private assets IRs (10 <sup>5</sup> ) (%)	2.57 (10)	12.9 (77)	1.36 (18)	2 (11)
Total investments through project IRs (10 <sup>5</sup> ) (%)	26.8	16.74 (100)	6.68 (100)	18.26 (100)
Private investment triggered by project IRs (10 <sup>5</sup> ) (%)	52.5 (196)	0 (0)	12.6 (189)	8.5 (47)
Total of project and private investments IRs (10 <sup>5</sup> )	79.3	16.7	19.4	26.7
Net annual returns from Agriculture	18	8.3	5.4	5.7
Net annual returns as percentage of total project investment (%)	67.16	49.76	80.15	31.27
Net annual return as percentage of total investment (project and private) (%)	22.70	49.76	28.09	21.34
Total households in the village (no.)	125	300	256	126
Net annual return per household IRs	14,400.0	2,776.7	2,128.9	4,531.7
Project investment per household IRs	21,440.0	5,580.0	2,656.3	14,492.1
Ratio of annual return per household to total project investment per household <i>in one year</i>	0.7	0.5	0.8	0.3

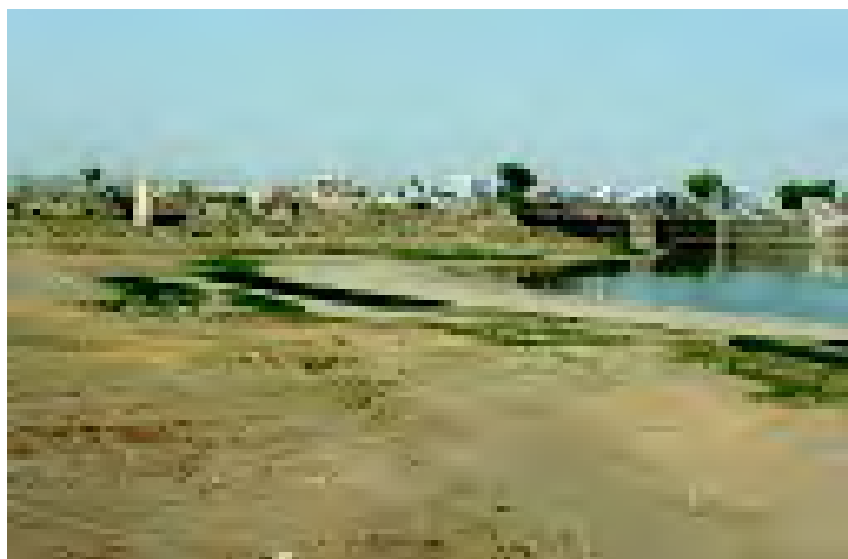
Note: Figures in brackets show percentage to 'total investments through project'

additional private investment in groundwater development and utilisation that was triggered by the project when farmers realised, after one or two monsoons, that groundwater availability had improved. In both cases the additional investment was almost two times the original project investment. When one compares the net annual return as a percentage of total investment (including both project and private investments), the difference between the four initiatives looks less significant. Looking at the ratio of net annual return per household to total project investment per household, PRADAN (Ratakhurd) once again appears as the leader with 0.8. It is followed closely by SKTGSM with 0.7, while Seva Mandir comes the rear with 0.3. It is important to recognise, however, that such benefits are highly dependent on the ecological endowments of an area. Furthermore, as mentioned earlier, investments in watershed projects are justified not just by their economics but also by non-tangible social benefits such as drought-proofing and social equity. This aspect is discussed in the next section.

As the proportion of investments made in community assets increases, perceptions of social equity and of the inclusion of weaker sections of the community also increases. In the sample areas of interventions, the proportion of project investments in community assets (such as village tanks and soil and water conservation structures viz *nala* plugs, trenches, loose stone checkdams on

village commons) was the highest in the case of Seva Mandir (27%) followed by SEWA (23%) and PRADAN (20%) (See table 7). Investment in community assets was negligible in the case of SKTGSM. If private investments triggered by the project are induced, the proportion of investment in community assets becomes insignificant for both PRADAN and SKTGSM. SEWA leads with 22.94% and is followed by Seva Mandir with 18.24%. PRADAN and SKTGSM, focused on individual farms through the creation of common property assets among small groups of farmers. Seva Mandir was most successful in ensuring that different social groups, hamlets, and gender are represented in the committees governing watershed investments. It was also the only agency formally monitoring institutional performance from the viewpoint of long-term sustainability. In the case of both SEWA and Seva Mandir, the watershed committees evolved into *gram vikas* committees with a larger mandate and more responsibilities for coordinating long-term development initiatives in the villages.

As the proportion of investments made in community assets increases, perceptions of social equity and of the inclusion of weaker sections of the community increases.



