

The Role of Local Institutions in Adaptation to Climate Change¹

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Glossary for Key Terms Used in the Paper³

Adaptation: actions and adjustments undertaken to maintain the capacity to deal with stresses induced as a result of current and future external changes (Nelson et al. 2007:396, Alland 1975).

Adaptive Capacity: preconditions that enable actions and adjustments in response to current and future external changes; dependent both on social and biophysical elements (Nelson et al. 2007: 397).

Community: group of individuals united by commonality of purpose, characteristics, beliefs, and/or actions. Most communities are also internally differentiated (Agrawal and Gibson 1999).

Coping: use of existing resources to achieve various desired goals during and immediately after unusual, abnormal, and adverse conditions of a hazardous event or process. The strengthening of coping capacities, together with preventive measures, is an important aspect of adaptation and usually builds resilience to withstand the effects of natural and other hazards.

Decentralization: downward redistribution of resources, responsibilities, and decision-making powers in a territorial and administrative hierarchy.

Institutions: humanly created formal and informal mechanisms that shape social and individual expectations, interactions, and behavior (Ostrom 1990, North 1990, Bates 1981). Institutions structure and shape outcomes through the actions of individuals and decision makers associated with them. To understand their impacts it is necessary to examine their internal processes, external relationships, and linkages with different social groups and households.

Institutional Access: degree to which households and different social groups in a given location are connected to institutions and have the ability to gain institutional benefits as a result of such connections.

Institutional Articulation: extent to which different institutions in a given territory are linked to each other, and the nature of such linkages.

Livelihoods: comprise the capabilities, and material and social assets necessary for a means of living; includes the idea of coping with and recovery from external stresses

³ The definitions provided in the glossary are drawn from a broad selection of literature on climate change and adaptation. Because the field is growing rapidly, many of the definitions remain works in process. A number of other World Bank documents and papers place somewhat different emphases on the key terms used in this paper, partly because of the differing emphases and purposes. See, for example, Heltberg et al. 2008, and World Bank, forthcoming.

(Carney 1998, Chambers and Conway 1992, Scoones 1998), and the sustainability of the resource base on which livelihoods depend (Ashley and Carney 1999, Norton and Foster 2001).

Mitigation: actions and policies that reduce exposure to climate change, for example, through regulation and institutional changes, technological shifts, alterations in behaviors, or change in location (Nelson et al. 2007).

Organizations: concrete manifestation of institutions with an identifiable location, personnel, and rule structure. For this paper, classifiable into three broad, sometimes overlapping sectors: public (bureaucratic administrative units, and elected local governments), civic (membership and cooperative organizations), and market sectors (service and business organizations) (Uphoff and Buck 2007: 47).

Resilience: the amount of change a system can undergo and still retain the same function and structure while retaining options to develop in desired directions (Berkes et al. 2003, Holling, 1973, Nelson et al. 2007).

Territorial Development: an approach to development focusing on productive transformation of agricultural and non-agricultural activities in a well-defined distinct territory through institutional development that links people, local governments, economic and civil society organizations, and higher level government institutions (de Janvry and Sadoulet 2004). The heterogeneity of territories necessitates careful modulation of public policies to meet the needs of affected parties in a given territory.

Terroir: a socially and geographically defined space within which community resources and associated rights are located in order to satisfy their needs (FAO 2003).

Vulnerability: the susceptibility of a system to disturbances and loss, determined by exposure to perturbations, sensitivity to perturbations, and the capacity to adapt (Smit and Wandel 2006). The nature of perturbations (slow onset or sudden and episodic) and the location of the system in the risk cycle are crucial in shaping vulnerability.

The Role of Local Institutions in Adaptation to Climate Change

Arun Agrawal

1. Introduction

The most important implications of climate change from the perspective of the World Bank concern its potentially disastrous impacts on the prospects for development, especially for poorer populations in the global South. Earlier writings on climate change had tended to focus more on its links with biodiversity loss, spread of pathogens and diseases, land use planning, ecosystem change, and insurance markets, rather than its connections with development (Easterling and Apps 2005, Harvell et al. 2002, Tompkins and Adger 2004). But as the Social Development Department of the World Bank recently noted, “Climate change is the defining development challenge of our generation” (SDV, 2007: 2). These words echo the World Bank President Robert Zoellick’s statement at the United Nations Climate Change Conference in 2007 in Bali where he called climate change a “development, economic, and investment challenge.” Indeed, understanding the relationship between climate change, the human responses it necessitates, and how institutions shape such responses is an increasingly urgent need. This study directs attention towards a subset of such relationships, focusing on rural institutions and poor populations in the context of climate variability and change-induced adaptations.

It is critically important to understand better the role of institutions in shaping adaptation, especially the role of local institutions, if adaptation to climate change is to help the most vulnerable social groups. Not only have existing institutions affected how rural residents responded to environmental challenges in the past, they are also the fundamental mediating mechanisms that will translate the impact of external interventions to facilitate adaptation to climate change. Institutional arrangements structure risks and sensitivity to climate hazards, facilitate or impede individual and collective responses, and shape the outcomes of such responses. Understanding how they function in relation to climate and its impacts is therefore a core component in designing interventions that can positively influence the adaptive capacity and adaptation practices of poor populations.

Attending to the role of institutions has become especially important as climate change and its impacts move from being the pet obsession of a few atmospheric scientists to becoming the subject of both dinnertime conversations and intense scholarly exchanges. The changing politics of climate change and adaptation, and the relevance of climate change to development trajectories is a result of the extraordinary diverse ways in which climate change will produce ubiquitous effects (Chopra et al. 2006).

Indeed, the concern about climate change is pervasive because of the all-encompassing and multi-dimensional nature of climate impacts. Droughts, higher temperatures, flooding, sea-level rise, heat waves, more intense storms, and greater uncertainty in weather patterns translate into more widespread diseases, greater biodiversity loss, crop losses, and system transformations which in turn imply major social and economic dislocations and threats to livelihoods of the poor. The impacts of climate change are likely to be especially severe in social and ecological contexts of arid and semi-arid regions, colder and polar areas, and coastal locations where livelihoods are

often already stressed and additional adverse biophysical and social changes can be overwhelming.

The popular consensus on the reality of climate change, its human causes, and the severity of its impacts may not be very old,¹ but most scholarly and policy literature holds that poor, natural resource-dependent rural households will bear a disproportionate burden of adverse impacts (Kates 2000, Mendelsohn et al. 2007, Ribot et al. 1996, Smith et al. 2003, and Thomas and Twyman 2006). Certainly, in many parts of the world, these effects are already in play with potentially disastrous consequences for the poor (Adger et al. 2005, Adger et al. 2007). But the rural poor² have also successfully faced threats linked to climate variability in the past, even if climate change likely increases the expected frequency and intensity of such threats (Mortimore and Adams 2001, Scoones 2001). The success of historically developed adaptation practices among the rural poor depends crucially on the nature of prevailing formal and informal rural institutions.

Historical experience and knowledge about adaptation possibilities is critical to future policy formulations regarding adaptation. This is because the specific nature of climate change impacts continues to be uncertain, especially for small territorial units,³ even as it is evident that the general impacts of climate change will be striking and long lasting if current trends continue. Future efforts to address climate change and craft strategic initiatives to enhance rural poor's adaptive capacity can therefore profitably examine historical adaptive responses, their institutional context and correlates, and the role of institutions in facilitating adaptation. Indeed, documenting, understanding, and learning from past institutional experiences and crafting interventions that strengthen historically proven collective efforts and institutions is a critical first step. It is also potentially one of the most effective mechanisms in the multi-stranded effort to address the adverse drastic as well as long-term impacts of climate change.

The paper develops its argument about the role of institutions by proposing an analytical classification of historically observed adaptation practices. It then uses the familiar distinction between public, civic, and private domains and insights from the literature on network analysis to survey important recent writings work on adaptation, and outlines a framework through which to view the relationship between adaptation due to climate change, livelihoods of the rural poor, and the role of institutions in facilitating external support for adaptation.⁴ The Adaptation, Institutions and Livelihoods Framework in figure 1 shows the critical role of institutions in thinking about climate change and adaptation. Institutions structure the impacts of climate risks on households in a given ecological and social context, and shape the degree to which the responses of households are likely to be individually or collectively oriented. They also mediate the influence of any external interventions on adaptation practices. The exact manner in which institutions generate these effects depends on a large variety of factors, among them the nature and severity of climate events and trends, the local context and household and community endowments, the larger set of social and political factors within which institutions function, and obviously, the interests of those whose decisions and actions institutions translate into actions and outcomes.