Dried lake in Rajasthan



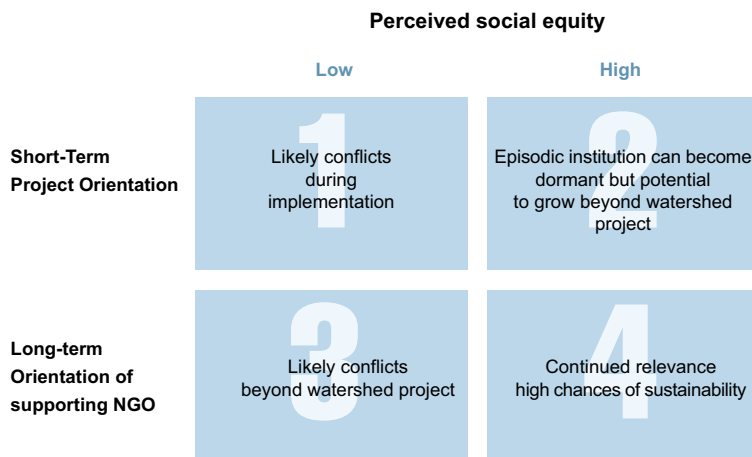
**Social capital - investments and a multitude of benefits:** The figure below illustrates the relationship between social equity, short-term project orientation and the sustainability of the institutions created. Perceptions that social equity is low and a short-term project orientation undermine the sustainability of institutions. When the perception of equity is high (cell 2) but projects have a short-term orientation, institutions are ephemeral and unless they develop leadership and vision which takes them on to new objectives beyond watershed development, they are likely to become dormant or disintegrate after the project is over. The best chances for sustainability are when all stakeholder groups are satisfied with their roles and responsibilities and their potential shares in the benefits and when both the facilitating agency as well as the concerned CBO begin to develop a long-term developmental orientation (cell 4). Low levels of equity combined with a short-term project orientation

tend to lead to implementation conflicts, while low levels of equity and a long-term focus lead to other forms of conflict.

Variations in the orientation of partners towards watershed development programmes were observed. For SEWA and Seva Mandir, watershed activities were part of their long-term strategy of rural development in project villages. In the sample cases, the committees in Savarkundla (initiated by SKTGSM) and the isolated watershed committees of Alwar (initiated by PRADAN) could be classified as episodic institutions as they performed well during the project period but began to lose direction once the project was over. In contrast, the committees promoted by SEWA in Santalpur and those promoted by Seva Mandir in Udaipur, and the 10 committees in Alwar that became federated, remained active and purposeful beyond the durations of the watershed projects. In fact, with the adoption of increasingly wide responsibilities, the committees in both Santalpur and Udaipur were gradually converted into gram *vikas* committees with a large developmental mandate.

Investments in watershed projects are justified not just by their economics but also by non-tangible social benefits such as drought-proofing and social equity.

Figure 11: Variables Affecting Institutional Sustainability



A key point, emerging from this discussion is that the development of human and social capital in the form of perceived social equity and the sustainability of institutions is critical for addressing access-equity and the sustainability of natural assets. Only when the institutions created in the context of a project are able to move beyond short-term objectives and expand their range of activities do they

remain present and viable as points of social organisation for resource management and drought mitigation in future years. The ability to achieve this was closely connected to the nature of the NGO support. In all cases, the long-standing presence of NGOs in the area prior to involvement in watershed projects created a feeling of supported credibility and the ability to provide long-term support. All four partner organisations enjoyed the credibility, which allowed them to enjoy good rapport with the local communities and contributed to the development of social capital. This established presence enabled traditionally ‘voiceless’ groups to participate effectively. In the project areas of SEWA, Seva Mandir and PRADAN, for example, women gained enough freedom to be able to articulate their concerns at *panchayats* and watershed committees.

#### Human capital - Investments and returns:

The experience gained over recent decades through work on common property institutions, indicates that institutional sustainability depends upon, among other things, creating broad-based leadership, securing financial sustainability, building capacities at all levels and adopting democratic values and principles of governance. These steps require long-term and concerted investment in human capital. At least two of the NGOs reviewed by WINROCK Seva Mandir and SEWA were attempting this. It is interesting to note the difference in funding for hardware (the construction of structures fostering the development of natural assets)

activities and software (the building of capacities leading to development of human capital) across all the four partners. For the Rajasthan partners, funding for hardware activities was foreign aid, while for the Gujarat partners it was the government. This distinction is important since expenditure is heavily skewed towards hardware in the case of government funding.

#### Drought coping and livelihood security:


*Drought coping refers to the measures taken by communities in the short run to survive the scarcity of food, fodder and water caused by a drought.*

*Livelihood security refers to the augmentation of livelihood options for local people in the long run. These could either be through increases in conventional options (e.g., expansion or intensification of agriculture and animal husbandry) or through non-conventional options.*

An increase in livelihood options results in better drought coping especially if they are not based on land-based activities and can be relied on as sources of income even during periods of drought. Because the four partner NGOs were involved in other interventions beyond watershed development to augment the livelihood options of the local communities, there was a need to separate the impacts of the two types of interventions and also to look at them together to see the total impact in a given region.

The source of drought proofing, whether watershed treatment or the generation

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 The best chances for sustainability are when all stakeholder groups are satisfied with their roles and responsibilities and their potential shares in the benefits and when both the facilitating agency as well as the concerned community-based organization to develop a long-term developmental orientation.

of alternative livelihood options was mapped on the basis of the data available as shown in the figure 12.

The figure indicates that in the case of PRADAN the major contribution to drought proofing was watershed treatment while in the case of SEWA it was through its livelihood interventions. PRADAN has also started promoting dairy cooperatives for women in a major way. Seva Mandir and SKTGSM have made some efforts at developing alternative livelihood options but these are in the nascent stage (e.g., making soap from *ratanjyote* and cultivating *safed musli* in the case of Seva Mandir and manufacturing bio-pesticides in the case of SKTGSM).

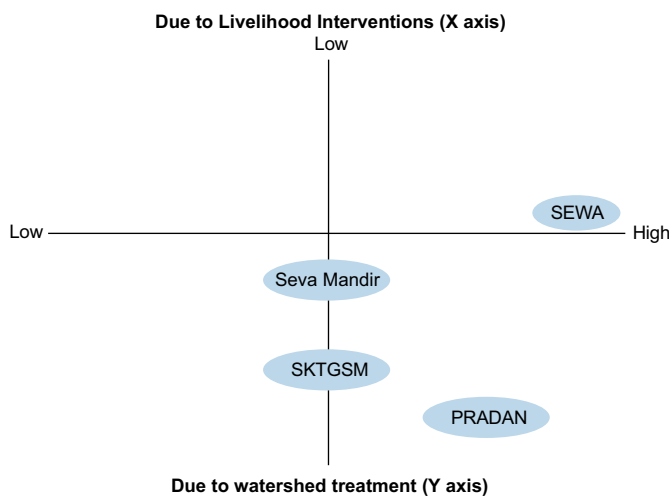
The degree to which watershed programmes improve the ability of communities to cope with drought depends on the extent of surface and groundwater storage capacity created and the strength of local institutions to

manage equitable and efficient use of this resource.

The drought-coping capacity in the rural agricultural areas where the NGOs are working depends on *grain, fodder and water security*. Watershed interventions undertaken in the areas reviewed have been successful in providing security although the degree varies in each region depending on its ecological endowments. In Alwar, for instance, the groundwater recharge in a good year is sufficient to provide the people in the treated hamlet with drought-proofing for the next four years, even if the rains are poor in those years. In Barara, a village in Santalpur, the surface water collected in a tank had a catchment area covering several villages and hence the water lasted even during the severest of droughts. Shepherds and wild animals came to this water hole when all other village ponds in the area were dry. However, when water failed to suffice for grain cultivation during the third consecutive year of drought, people had to rely on the non-farm livelihood options introduced by SEWA, including gum collection, *bharatkam*, salt-making through cooperatives and so on. In most of the semi-arid regions studied, including Alwar and Udaipur, the first option during a drought was to shift the focus from agriculture to animal husbandry. Non-productive animals were sold, often at just one-third of the normal price, and the entire effort of the family was placed on feeding the remaining productive animals even if it meant purchasing fodder at exorbitant rates. This strategy was common to watershed project and control villages

Drought coping refers to the measures taken by communities in the short run to survive the scarcity of food, fodder and water caused by a drought. Livelihood security refers to the augmentation of livelihood options for local people in the long run.

Figure 12: Mapping Sources of Drought Proofing



alike. Locations where projects had been implemented were more successful, however, in their efforts to sustain livestock as they had more access to fodder within the village and to credit through SHGs.

Migration was also a common strategy in all villages, but in the case of watershed villages the intensity and duration of migration was much less than it was in other areas. The control villages were almost entirely dependent on funding from the government, borrowing from moneylenders at high rates of interest, mortgaging land or jewellery and migrating. Making charcoal by digging out the roots of *prosopis juli flora* was also practiced by the Thakore community. Table 8 summarises the common drought-coping strategies encountered in the four project areas and how the agencies sought to strengthen these through watershed development and other livelihood based interventions.

As the information in table 8 demonstrates, while watershed activities had substantial benefits in all locations, other livelihood strategies such as migration and the development of non-farm livelihood activities to augment traditional agricultural income sources remained essential. In many cases, the viability of non-farm strategies depended on the existence of community systems and organisations.

*The non-farm livelihood options generated in the NGO case areas can be divided on the basis of their type*

*(whether conventional or new) and on the target beneficiaries (whether individual or group).* The combination of these two variables produces four categories. The agencies in the study used all four categories of livelihood augmentation (Figure 13).

The success of many of these initiatives depended on collective marketing of the produces. In the case of Banaskantha Dwacra Mahila Sewa Association (BDMSA, a federation promoted by SEWA) and the federations of Alwar (promoted by PRADAN), marketing interventions were successfully taken over by these institutions.

For livelihood interventions to succeed in the long run the creation of federated structures which provide marketing support appears to be one of the best of alternatives.