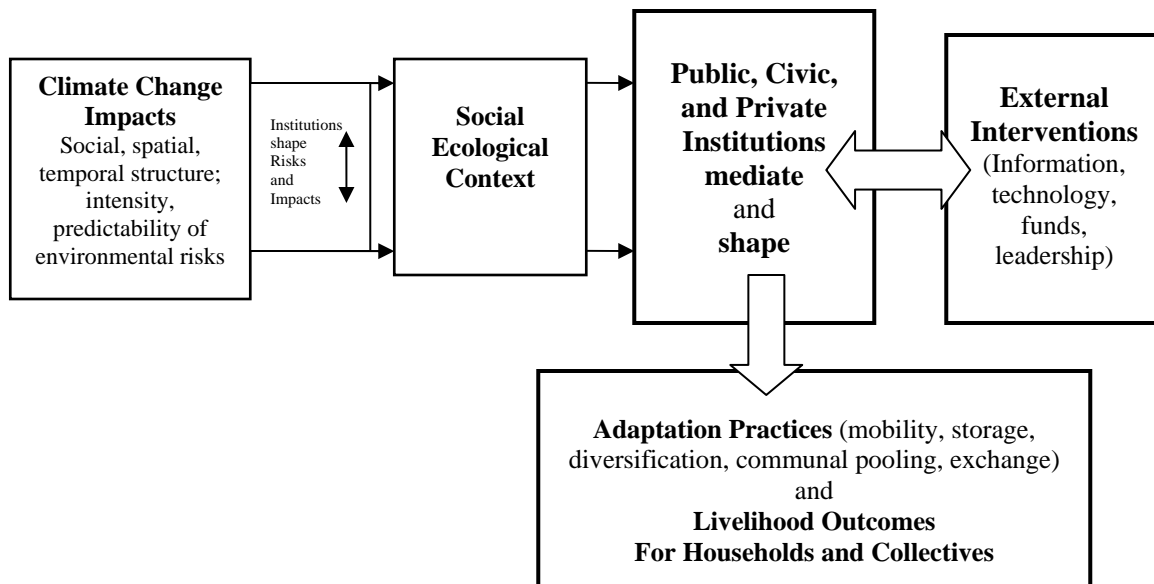


Figure 1: Adaptation, Institutions, and Livelihoods Framework

After examining the relationships between climate related vulnerabilities, adaptation practices, institutions, and external interventions, the paper applies the AIL analytical framework to nearly 300 cases of adaptation practices drawn from the UNFCCC’s coping strategies database, and the most desired adaptation projects selected by nearly 15 countries in their National Adaptation Programmes of Action. It thus shows how local rural institutions can serve as anchors and scaffolding to reinforce the adaptive capacity and adaptation practices of the rural poor. The lessons from this discussion are finally applied to three different types of World Bank climate-related projects to draw out the operational significance of institutional analysis in the context of climate change.

2. Climate Change, Development, and Adaptation

The core manifestations of climate change comprise gradual changes in mean temperatures and precipitation, greater range in seasonal and inter-annual variation, increased frequency and intensity of extreme events, and potentially catastrophic transformations of ecosystems (Tompkins and Adger 2004). These manifestations will correlate with both slow-onset hazards such as erratic rainfall, sea level rise, water table changes, and increasing temperatures, and rapidly unfolding phenomena such as droughts, floods, failure of rains and crops, and storm. They will lead to greater exposure and sensitivity (see glossary) of rural populations through three major impacts on their livelihoods: increase in environmental risks, reduction in livelihoods opportunities, and in consequence, greater stresses on existing social institutions.

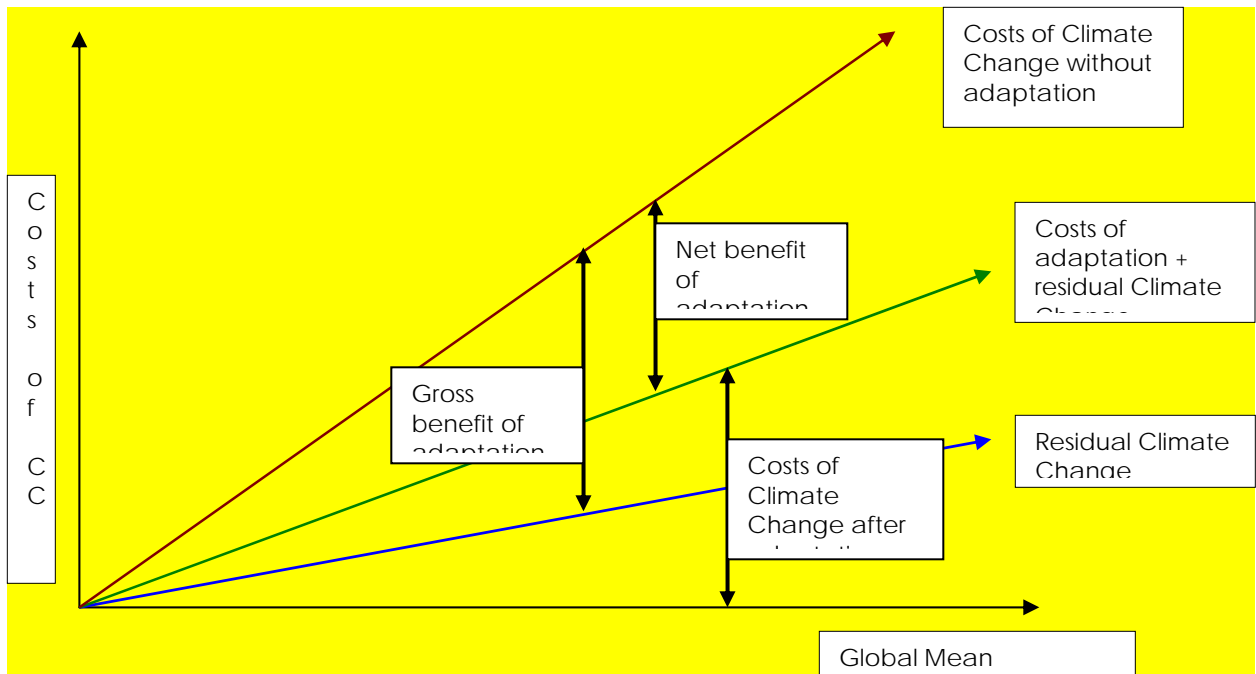


Figure 2: Stylized Relationship between Costs of Adaptation and Climate Change (from Stern Review, 2006).

Because of the lagged relationship between emissions and their future impacts, past and current emissions have already committed the planet to appreciable changes in climate. No matter the scope of future mitigation efforts, therefore, adaptation is necessary to reduce the impact of committed changes in climate. The greater the delay in lowering emissions to a point where they are no greater more than the capacity of the planetary carbon sinks to absorb, the stronger will be the need for more wide-ranging adaptations. Given that current emissions are somewhere between three and five times the absorptive capacity of the planet and a resolution to negotiations on global emissions is urgent but nowhere in sight, planning for adaptation continues to become increasingly urgent. At the most general level, then, adaptation is necessary because some climate change, with attendant effects on human existence, is already inevitable.

But beyond the inevitability of changes in climate, planning for and implementing strategies to promote adaptation is necessary for four additional reasons (see figure 1 above): increasing knowledge about future impacts of climate change (IPCC 2007b), existing experience of historical forms of adaptation which provide strategic lessons about the suitability of different forms of adaptation in different contexts (Adger et al. 2005, Finan and Nelson 2001), potentially larger negative social, economic, and ecological effects of unplanned adaptation (Adger et al. 2006), and potentially greater costs of adaptation, especially for poorer populations, the longer the delays in initiating adaptation.⁵

2.1 Development, Adaptive Capacity and Adaptation

Adaptation to climate impacts will necessitate changes in response to multiple types of stresses, across multiple scales, and by many actors who may sometimes work at

cross-purposes. Learning from past experiences and planning adaptive responses is therefore especially important in the context of development. Indeed, development strategies, focusing successively over the past half century on growth, equity, and/or sustainability need also to incorporate adaptive concerns to be of relevance to the increased risks that climate change poses. The problems of poverty, inequality and oppression, and resource overuse to which development as growth, as equity, and as sustainability has been a solution are pertinent to address several dimensions of vulnerability of marginal populations. But it is also possible to address these problems, especially poverty and inequality, without sufficiently attending to vulnerabilities related to a lack of resilience and adaptive capacity.