**Conclusions:** Watershed development and rainwater harvesting programmes are not a panacea for drought. The benefits from these programmes depend heavily on the physical and natural resource context, including the

Building robust institutions is input-intensive both in terms of time and financial resources.

Figure 13: An Example of Livelihood Augmentation

		Level	
		INDIVIDUAL	GROUP
Conventional Options generated		Ghee collection	Salt cooperatives
		Improved agriculture	Women's dairy cooperatives
New (value-added) In the case of BDMSA		Safed musli farming manufacture	Bio-pesticide manufacture <i>Bharatkam</i>
		Gum collection with new technology	Soap from <i>Ratanjyote</i>

Table 8: Common Drought Coping Strategies with and without Support from Watershed Projects

Strategy	Conventional Strategies	Impact of Watershed Development
Water security	Deepening of wells (without success) New open and tube wells (mostly failed) Resort to government tankers/pipelines Resort to neighbouring villages	Wells recharged due to water harvesting New wells made due to ground water recharge, wells near percolation tanks Tanker/pipeline supply as a measure of last resort
Shift to animal husbandry	<i>Common features:</i> Distress selling Natural attrition of weak animals Shift to stall-fed animals Retaining 1-2 lactating animals/ household  <i>Special features:</i> Traditional institution of migrating shepherds in Barara to look after animals of other villagers till next monsoon Use of tree leaves in forest areas (Udaipur). Resort to stress fodder from forests during drought.	<i>Strengthening of traditional strategy:</i> Increased fodder supply due to watershed treatment Increased drinking water for animals Credit for purchase of fodder and lactating animals from SHGs and other finance institutions
Scarcity work	Almost entire village dependent on scarcity work from state government and/or <i>panchayat</i>	Reduced dependence on scarcity work - depends on severity of drought and extent of water potential created (e.g., 2 <sup>nd</sup> , 3 <sup>rd</sup> or 4 <sup>th</sup> year)
Migration	Migration of entire families to partial migration for one to six months Working in nearby mines and urban centres on daily basis Masons getting work in urban centres	Migration reduced significantly: Entire family migration almost stopped, Some migration during 3 <sup>rd</sup> , 4 <sup>th</sup> year of consecutive drought
Finance	Loans for marriages and consumption (fodder and good grain) from moneylenders and other local sources including SHGs Mortgaging of land and pledging of jewellery, exorbitant interest rates (e.g. 5%/month) in case of moneylenders	Some increase in debt burden especially among the poor Rescheduling of loans from cooperatives, additional loans in some cases Credit from shopkeepers Loans from SHGs and other institutional sources at reasonable rates of interest
Other alternatives	Charcoal making after digging out roots of <i>Prosopis juliflora</i> Distress selling of land to urban landlords Collection of wild fruits, e.g. gheea at Barara (Santalpur)	Women's milk cooperatives to displace <i>dudhia</i> system in Alwar Diamond polishing in case of Savarkundla *Bharatkam (embroidery) marketed through SEWA Collection of <i>Prosopis</i> gum and marketed collectively through SEWA Soap-making from <i>ratanjyote</i> seeds by SHGs (trial basis in Udaipur)

\*This option existed prior to the watershed intervention.

characteristics of a region's hydrogeology, rainfall, slope and landuse patterns. In addition, the extent and distribution of the benefits received (especially by vulnerable sections of communities such as the landless,

women and small and marginal farmers) depends on access to credit and social inclusion, both of which require robust and equitable institutions. Building robust institutions is input-intensive both in terms of time

and financial resources. This is currently, in broad terms, out of the purview of government supported programmes for NGOs. As mentioned above, guidelines from the Ministry of Rural Development for investment in watershed activities mandate that approximately 80% of the funds made available be invested in physical structures leaving, after NGO overheads, approximately 10% for training and institutional development.<sup>62</sup> In the case of the NGOs reviewed here, however, additional institutional development was financed through the Ford Foundation.

Our review shows that the strength of village-based institutions is positively correlated with both a long-term orientation of the facilitating NGO and high investment in community assets (village commons, tanks, joint forest management areas etc.). Aside from the significant amount of employment generated during the implementation of these programmes, in the post-programme phase indirect benefits are reaped by vulnerable sections of the community. These include increased wage labour opportunities associated with improved agriculture regimes and increased food and fodder security due to shared/contract farming practices. During long droughts of 2-3 or more years, income from non-farm sources of livelihood, such as migration and marketing of commodities produced using locally available resources (for example, gum) and traditional skills (craftwork etc.) of community, becomes critical for most vulnerable populations. While migration is often essential as a source of subsistence income, only in a

few cases did it help in creating physical assets of community. Although we did not study remittance patterns in detail, it is an important area for future study. In addition, remittances and local investments depend heavily on the potentially exploitative forms of non-farm labour employment. Other associated social costs are important too. Both remittance patterns and non-farm employment patterns are critical areas for further study in order to understand the capacity of communities to adapt to drought through income diversification.

Aside from migration, the extent of income generated through non-farm activities by vulnerable populations also depend on how successfully NGOs facilitate development of human capital (information, skill and knowledge); institutional capital; and, physical capital (technology). In case of SEWA and PRADAN, strong federations of women's institutions/cooperatives have enabled access to credit (financial capital) and marketing support (institutional capital), which have helped women members of the cooperative to 'live with' droughts.

### Floods: NGO Involvement in Relief and Longer-term Mitigation

NGO involvement in long-term flood mitigation occurs at much lower levels than in the case of drought. Part of this may be a function of location. Some of the most flood-affected regions, such as Bihar and Eastern UP are also least developed in India and, compared to Gujarat and Rajasthan,

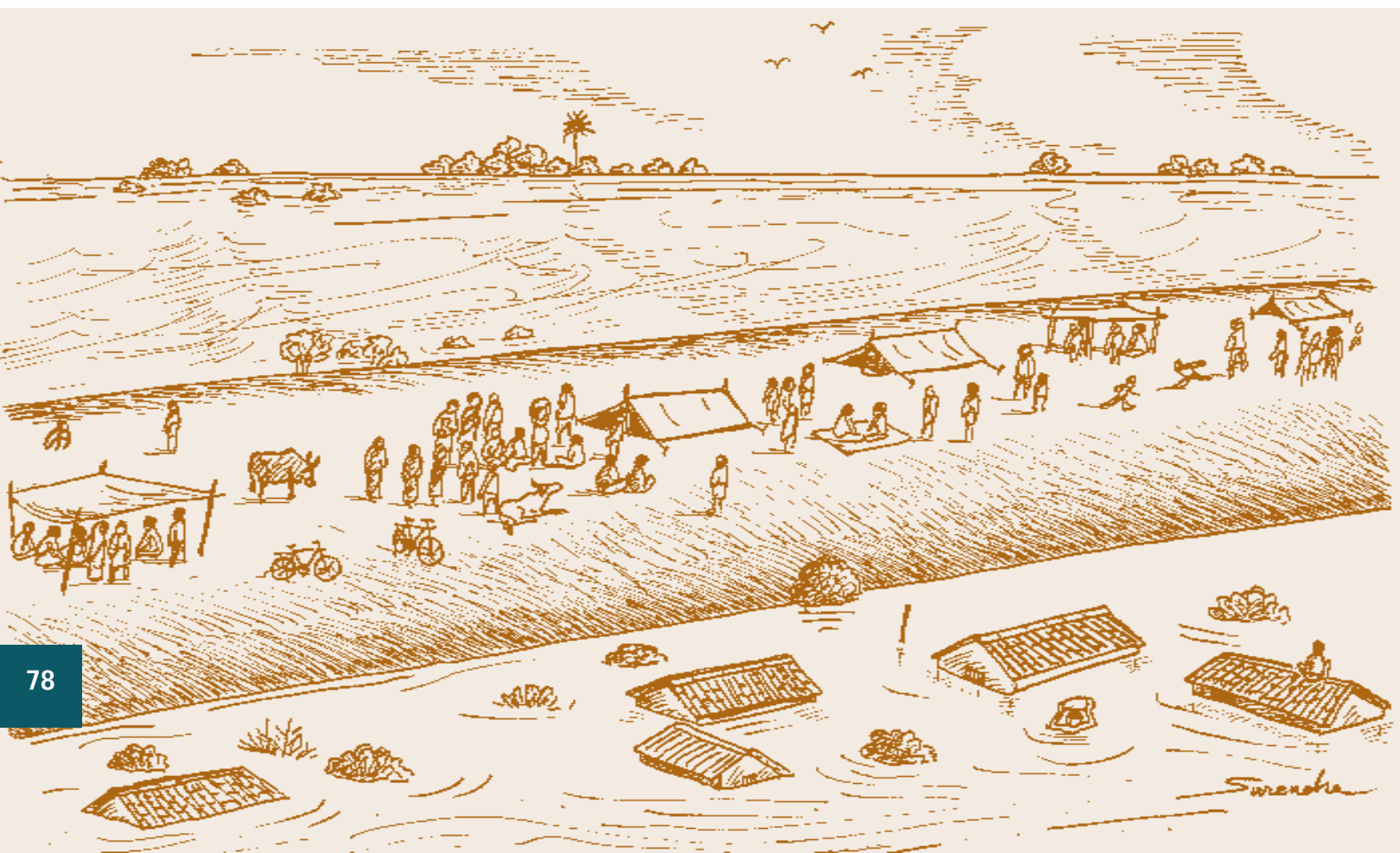
While watershed activities had substantial benefits in all locations, other livelihood strategies such as migration and the development of non-farm livelihood activities to augment traditional agricultural income sources remained essential.

lack strong NGO presence and capacity. Poor access to funding sources and lack of programme focus are a major limitation. Watershed development programme activities are concentrated mostly in regions vulnerable to droughts and continue both in normal and drought years. Much of the watershed programme implementation is facilitated by NGOs leading to their sustained presence locally and growth in their capacity. Limitations of NGOs notwithstanding, watershed programmes create a tangible link between long-term development and drought mitigation. In most flood prone regions similar tangible links are absent. As a result, while NGOs are often directly involved in flood disaster response, their involvement in long-term flood

mitigation and development activities has been limited. The case of the Orissa Cyclone illustrates this well.