Consider a familiar example. A climate-related shock to livelihoods, e.g. a drought in a semi-arid region, has the potential to devastate the livestock owned by a household. Development interventions that increase the milk or meat yields from herds without increasing their capacity to survive in the face of fluctuations in fodder availability can potentially increase total yield for the herd owner, but fail to smooth fluctuations across time periods. In the same agro-ecological context, privatization of land parcels can increase tenure security and encourage landowners to invest in the improvement of territorial infrastructure. But improvements may yield indifferent returns because of spatial and temporal fluctuations in rainfall that exacerbate household and community level vulnerability. However, if land is under open access in dry seasons, livestock-owning households can migrate to take opportunistic advantage of areas where forage is available – indeed, this is the strategy many of them use in drier areas of Sub-Saharan Africa, Mongolia, and western India (Agrawal 1999). On the other hand, development of drought resistant breeds of cattle, and land tenure regimes that permit mobility can lead to lower overall output in terms of fodder, milk, or meat, but also go together with greater capacity to withstand climatic variability.

Indeed, one of the more likely impacts of climate change is greater climate variability. With increasing climate variability, development interventions that do not attend to vulnerability, adaptive capacity, and resilience may end up worsening the situation of those they seek to benefit (see box 1). Efforts to address vulnerability of the poor and to improve adaptive capacity require deeper attention to institutions at multiple scale, and careful planning to ensure that institutions can work to help poorer groups who are most at risk from increasing volatility in climate phenomena and their human impacts. They live close to subsistence margins, and variations in earnings and livelihoods capabilities are far more likely to plunge them below the margin in comparison to the relatively well off who can draw upon a variety of capitals, assets, and institutional networks in times of stress.

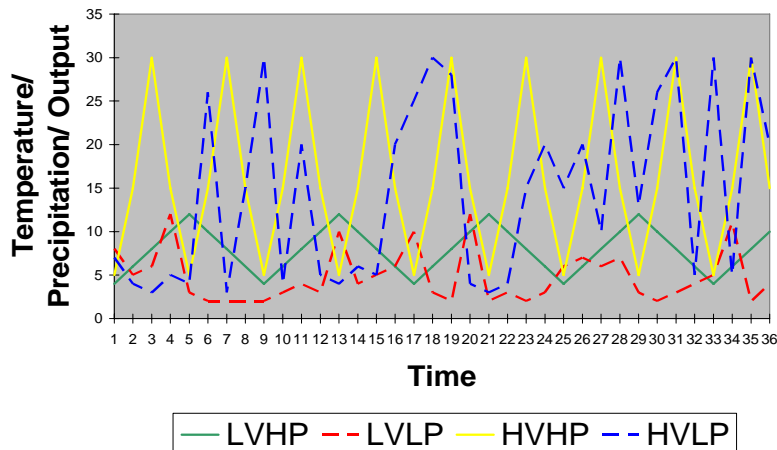
Box 1: Development Strategies and Climate Change Effects

Since the mid-1940s, development interventions have tried to address specific goals of social change: growth, growth with equity, and sustainability. These goals of development interventions have broadly attempted to ameliorate the problems of poverty and underdevelopment, inequality, and resource scarcities/pollution. Impending climate change makes it necessary that development policy-makers and practitioners attend to a new set of problems related to climate risks and vulnerability.

Climate change, through changes in temperature and precipitation, can produce four

major classes of impacts on rural livelihoods. These are indicated in the figure below through four illustrative curves denoted by a) low variability, high predictability (LVHP – green, solid curve); b) low variability, low predictability (LVLP – red, dotted curve); c) high variability, high predictability (HVHP – yellow, solid curve); and d) high variability, low predictability (HVLVP – blue, dotted curve). Development strategies that continue to focus on ameliorating poverty, inequality, and resource scarcities are likely also to be at least somewhat effective in addressing climate change effects that are characterized by high predictability.

Forms of Environmental Variability



But without explicitly attending to adaptation and adaptive capacity, existing development strategies are likely to founder when confronting climate change that affects livelihoods significantly and unpredictably. This differentiation is especially important in view of the fact that many observers of climate point specifically to elements of discontinuity, irreversibility, and surprise in future climate change impacts.

In considering climate impacts it is necessary to attend to their frequency, periodicity, intensity, and timing to understand how they impact adaptive capacity. The dynamics of risk exposure can be crucial in determining both the sensitivity and adaptive capacity of social groups and households. Repeated and unpredictable exposure to risks can drastically reduce the ability of even households with high adaptive capacity to cope or respond effectively to risks. Thus the adaptive capacity of a household or community may be significantly depleted as a result of a recent major shock to its livelihoods and assets; similarly, communities and households that face regular occurrences of particular climate hazards are more likely to have developed adaptive responses over time as long as the scale of the hazard is not such as to wipe them out (Davies 1996).

2.2 Climate-Specific Adaptations

Adaptation has had a complex history even as it has come to be broadly accepted to signify the ways in which human societies will need to adjust to climate change. Adaptations to environmental risks, including those associated with climate change are especially necessary in regions that are already ecologically stressed. These include drylands and semi-arid areas, low-lying coastal regions, and colder and mountain

environments. This review focuses especially on semi-arid and coastal environments in light of the available data.

Increasing temperatures, greater precipitation, more extreme events, and greater variability in them mean that agriculture-based livelihoods in drier parts of the world will likely require major technological inputs as well as significant institutional adjustments. As the variability of rainfall and mean temperatures increase, semi-arid regions will experience higher levels of land degradation, crop damage and failure, livestock deaths, and wildfires. Increased water and heat stress will also lead to greater risks of food and water shortage, malnutrition, health problems, and forced migration.

Low-lying coastal areas, especially islands are similarly exposed to significantly greater threats. These include more intense storms and coastal flooding, and higher risks of coastal erosion and inundation. With sea-level rise it is likely that there will be more frequent devastating storm surges. These phenomena are projected to lead to a loss of more than a third of coastal wetlands around the globe, greater erosion of beaches, higher levels of coral bleaching, and the possibility of greater salinity in coastal freshwater systems. Collectively, millions of households in coastal areas may be devastated because of damage to infrastructure, settlements, and facilities necessary for life and livelihoods. Since many coastal areas support very high densities of human population, permanent relocation of human settlements may prove generally infeasible. Climate change will therefore require significant investments in infrastructure facilities but also extensive institutional buffering in the wake of disasters.

It is worth noting that much of the current work on options for adaptation in semi-arid and low-lying coastal areas has tended to devote far greater attention to technological and infrastructure alternatives for reducing vulnerabilities and enhancing adaptive capacity at the expense of attending to social or institutional alternatives. Take as an example the IPCC Fourth Assessment Report (AR4) which examines adaptation options in coastal regions and their costs. Even as it locates impediments to adaptation in such factors as social resistance to change, weak governance, fragmented and ineffective institutional arrangements, inadequate knowledge of coastal conditions, lack of information on key vulnerability indicators and absence of data on existing indicators goes on to talk about embankments, dykes, flood proof buildings, sand dune replanting, levees, and sea walls as the measures needed for adaptation (Nicholls et al 2007: 340-44). However, such infrastructure enhancement measures may prove both more costly and less effective than efforts which combine governance and institutional interventions with technical and capital improvements.

What is also important from an adaptive development perspective is that without adequate attention to the institutional and social contexts of technical or infrastructure interventions, the likelihood is very high that richer, more powerful agents will appropriate the benefits of such interventions. The history of development interventions for the past half century suggests that even when development projects are specifically designed with the poor in mind, better-off groups often end up benefiting disproportionately. When the interests of the poor are not considered explicitly, they are even more likely to produce inequitable outcomes. It is therefore critically important to examine the institutional and social linkages of adaptation interventions even when such interventions are only technical or capital-intensive in nature. Indeed, at present the state

of knowledge about how technological, capital, and institutional interventions may be combined cost effectively is far from satisfactory.