The Orissa Cyclone in 1999 was, in many ways, a watershed point with respect to NGO involvement in flood and non-drought, climate-related disaster response in India. The cyclone killed nearly 9,000 people and 4,40,000 livestock in a thirty-six hour period starting 29 October.<sup>63</sup> In some locations over 75% of traditional houses were destroyed.<sup>64</sup> In response, approximately 40 local and international NGOs established the Orissa Disaster Mitigation Mission to coordinate their own relief and restoration activities and to coordinate with the government. The activities of these NGOs included the following:

Watershed development and rainwater harvesting programmes are not a panacea for drought.



1. Immediate relief, including the provision of cooked food, shelter and medical services,
2. Interim food security and revival of institutions such as schools and social organisations in the immediate post-relief period; and, to a certain extent,
3. Long-term activities to restore livelihoods and reduce vulnerability.


NGO involvement in immediate disaster relief was extremely high. Government and international donor funds poured into Orissa and NGOs were at the forefront in the actual delivery of relief supplies and services. In many cases, this included such vital and difficult to achieve activities as the delivery of cooked food into regions where, despite food availability, local populations lacked the capacity to cook it and were, as a result, on the verge of starvation.

In the period immediately following the cyclone, government and donor funds for rehabilitation activities continued to pour into Orissa. During this period, many NGOs initiated interim and long-term mitigation activities that involved attempts to restore and initiate non-farm livelihoods, promote the formation of micro-credit organisations and encourage the formation of self-help groups. In addition, resources were used to construct multi-purpose cyclone shelters and strengthen community disaster preparedness systems through training and planning activities. Sustaining these efforts has unfortunately not always proved

possible. As Aurobindo Behera, the Managing Director of Orissa's 'State Disaster Management Authority' commented in 2002: 'NGOs that could mobilise resources went ahead with long-term development initiatives even as others withdrew from the scene'.<sup>65</sup> Reviews of international assistance in the wake of the Orissa cyclone emphasised the links among relief, rehabilitation and long-term development.<sup>66</sup> These and the emerging global consensus regarding the importance of recovery activities that reduce vulnerability probably contributed to initiatives, such as that undertaken by UNDP following the 2001 floods in Orissa, that sought to reduce vulnerability by revising rice planting dates.<sup>67</sup>

The above said, in the case of the Orissa cyclone the rehabilitation activities supported by international NGOs were often less effective than immediate relief activities and were often subject to donor-defined time constraints.<sup>68</sup> As a result, the strength of NGO activities gradually dissipated. Groups that were able to raise funds gradually shifted their primary focus back to long-term development, while others pulled out. In 1999-2000, immediately following the cyclone, central government allocations from the National Fund for Calamity Relief to Orissa totalled IRs 8,281.5 million<sup>69</sup> far more than the IRs 350 million provided by the same source to mitigate drought in 2000-2001. Flood and cyclone relief often involves huge surges of water and funds followed by a relative scarcity of both.

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 NGO involvement in long-term flood mitigation occurs at much lower levels than in the case of drought.



The situation in Orissa has many parallels with the conditions in the Nepal Tarai, Bihar and eastern Uttar Pradesh, where the case studies for this project were carried out. NGOs, which work on flood-related issues, are rare and they have relatively limited capacities. They are often dependent on just a few international donors, such as OXFAM. When donor priorities shift or donors reduce their focus on a given

area, there are few alternative sources of finance and the NGO activities decline. Only a few high profile NGOs, such as the Gorakhpur Environmental Action Group, are able to develop the capacity to tap into diverse sources of international and other financing and, with this, slowly build their own capacity to deliver support that links flood mitigation with overall development.

## LINKS TO EMERGING DEBATES OVER DEVELOPMENT AND DISASTER MITIGATION

Emerging global perspectives on disaster response and mitigation emphasise the central role played by livelihood systems and entrenched institutional relations in the creation and re-creation of vulnerability.

The above analysis of the changing social and hydrological context and the institutional environment surrounding flood and drought mitigation highlights three core issues:

1. The social, the economic and indeed the hydrological context in which floods and droughts occur is undergoing processes of transformative change where urban-rural inter-linkages heavily influence the vulnerability of livelihoods;
2. The institutional history and context of development and disaster mitigation has produced a relatively narrow range of governmental responses that focus on structural measures for water control and disaster relief as the primary mechanisms for responding to floods and droughts and ignore on the role of social institutions; and
3. The involvement of civil society and NGOs in flood and drought relief and mitigation recognises the importance of community institutions and local livelihood systems as central to both long-term development and disaster mitigation but such organisations have had a hard time translating that recognition into programmes with the sustained financial basis required for widespread implementation. Particularly in flood-prone areas, where major, sustained sources of finance for mitigation, like that for watershed programmes in drought-prone areas do not exist, the continuity of support to communities is poor. Furthermore, even in areas where watershed activities are implemented most interventions are structural (investments in the physical treatment of watersheds) and only poorly recognise urban-rural livelihood links.