2.3 Impacts of Climate Change and Vulnerability

Most recent studies on climate change have drawn on earlier work on vulnerability (Bohle et al. 1994, Cutter 1996, Watts and Bohle 1993) and highlighted the fact that vulnerability to climate change is a function not just of biophysical outcomes related to variations and changes in temperature, precipitation, topography and soils, but also of socio-political and institutional factors that can vary significantly at a relatively fine scale (Adger 2006). Thus although climate change is a global phenomenon, adaptation to climate impacts is inevitably and unavoidably local.

Similar changes in greenhouse gas levels, average temperatures, and mean precipitation hide a wealth of diverse impacts across regions, localities, and social groups within localities. This is because even if different areas within a region are exposed to the same climate risks, the sensitivity and vulnerability of different groups to climate impacts varies enormously depending on their institutional links, material endowments, occupational patterns and asset portfolios, and social networks. Especially important in this context is the role of institutions. They affect the impacts of climate-related phenomena, shape the access of individuals and groups to assets and services, and allocate available and external resources by structuring impacts of actions and decisions.

A comparative study of two districts in India strikingly illustrates how local institutional, policy, and micro-ecological variations affect access to resources, levels of vulnerability, and ability to adapt. Anantapur district in Andhra Pradesh India is a drought-prone area exposed to climate change as well as economic liberalization impacts. Growing import competition and stagnant market prices have coincided with a multi-year drought to threaten the principal crop in the district: groundnut. It is difficult for farmers to switch livelihoods. Rain-fed fruit crop varieties require too much capital, and have too short a shelf life to be marketable. Dry-land farmers find themselves in a highly vulnerable position.

In contrast, groundnut farmers in the neighboring district of Chitradurga in Karnataka exhibit lower levels of vulnerability owing to lower climate sensitivity and higher adaptive capacity. They are vulnerable to trade liberalization, but many have taken advantage of available irrigation and state government policies to cultivate alternative crops such as arecanut, pomegranate, and banana. Larger farmers have benefited especially from subsidized drip irrigation, cheap bank credit, crop insurance, and contracts with export companies for gherkin production aimed at European markets. Smaller farmers lack information and depend on local merchants for credit.

The comparison shows the crucial role of institutional barriers vs. support systems. In Anantapur, institutional barriers leave farmers poorly equipped to adapt to climatic and economic stresses. In Chitradurga, institutional support facilitates adaptation to both climatic change and trade liberalization. And such support benefits larger farmers disproportionately. As Brooks et al. (2005: 152-53) note, vulnerability depends critically on context, and is a function of both the hazard and the system in question. (Source: O'Brien et al. 2004).

3. Climate Impacts and Types of Adaptation

Two recent major surveys of climate change and its impacts have identified many areas in which there is now significant scientific consensus about the significant adverse impacts of climate change on agricultural, food, water, social, and ecological systems (IPCC 2007a, 2007b, Stern 2006). There also now exists a well developed body of work around the key concepts of vulnerability, resilience, and adaptation in the context of global environmental change (Janssen et al. 2006). This evidence suggest that climate change will stress existing livelihood options, and even more importantly, make them more unpredictable owing to increased volatility in climate impacts (Rosenzweig and Parry 1994, Pimental 1999, Wandiga et al. 2006, Yohe and Tol 2002).

The problem of increased volatility and risks owing to climate change is especially important. It means that many more vulnerable households can periodically be driven into destitution and hunger and find it difficult afterwards to recover. This is because the incomes and livelihoods of poorer, more vulnerable households, by definition, are closer to the line separating an adequate subsistence from malnutrition and starvation. When variations in climate impacts and consequently in livelihoods increase, it is logically obvious that poorer households will more frequently face declines below subsistence levels. They will need to identify and rely on livelihoods sources that allow them therefore either to smooth consumption to survive through periods of scarcity, or to maintain livelihoods such that they do not dip below subsistence levels.

The role of rural local institutions in this regard is critical. Not only do institutions affect how households are affected by climate impacts, they also shape the ability of households to respond to climate impacts and pursue different adaptation practices, and mediate the flow of external interventions in the context of adaptation. The nature of access of different households and social groups to institutions and institutionally allocated resources is a critical factor in their ability to adapt successfully.

It is clear therefore that development strategies and institutional interventions that focus simply on improving total benefits to poor households without taking into account how households can address fluctuations in their livelihoods are ill-suited to address the impacts of climate change. They are ill suited for two reasons. On the one hand, they ignore a critical feature of climate-related stresses – increased riskiness of livelihoods because of the nature of impacts climate change is likely to generate. Relatedly, they ignore the very real concerns of the rural poor about preventing starvation and destitution. Indeed, a long tradition of scholarship in the social sciences has argued about the extent to which many rural households live close to the margins of subsistence (Scott 1976, Wolf 1969), and seek to avoid drops in livelihoods below subsistence (for a discussion of the links between climate risks and household level livelihoods outcomes, see Rasmus et al. 2008).

There is significant consensus in the literature about the generally adverse impacts of climate change on rural populations, and the hazards through which such impacts will become manifest. Some of this consensus is reflected in the overlap between the different kinds of indicators used to assess vulnerability (see table 1). At the same time, we also face uncertainties in how particular locations and groups will experience and be affected by climate change. Policy interventions can therefore more fruitfully focus on improvements in adaptive capacity of disadvantaged rural populations rather than on identifying specifically how a given group of rural poor in a particular area will be affected by climate change. Efforts to reduce vulnerability and enhance adaptive capacity

of at-risk-groups need to attend especially to proactive approaches that address social processes leading rural poor into vulnerable conditions, and structural inequalities that are often at the root of social-environmental vulnerabilities (Thomkins et al. under review).

Table 1: Key Indicators of Vulnerability at Different Levels
(Adger 1999, Brooks et al. 2005, Eakin 2005)

National/Regional Level (Indicators)	Community Level (Variables)	Household Level (Variables)
1. population with access to sanitation, 2. literacy rate, 15–24-year olds, 3. maternal mortality, 4. literacy rate, over 15 years, 5. calorific intake, 6. voice and accountability, 7. civil liberties, 8. political rights, 9. government effectiveness, 10. literacy ratio (female to male), 11. life expectancy at birth.	1. poverty 2. inequality 3. social capital 4. social entrepreneurs 5. institutional interconnections 6. institutional density 7. institutional effectiveness 8. gender composition 9. cultural factors (whether indigenous) 10. age compositions	1. poverty 2. dependence on risky resources 3. asset portfolios 4. occupations 5. skill sets 6. information availability 7. labor availability 8. institutional access 9. literacy 10. gender balance 11. age distribution

The above table draws attention to three aspects of social and household level vulnerability. In identifying factors such as age composition, gender, and culture as influencing community level vulnerability, it suggests that many of the structural obstacles to development identified by scholars of development are also equally important in thinking about vulnerability to climate change. It is very likely that women, indigenous populations, the very young or the very old, and the poor will suffer more from the effects of climate change. Second, vulnerability is a function not just of the nature and strength of environmental impacts, but also of variations in socio-economic factors. Finally, although there are clearly developed measures of some variables that affect vulnerability, such measures still remain to be generated for others.

Indicators of vulnerability and their specific measures are an initial step in the direction of assessing the extent to which different territories and actors within them will be affected by climate change, and the kinds of adaptation interventions necessary to safeguard their livelihoods. The list of indicators above shows the importance of a wide range of non-climatic variables in shaping the extent to which rural households and communities are susceptible to different environmental risks and the role of institutional linkages, governance factors, and access to different kinds of assets in this regard.

3.1 Historical Experiences of Environmental Risks and Vulnerability

To strengthen the adaptive capacity of the rural poor, therefore, governments and other external actors need to understand, take advantage of, and strengthen already existing strategies that many households and social groups use singly or collectively. In different parts of the world, many rural communities already experience high levels of climate variability and have developed more or less effective responses to address such variability. Much of the Sahelian region, for example, faces extreme irregularity in rainfall with recurrent droughts. A number of scholars have argued, based on available data, that annual rainfall levels in the region have declined together with an increase in inter-annual and spatial variability as well as the intensity of drought events (Hulme et al, 2001, Tarhule and Lamb 2003). In response, farmers have adapted their farming, livestock rearing, and other income generating activities to achieve some degree of sustainability in their livelihoods (Blanco 2006, Nyong et al. 2007). Similar arguments can also be found about the way climate change is already affecting rural landscapes and livelihoods (Howden et al. 2007, Zheng et al. 2006).

3.2: Classes of Adaptation Practices and their Characteristics

A policy-relevant framework for examining adaptation practices in the context of rural institutions and livelihoods needs to be sufficiently general to cover the many empirical examples of adaptation practices used by different social groups, but also needs to be based on an analytical approach that takes into account the most important characteristics of the impacts of climate change on rural livelihoods – likely increases in environmental risks, reduction in livelihoods opportunities, and stresses on existing social institutions.

The basic coping strategies in the context of environmental risks to livelihoods can be classified into five analytical categories of adaptation responses and their combinations: mobility, storage, diversification, communal pooling, and exchange (Halstead and O’Shea 1989 discuss four of these). The effectiveness of these strategies is in part a function of the social and institutional contexts in which they are pursued. Where successful, these responses pool uncorrelated risks associated with flows of benefits from different classes of assets.

Mobility is perhaps the most common and seemingly natural responses to environmental risks. It pools risks across space, and is especially successful in combination with clear information about the spatial and temporal distribution of precipitation. It is especially important as an adaptation strategy for agropastoralists in Sub-Saharan Africa, west and south Asia, and indeed most dry regions of the world (Niamir-Fuller 1999).

In the context of climate change mobility has sometimes been viewed as a maladaptation, in which climatic stresses lead to involuntary migrations on a massive scale with attendant social and political instabilities (Tickell 1990). However, mobility is also a way of life for large groups of people in semi-arid regions, and a long standing mechanism to deal with spatio-temporal variations in rainfall and range productivity. Mobility as an adaptation practice, therefore, is more or less desirable depending on the social groups being considered.

For agricultural populations, mobility can often be the last resort in the face of environmental risks and disruption of livelihoods (McGregor 1994). For pastoralist and agro-pastoralist populations, on the other hand, efforts to limit mobility could lead to

greater vulnerability and lower adaptive capacity (Agrawal 1999, Davies and Bennett 2007). At the same time, frequent movement of people with their animals raise particularly intricate questions about the role of institutions in facilitating adaptation. Most governance institutions are designed with sedentary populations as their target. To address the needs of mobile populations, the role of information in tracking human and livestock movements, and mobile provision of basic services such as health, education, credit, and marketing of animal products is especially important to reinforce adaptive capacity.

Storage pools risks across time. When combined with well constructed infrastructure, low levels of perishability, and high level of coordination across households and social groups, it is an effective measure against even complete livelihood failures at a given point in time. As an adaptation practice to address risks, storage is relevant to individual farmers and communities, and to address food as well as water scarcities. Indeed, in light of the significant losses of food and other perishable commodities all over the developing world, improvements in storage technologies and institutions have immense potential to improve rural livelihoods.

Diversification pools risks across assets and resources of households and collectives. Highly varied in form, it can occur in relation to productive and non-productive assets, consumption strategies, and employment opportunities. It is reliable to the extent benefit flows from assets are subject to uncorrelated risks (Behnke et al. 1993, Ellis 2000, Sandford 1983). Diversifying households typically give up some returns in exchange for the greater security provided by diversification. Davies and Bennett (2007) provide a striking example from the Afar pastoralists of Ethiopia where many of them would be willing to live with some level of poverty in exchange for reduction in vulnerability. More typical forms of diversification are those reported by Young and Lipton (2006) for the Quechua in Peru. Quechua households living near the Huascarán National Park in north-central Peru have described significant changes in climate occurring within their lifetimes. Impacts of these changes include retreat of glaciers, greater variability as well as decline in precipitation, and for some, associated declines in agro-pastoral productivity. As a result many households describe extensive diversification. Within the agricultural sector, farmers have adopted new maize varieties. Some have also moved away from agro-pastoralism, typically by resorting to wage labor in tourism and mining economies and in government construction projects. Local residents also report seeking improvements in their skills and technical capacities.

Local residents also mention their distrust of government and other external institutions, especially those associated with environmental conservation. Community institutions, in contrast, are viewed as providing reliable scaffolding in times of need and risks by providing support, information, and expertise.

Communal pooling refers to adaptation responses involving joint ownership of assets and resources; sharing of wealth, labor, or incomes from particular activities across households, or mobilization and use of resources that are held collectively during times of scarcity. It pools risks across households. Although it can also occur in combination with the above three ways of addressing environmental risks, its hallmark is joint action by members of a group with the objective of pooling their risks and resources. Joint action on the one hand increases the range of impacts in comparison to that with which households could have coped individually. It also requires functioning and viable

institutions for coordination of activities across households. It is one way for social groups, especially those dependent on natural resources for livelihoods, to enhance their capacity to adapt to the impacts of future climate change as advocated by Tompkins and Adger (2004). Indeed, the example they provide illustrates the above points well. Collective action through community-based coastal management in Trinidad and Tobago helped enhance adaptive capacity in two ways: by building networks important to cope with extreme events and by ensuring the resilience of existing resources and ecological systems.

Coastal management in Trinidad and Tobago is particularly controversial, as it is in many island states and other tropical coastal areas. Controversies arise because of competing demands related to conservation and development. With impending climate change, existing conflicts are likely to become more intense. In the Buccoo reef area of Tobago, institutions prior to the 1990s were relatively exclusionary, and conflicts between development and environmental imperatives proved difficult to resolve.

Action research in 1997-2000 was followed by a process of deliberation and learning in which various stakeholder groups came together for discussion, engagement, data collection, and information sharing so as to develop effective strategies to reverse ongoing environmental deterioration. The creation of an informal group led to greater communication and small behavioral modifications such as more careful use of oil in boats to reduce spillage, launching of an information campaign, and increased community outreach.

Joint action also led to greater leverage in interactions with government officials and agencies. At the same time, government officials found the group an effective partner in introducing changes in coastal management practices. This case highlights the importance of inclusionary communication and deliberation, institutionalized mechanisms for social learning, and communication and resource flows that connect local and external actors. These developments have increased community level resilience and helped local groups address risks of climate change flexibly (Tompkins and Adger 2004).

Exchange is perhaps the most versatile of adaptation responses. Indeed, markets and exchanges are a characteristic of almost all human groups, and are a mechanism not just for adaptation to environmental risks but also critical for specialization, trade, and welfare gains that result from specialization and trade at multiple scales. Exchange-based adaptation practices can substitute for the first four when rural poor have access to markets. But they are likely to do so mainly when there are well developed institutions to facilitate market access. Further, equity in adaptation practices based on market exchanges typically requires great attention to the institutional means through which access to markets and market products becomes available to households. In the absence of institutional mechanisms that can ensure equity, the rural poor are less likely to benefit from purely market exchange based adaptation. A prominent example of market-based adaptation to climate change is weather-related insurance schemes designed for agricultural or pastoralist populations. The scheme resulted from a nation wide participatory poverty assessment and a Bank-supported Sustainable Livelihoods Program is one such initiative (Mearns 2004). Currently under implementation, the project addresses the weather-related risks faced by Mongolian herders. Weather-related losses to pastoralists have been significant in recent years; traditional insurance products have proved to be too costly because of correlated risks. The proposed insurance scheme layers

the risks faced by pastoralists through a base insurance product that is based on total animal mortality in a given location and is offered by commercial insurers, and a disaster relief product which provides relief to registered herders when collective losses reach catastrophic levels. A small proportion of risk is borne by herders themselves.

The innovative aspects of the IBLI concern the effort to overcome several traditional obstacles to the success of insurance products in agricultural contexts. Small size of individual contracts is dealt with through a product available to all registered herders; indexing payments to catastrophic collective losses helps mitigate against adverse selection and moral hazard. Using market-based insurance to address climate risks will require similar partnerships between public, private, and community actors (Mills 2007, and World Bank 2005).

3.3 Determinants of Adaptation Practices

The choice of specific adaptation practices is dependent on social and economic endowments of households and communities, and their ecological location, networks of social and institutional relationships, institutional articulation and access, and access to resources and power. For example, the poor are more likely to migrate in response to crop failure; the rich more likely to rely on storage and exchange. This is because the rich are more likely to have institutionally secure access to resources that make forced migration unnecessary. Migration is more likely to be an effective long-term strategy for pastoralists and agropastoralists confronting lower rainfall or range productivity in contrast to settled agriculturists. But the ability to migrate depends on the nature of property institutions over pasture lands along the migration route. Occupational diversification into agricultural activities may reduce the long-term adaptive capacity of pastoralist groups in contrast to diversification into part time wage employment or even investment in market exchanges during times of rainfall stress. But such diversification may be impossible if access to agricultural land is unavailable.