Emerging global perspectives on disaster response and mitigation emphasise the central role played by livelihood systems and entrenched institutional relations in the creation and re-creation of vulnerability. In their classic analysis of disaster vulnerability, *At Risk*, Wisner, Blaikie, Cannon and Davis emphasise the central role of governance in risk reduction and the need to build risk reduction into sustainable development.<sup>70</sup> They also emphasise the need to reduce risks by improving livelihood opportunities and list a series of measures that are central to this. They include the following:

- *Diversifying income sources* for the vulnerable within and outside the agricultural sector, with a view to capital formation and the building up of assets of their own.
- *Diversifying agricultural production* and the crops grown.
- *Increasing food security* by enhancing local subsistence production (returns to labour and land, and reduction of risk through climatic variation).
- *Facilitating local networks* of support and risk awareness.
- *Strengthening local coping mechanisms* through the decentralisation of decision making.
- *Developing 'buffers'* (including food, cash savings and accessible forms of insurance) to cushion the trauma of disasters.
- *Developing crops and seeds storage* (e.g. community grain banks).
- *Securing increased, equitable access to key resources* for those 'at risk' (including natural and financial resources – see below – as well as logistical and informational resources such as timely information about extreme events, transportation where evacuation is required,

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Effective governance  
is central to risk  
reduction.



For building roads and bridges in the lower Ganga Plains, stone are imported from the hills.

The context of rural life in India and Nepal is dynamic and is undergoing fundamental changes, but approaches to flood and drought mitigation are relatively static.

- shelter, emergency health services, communication with relatives, etc.)
- *Challenging the structures of domination* that impede the equitable distribution of livelihood resources (including urban and rural land reform, dissemination of knowledge about land law, and vigorous public oversight and regulation of privatised services such as water and electricity).
  - *Developing micro-credit* and small-scale, decentralised banking systems.
  - *Public provision of universal education and health care in the longer-term* and subsidies allowing universal coverage within privatised or mixed delivery systems in the short-term.
  - *Recognising the importance of the local state, the municipality and mediating institutions (NGOs) as facilitators* of access to key resources for livelihood sustainability.
  - *Giving the necessary encouragement, funding and facilities for women's empowerment*, through actions such as adult literacy classes, training in interpersonal skills, accounting, managing public meetings, etc., savings clubs, women-only micro-credit and training to combat the threats present after disasters (for example, polluted drinking water, epidemic disease in children).<sup>71</sup>

Many of the above measures for improving livelihoods parallel the wider processes of economic evolution

within society. As rural-urban inter-linkages and the peri-urbanisation of rural areas increases, opportunities for income diversification also increase, as do opportunities for information flow, communication and access to institutions and social networks that extend beyond the bounds of flood or drought-affected areas.

Unfortunately, these wider perspectives are poorly integrated into the flood and drought mitigation activities currently being undertaken by governments and often also by NGOs, in India and Nepal. Investment by governments tends to focus heavily on structural measures for water control. While programmes such as the watershed programme in India are beginning to develop a link between drought mitigation and long-term development, most of the budget is tied to the construction of watershed treatment structures and may have relatively little relationship to livelihoods or to the wider processes of change. Furthermore, in flood-prone areas long-term activities similar to the watershed programme in drought-prone areas do not exist. Thus, there is no substantive link between development processes at the community level and reductions in vulnerability to flooding.

Overall, although context of rural life in India and Nepal is highly dynamic and is undergoing fundamental changes, approaches to flood and drought mitigation are relatively static. They focus on building physical structures for water

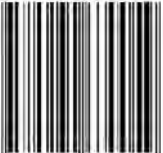
control and place little emphasis on the role livelihood systems play in the creation and reproduction of vulnerability at the household level. The case studies in the next section

of this report examine dynamics at the household level and what people in a series different regions are actually doing to respond to floods, droughts and climatic variability.