Similarly, whether households and communities can diversify into new occupations and assets depends on the extent to which they have the ability to trade some level of returns for lowered risks, but it also on access to capital, availability of skills training, and the effectiveness of agricultural extension institutions. The importance of institutions as the scaffolding on which households and individuals can coordinate their expectations and thereby create effective collective action has been repeatedly demonstrated. And market exchanges depend crucially on institutions that can reduce or eliminate problems of adverse selection, moral hazard, and in general lower different types of transactions costs.

In addition, the different adaptation practices above have natural affinities and incompatibilities. Storage and mobility tend not to go together. Other combinations complement each other: storage and exchange can play off temporal variability against spatial variability (Halstead and O'Shea 1989: 4). Diversification similarly allows agricultural households simultaneously to reduce risks, and reap the benefits of market exchange.

The five classes of adaptation practices contain wide variations in terms of specific adaptation actions they each cover. To assess their suitability for specific social groups, it is necessary to understand better the characteristics of the groups and their contexts (see section 6).

4. Rural Local Institutions and Adaptation to Climate Change

In examining the role of rural institutions in adaptation, it is necessary to pay attention to three sets of factors: their nature and goals, patterns in how specific types of institutions facilitate particular types of adaptation strategies, and their linkages with each other and with different rural households. An understanding of the above three aspects helps identify the characteristic features of institutions relevant to successful adaptation outcomes. The paper focuses on the types of institutions by appealing to the familiar distinction between public, private, and civil society institutions. It suggests that they play three general roles in relation to climate variability and change: structuring risks and impacts, acting as links between individual and collective actions, and mediating external interventions. Finally, it examines linkages among institutions through social network analysis tools for institutional mapping.

Although households and communities have historically adapted to climate variability through many different strategies, their capacity to adapt depends in significant measures on the ways institutions regulate and structure their interactions: both amongst themselves and with external actors. All adaptation practices discussed in section 3 depend for their success on specific institutional arrangements -- adaptation never occurs in an institutional vacuum. They all, thus, depend on clear property rights and other institutions that regulate access to resources and exposure to risks. Storage requires physical infrastructure, but it also depends on institutionalized monitoring and sanctioning in case of individual or collective infractions of rules governing storage. Mobility can take place only with adequate information about the spatial and temporal structure of variability in precipitation and range productivity. No wonder many indigenous pastoralist systems developed strong norms of information storage and exchange (Agrawal 1999, Nyong et al. 2007).

Indeed, the role of institutions at multiple scales, including local contexts, is broadly accepted in many analyses of climate and adaptation (Batterbury and Forsyth 1999, Thompson et al. 2006, Young and Lipton 2006). Specific studies focusing on themes such as water conservation, agricultural development, rural livelihoods, forest governance (Adger 200b, Droogers 2004, Naess 2005, Shepherd et al. 2006, Ziervogel 2003) have all identified local institutions as being key to adaptation. And yet, relatively little of the existing work has undertaken a careful or systematic analysis of the different types of institutions relevant to climate hazards-related adaptation, the different roles of local institutions in the context of adaptation, or the features of institutions most important for successful adaptation in rural contexts in the developing world (but see Bakker 1999, Tompkins and Adger 2004).

Local institutions are obviously critical to adaptation. The relative absence of systematic, comparative work to enable targeted policy initiatives that can strengthen local institutions and enhance adaptive capacity is therefore all the more striking. Undertaking such an analysis would require significant empirically based research on a selected, comparable set of adaptation projects. However, it is still possible to identify a basic institutional typology relevant to local adaptation efforts, the types of roles local institutions perform in relation to the broad classes of adaptation strategies identified in section three, and begin to focus on some of the factors presented in the institutional

literature as leading to improved institutional performance. This section makes an initial attempt along these three directions.

4.1 Classifying Local Institutions Relevant to Adaptation

In examining the role of local institutions in facilitating adaptation, this paper focuses on three types of institutions: civic, public, and private, primarily in their formal but where relevant, also informal form. Certainly, it is possible to categorize local institutions in a variety of ways as the institutional literature has demonstrated. The differences among the various attempts to classify institutions hinge ultimately on the aspects or features of institutions considered most relevant to institutional design and performance. Analytical approaches thus have focused, among other dimensions, on the degree to which rural institutions are formal or informal, whether they are sector-specific or multi-sectoral/general purpose, and on their hierarchical nature (IFAD 2003). In this paper, the analytical focus is on the three broad domains of social action – market/private, public/government, and civic/community – to cover the range of institutions relevant to adaptation to climate change and addressing the different forms of vulnerability that the rural poor are likely to suffer as a result of climate variability and change.

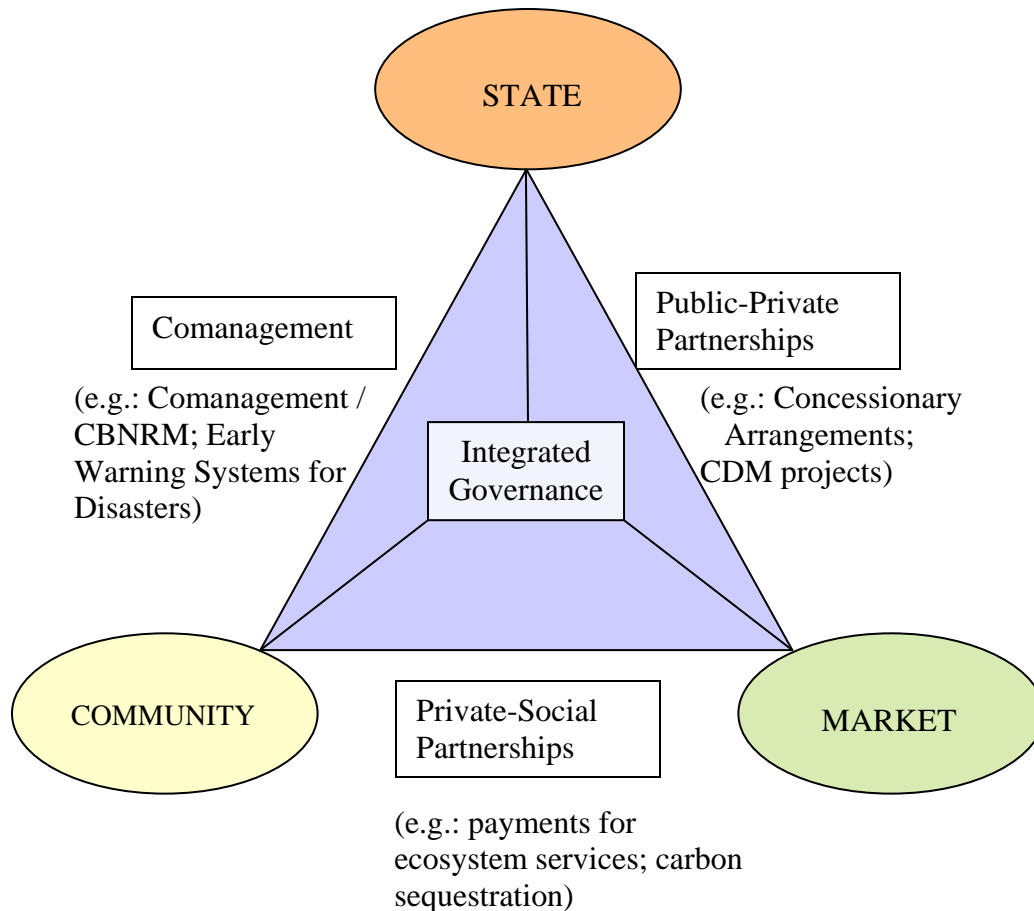


Figure 3: A Schema of Collaborative Institutional Arrangements for Environmental Action in the Context of Climate Change (Agrawal and Lemos 2006)

It is worth pointing out that in many contexts, formal local institutions and organizations work in ways that promote informal processes, and these interactions can be critical to adaptation. Further, although the analytical distinctions among these different types of organizations are important to bear in mind, in their functioning these organizations often enter into partner relationships, promoting cross-domain collaborations. Indeed, there are strong reasons to believe that such partnerships between public, civic, and private organizations can prove extremely important in addressing climate hazards related adaptation. Figure 3 above proposes a schematic representation of such partnerships and collaborative arrangements as a first step in analyzing how institutions across the public, civic, and private boundaries can work jointly to help facilitate adaptation.

The basic motivation for such collaborative arrangements stems from the specific limitations of institutions and organizations within the private, public, or civic domains. With their main focus on regulating socioeconomic interactions (public), promoting voluntary/social relationships (civil society), or generating profits (market), organizations within these three domains may not have sufficient capacity or expertise to facilitate adaptation which, depending upon the context, may require the pursuit of a mix of objectives through flexible operational strategies. But in collaboration, each type of organization may be able to overcome the weaknesses of its partners. The success of such partnerships obviously depends significantly on common or complementary perceptions about the problem to be addressed, and coordination of organizational strategies to achieve adaptation-related goals.

Such partnerships have become especially common in the environmental arena as well as in the context of development projects. In many instances, government agencies have sought to manage resources more effectively by partnering with civic bodies, reduce pollution by working with corporations, implement development projects in partnership with NGOs, or decentralize control over administrative functions and outsource important functions related to accounting, record keeping, financial management, and project monitoring and evaluation.

The figure above thus not only suggests the possibility of institutional partnerships across the public-private-civic domains in the context of climate adaptation, it also highlights the importance of such partnerships. A number of people have called climate change one of the greatest market failures of human history. It is clear that adaptation to climate change will require the concerted efforts of decision makers in diverse institutions across multiple scales.

4.2 How do Local Institutions and Organizations affect Adaptation and Livelihoods?

Broadly speaking, different local institutions shape the effect of climate hazards on livelihoods in three important ways.

1. **They structure environmental risks and variability and thereby the nature of climate impacts and vulnerability.** Depending on the nature of governance and institutional configurations, the same phenomenon – say, reduced precipitation in a region by 20% in a given year – will have very different effects on the livelihoods of residents in the region. More equitable access to livelihoods-related institutions and their resources, coupled with transparent communication and

governance is likely to reduce the ill effects of rainfall failure in contrast to a situation where institutional access is highly stratified and information about institutional capacities is monopolized by a small group.

2. **Institutions create the incentive framework within which outcomes of individual and collective action unfold.** It is within such incentive frameworks that households and collectives choose specific upon adaptation practices. Strong institutional norms around labor sharing may, thus, reduce the ability of households to migrate or diversify. Closer social networks may make it easier to undertake communal pooling of resources as illustrated in box 3 above about the Tobago case.
3. **Institutions are the media through which external interventions reinforce or undermine existing adaptation practices.** In this context, greater attention to the reasons why households and collectives opt for one type of adaptation practice vs. another is necessary if external interventions are to reinforce the adaptive capacity of the rural poor. Social groups that do not have secure rights to land will find it more difficult to diversify asset portfolios or engage in exchange as illustrated by the example in Box 4. Lacking access to capital and infrastructure, groups may be unable to use either storage or exchange to address environmental risks. Without access to markets, communities may be forced to pursue ways of storing their harvest carefully and invest resources into storage infrastructure. It is especially important to attend to these empirical patterns because reliance on particular adaptation practices can have lasting implications for the extent to which the rural poor can adapt either successfully or sustainably to future risks.

Consider the management of climatic risk by households. In general, the effectiveness of such risk management is a function of education, wealth, resource endowments, and local knowledge of households but also social organization and institutional relationships, among other factors (see, e.g., Brush, 1977; Mortimore, 1989; Netting, 1993; Zimmerer, 1991). In examining the responses of households from three different communities in Mexico, Eakin (2005) found that a wide range of adaptive responses to climate variability and change. In one community, households engaged in a more diverse set of productive activities, intensified their involvement in non-farm work including public works programs, and emergency food distribution campaigns. In a second community, household primarily engaged in migration and selling livestock to buy maize. And in a third, extensive labor demands and high investments in irrigated agriculture led many households to accept the migration of some members to the United States.

These differences in household responses across the three communities are indicative of resource endowments but also of institutional support at the local level, and market integration and institutional linkages at higher levels. Depending on institutional access to land, markets, and social networks, households intensify agricultural production, diversify into livestock or new crops and engage in market exchanges, or invest in education and migration to manage changing patterns of climate and other risks. Institutional connections provide households and communities greater flexibility in their choice of diversification and adaptation strategies.

This case also points to the difficulties inherent in attempting to gain a generalized picture of vulnerability and adaptive capacity based on a list of indicators and

quantitative measurements (but see Brooks et al. 2005: 157). As much as the presence of formal and informal institutions, it is their linkages with each other and rural households that affects how climate change and variability produce their effects.

As the description for three communities in Mexico illustrates, local institutions play a crucial role in influencing the adaptive capacity of communities *ex ante*, and the adaptation choices made by community members *ex post*. The above example also shows the importance of close connections between local and higher level institutions, and the extent to which such connections allow rural residents to leverage their membership in local institutions for gains from outside the locality. Indeed, the critical role of institutions is underscored in study after study of adaptive capacity and adaptation choices (Adger 1999, 2000b, Berkes and Jolly 2001, Ivey et al. 2004).

Local institutions structure livelihoods impacts of climate hazards through a range of indispensable functions they perform in rural contexts. Institutional functions include information gathering and dissemination, resource mobilization and allocation, skills development and capacity building, providing leadership, and relating to other decision makers and institutions. Each of these functions can be disaggregated further, but the extent to which any given institution performs the above functions depends greatly on the objectives with which the institution was formed, and the problems it has come to address over the course of its existence.

4.3: Institutional Linkages: Access and Articulation

The capacity of particular institutions is obviously important in how they affect adaptation. But equally important are the interconnections of institutions in a given location. **Institutional linkages are critical to adaptation because of the ways in which they affect flow of resources and influence amongst themselves and to households and social groups.**

Institutional linkages can be of two types. One type of linkages can be defined as *institutional access*. Households and social groups in a given territory or village have different degrees and types of links with the institutions in that location. Some households may participate in the meetings, day-to-day functioning, and decision making of a rural institution. Other households may be unconnected. Some households may benefit as a result of their connections or of institutional policies, Other households may be left untouched. Some households may work to shape what an institution does. Others may try and fail, or not even try. The degree and type of access of households to different institutions will affect the nature of benefits they gain from these institutions.

Another type of institutional linkage refers to those that institutions have with each other. These linkages can be called *institutional articulation*. Even if there are multiple rural institutions in a given location, the nature of their impacts on adaptation will be very different depending on the degree to which they are connected, whether and how they coordinate their actions and responses to climate hazards, and how they articulate with institutions and resources outside their immediate area of operation. Institutions without any links to other institutions – usually an empirical impossibility – or with conflictual links to other institutions are likely to be far less effective than those with multiple positive links with other institutions.

The importance of institutional articulation has already been implicitly indicated in figure 3 which points to comanagement, public-private partnerships, and private-social

partnerships as being potentially highly relevant to adaptation to climate change. But given the importance of institutional linkages, it is crucial to use analytical tools that can help identify, visualize, and analyze institutional access and articulation (see box 2). Social network analysis provides useful tools for this purpose.