## Endnote

- <sup>1</sup> Much of the information on which this section is based was collected in collaboration with the British Geological Survey COMMAN project.
- <sup>2</sup> Censuses of India, 2001, 1991, 1981
- <sup>3</sup> <http://www.censusindia.net/>
- <sup>4</sup> Classes VI, V and IV towns with less than 20,000 inhabitants
- <sup>5</sup> Dev (2002)
- <sup>6</sup> *Ibid.*
- <sup>7</sup> Srivastava (1998) and Dev (2002)
- <sup>8</sup> Dev (2002)
- <sup>9</sup> Adger, Kelly *et al.* (2002)
- <sup>10</sup> Shakya (2002)
- <sup>11</sup> Start (2001)
- <sup>12</sup> Sundaram (2001) and Dev (2002)
- <sup>13</sup> Sundaram (2001)
- <sup>14</sup> Wage rates for 1999-2000 normalised to 1993-94 prices.
- <sup>15</sup> Start (2001)
- <sup>16</sup> Deb, *et al.* (2002)
- <sup>17</sup> Personal communication, Himanshu Kulkarni, ACWADAM, Pune
- <sup>18</sup> Moench (1988)
- <sup>19</sup> Gyawali, Schwank *et al.* (1993)
- <sup>20</sup> McGee (1991)
- <sup>21</sup> Gyawali, Schwank *et al.* (1993)
- <sup>22</sup> Centre for Science and Environment (1982; and 1985)
- <sup>23</sup> Thomas (1971)
- <sup>24</sup> World Bank and Ministry of Water Resources, Government of India (1998)
- <sup>25</sup> Burke and Moench (2000)
- <sup>26</sup> Bandara (1977)
- <sup>27</sup> Kahnert and Levine (1989) and Ilich (1996)
- <sup>28</sup> Personal communication, CGWB officials attending the IWMI strategic review meeting, October 3, 2003, New Delhi.
- <sup>29</sup> Rogers, Lydon *et al.* (1989); Centre for Science and Environment (1991); Mishra (1997); Dixit (2002), Gyawali (2003) and Chaturvedi and Saroch (2004)
- <sup>30</sup> Dhawan (1988); Shah (1993); World Bank and Ministry of Water Resources - Government of India (1998); Moench (2003); Shah, Roy *et al.* (2003)
- <sup>31</sup> Kaczmarek, Kundzewicz *et al.* (1996)
- <sup>32</sup> Gyawali (2003)
- <sup>33</sup> Pradhan (1989)
- <sup>34</sup> Gyawali (2001)
- <sup>35</sup> Gyawali and Schwank (1994); Gyawali and Dixit (2000)
- <sup>36</sup> Thompson *et al.* (1986); Ives and Messerli (1989)
- <sup>37</sup> See Rana (1996)
- <sup>38</sup> WECS, Water Plan June (2003)
- <sup>39</sup> This section by M.S. Rathore and Srinivas Mudrakartha
- <sup>40</sup> Narain, Sharma *et al.* (2000)
- <sup>41</sup> Rao (1994)
- <sup>42</sup> IJAE (1994)
- <sup>43</sup> Rao (1994)
- <sup>44</sup> In comparison with other anti-Poverty programmes, PDS turns out to be the costliest. As the fact is that if only the Central Government costs are considered, an amount of Rs 4.27 was incurred to transfer one rupee of income to poor.
- <sup>45</sup> For detail survey see S. M. Jharawal (1998) 'Public Distribution System in India', Manak Publication Pvt. Ltd. New Delhi.
- <sup>46</sup> Government of India, Ministry of Water Resources (2000)
- <sup>47</sup> As cited in D'Souza (a) (1999)
- <sup>48</sup> D,Souza (1999)
- <sup>49</sup> Agarwal and Chak (1991)
- <sup>50</sup> Roy (2000)
- <sup>51</sup> *Ibid.*
- <sup>52</sup> Krishankumar (1999)
- <sup>53</sup> The Times of India (1999)
- <sup>54</sup> RBA (1980)
- <sup>55</sup> Tiwari (1999)
- <sup>56</sup> Sinha, Flooding in Bihar (2002)
- <sup>57</sup> Lok Sabha, Unstarred Question No. 4301, 12.08 2002
- <sup>58</sup> Smt. Bijoya Chakarborty, Minister of State in the Ministry of Water Resources replying to a question asked by MP Laloo Prasad Yadav, Rajya Sabha, Unstarred Question No 3377, 22.04.2003
- <sup>59</sup> Ministry of Water Resources (2000)
- <sup>60</sup> The welcome emphasis on the need to incorporate disaster mitigation into development activities in the Tenth Five-Year Plan document marks a distinct change from this history. This emphasises information and non-structural forms of mitigation (such as the development of insurance systems) and, if implemented, could initiate a major progressive departure from India's hardware focused history of disaster mitigation. (Government of India, Tenth Five-Year Plan : 2002-07, Chapter 7)
- <sup>61</sup> Chopde, Pastakia *et al.* (2003)
- <sup>62</sup> Ministry of Rural Development (2001)
- <sup>63</sup> Behera (2002)
- <sup>64</sup> (IMM Ltd. 2001) Citing a CRS report entitled: 'Baseline Livelihood Survey of CRS/DFID Livelihood Restoration Project' CRS Bhubaneswar.
- <sup>65</sup> Behera (2002)
- <sup>66</sup> IMM Ltd. (2001)
- <sup>67</sup> UNDP (2001)
- <sup>68</sup> International NGO Training and Research Centre INTRAC (2000)
- <sup>69</sup> Lok Sabha Unstarred Question No. 3324, dated 06.08.2002 - [www.IndiaStat.com](http://www.IndiaStat.com)
- <sup>70</sup> Wisner, Blaikie *et al.* (2004)
- <sup>71</sup> *Ibid.*

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