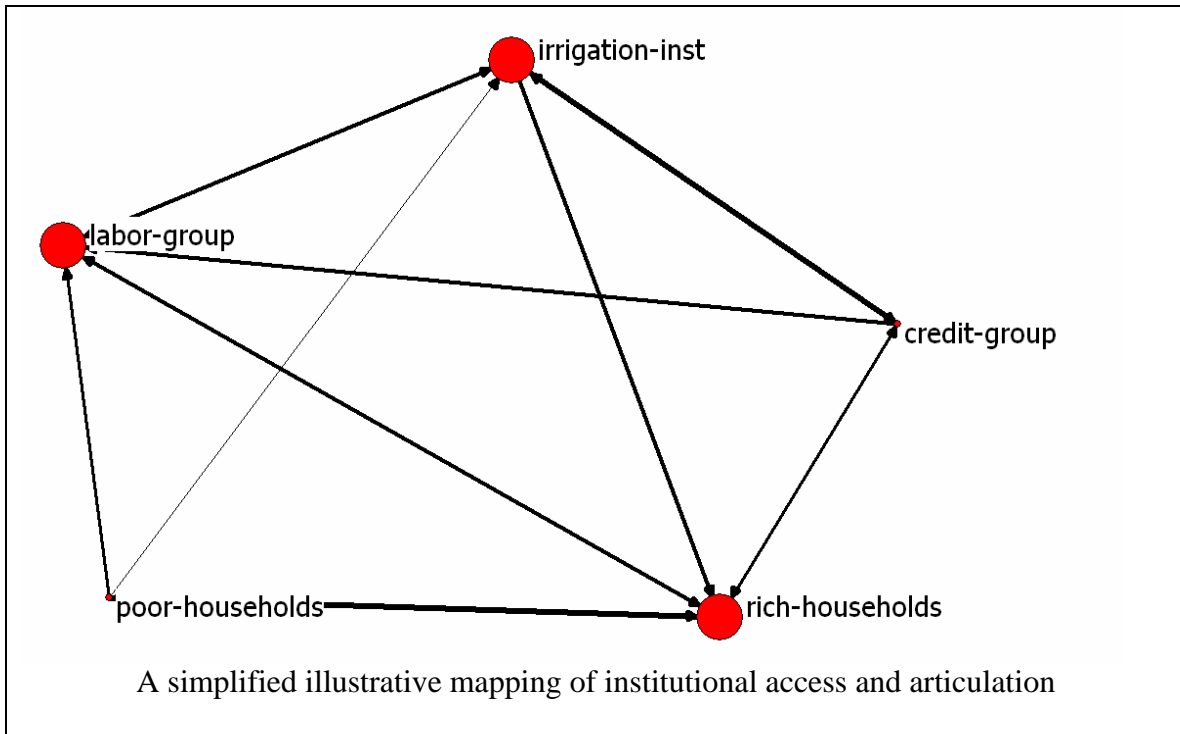
A better understanding of institutional linkages – both access and articulation – is essential to gain a grasp on how local rural institutions are likely to shape adaptation practices and responses in any given context. Such mapping provides a sense of the possible synergies among existing institutions, key entry points for external interventions, identity of key institutions and their capacities, the nature of flow of resources across institutions and from institutions to social groups, and thereby identify the appropriate leverage points for channeling resources for adaptive development in a given context. In contrast, much existing institutional analysis rarely attends to the nature of links among institutions and social groups, instead focusing upon specific institutions and their individual capacity.

Box 2: Institutional Access and Articulation

Social network analysis is a useful tool to understand and visualize institutional access and articulation. The figure below provides a simplified hypothetical example of how social network analysis can be used to present information about institutional access of different social groups, and institutional articulation among different institutions in a location.

The figure selects three local institutions and their links to two social groups for visual presentation. In the figure, institutions and groups are represented as nodes, and their links as ties. It shows the strength and direction of the links among institutions (through arrowheads and thickness of the connecting lines). Credit groups have a strong link with irrigation institutions, but the link between labor groups and irrigation institutions is weaker. It also shows the relative capacity of the different institutions and groups through the size of the nodes.

Finally, the figure also shows the nature of institutional access for rich vs. poor households. Rich households have greater access to the different institutions in this location, and their links tend to be stronger in comparison to the access of poorer households. The arrows pointing to rich households indicate that the flow of benefits from institutions is more toward them than is the case for poor households. Although it only provides a static picture, the figure suggests that external interventions in this context through the existing institutions have a strong likelihood of benefiting primarily the rich households who already have strong access to these institutions.



4.4: Features of Effective Local Institutions for Climate Adaptation

The critical role of local institutions in facilitating adaptation to climate change is evident. Nonetheless, little of the existing literature on the subject has attempted to identify the general factors relevant to better institutional performance. In attempting to identify some of the factors that likely promote superior performance on the part of local institutions, two sets of writings on community institutions for resource governance, and on decentralization of governance more generally are useful to consider. Many of the local institutions that promote adaptation and help improve livelihoods do so through better and more sustainable governance of local resources. A significant literature on common pool resources provides some insights into the kinds of factors that might help improve livelihoods outcomes. Two, because our concern is with local, decentralized institutions, existing writings on decentralization and local governance are also relevant to understand when institutions may work better.

Writings on the commons have provided perhaps the most systematic account of the factors that help promote better governance. The main conclusion of this body of work is that factors related to the context as well as to institutional design are relevant to institutional performance. In assessing contextual factors, it is important to pay attention to socio-economic, demographic, ecological, as well as political factors. In considering institutional factors, it is necessary to attend to the operational as well as higher level decision processes. The literature on decentralization provides important insights into the ways effective local institutions relate to external, higher level decision making bodies and organizations. Box 3 provides a summary set of the relevant factors identified in these two literatures as relevant to effective local institutions.

Box 3: Factors Promoting Better Institutional Performance for Adaptation

I. Characteristics of Institutions

- Organizational rules are simple and easy to understand
- Broad local involvement in organization and its rules
- Fairness in resource allocation
- Clear mechanisms for enforcing rules
- Clear, broadly acceptable mechanisms for sanctioning rule infractions
- Availability of low cost adjudication
- Accountability of decision makers and other officials

II. Characteristics of the Context of Institutions

- Mechanisms for dissemination of new technologies and training in their use
- Favorable returns for products sold in markets
- Central governments facilitate the functioning of local institutions by
 - Creating effective support for sanctions used by local institutions
 - Provide necessary support in terms of information, finances, and skill development
 - Develop indicators of performance against which institutions can be assessed over time
- The network of institutions present in a context and their links with different social groups

III. Characteristics of groups served by the Institutions

- Clearly defined boundaries of the group
- History of successful shared experiences; existence of social capital\
- Appropriate leadership that changes periodically– young, familiar with changing external environments, connected to local traditional elite
- Interdependence among group members
- Heterogeneity of endowments among group members, homogeneity of identities and interests

IV. Characteristics of the Ecological Context

- Match between demands on ecological system and its output
- Information availability about the ecological system
- Possibility of storing benefits from the system
- Group dependence on resources available from the ecological system

Source: Agrawal 2001, Baland and Platteau 1996, Ostrom 1990, Ribot 2002, Uphoff and Buck 2006, Wade 1994.

It is worth pointing out that the list of relevant factors in box 10 is at this point illustrative at best. It constitutes a starting point for collecting the necessary information against which to judge the performance of institutions active in facilitating adaptation.

4.5 Bringing the Strands of the Argument Together

The role of institutions in facilitating adaptation has already been summarized in figure 1 at the beginning of this review. At this point it is useful to recapitulate the main points, and examine some of the broad ways in which adaptive responses can be facilitated through institutions. Institutions structure adaptation in three major ways – by shaping the impacts of climate hazards on social groups and communities, and thus affecting their vulnerability and resilience; by serving as the mechanisms that link individual with collective action, and thereby the outcomes of adaptation strategies; and by acting as mediating mechanisms for external interventions.

Adaptive strategies related to climate risks can be classified along two dimensions: the timing of the adaptation, and the degree to which an adaptation practice is tied into other aspects of livelihoods of households and communities. The figure below presents the four types of adaptation strategies that can be thus identified and examples of the different combinations of these two dimensions of efforts to address climate impacts.

Figure 4: Timing and Comprehensiveness of Adaptation Strategies

	Targeted	Integrated
Reactive	-- post-hazard support for recovery; -- emergency coping strategies	-- integrated hazard management
Proactive	-- specific classes of adaptation practices; -- sectoral interventions	-- integrated development interventions; -- integrated territorial development

Some care should be exercised in interpreting these dimensions for classifying adaptation strategies and practices. It is true that a particular practice may be adopted only after the occurrence of a particular climate hazard and thus appear to be a coping mechanism, or a post-hazard adaptation. However, because many climate hazards are recurrent phenomena, coping strategies once adopted can also appear to be proactive strategies for future, recurrent episodes of climate risks. Similarly, when considered over time, targeted interventions may come to assume more comprehensive proportions. As institutions necessary for specific climate hazard, or for a particular sector continue in time, they may accrete new tasks and functions that allow them to support adaptation practices for which they were not initially designed.

In general, however, the more forward looking an intervention, and the more comprehensive or integrated the approach, the more important it becomes to examine institutional arrangements in a given location. Such an examination is necessary not only to identify appropriate means to channel external resources and ensure that they reach intended social groups, but also to prevent duplication and conflicts among institutions. In a territorial development perspective, the mapping of institutional connections and interactions among multiple institutions are of particular importance. Insights about how policies are to be designed and implemented for delivery through institutions becomes possible in part through the examination of institutional interactions, and their relationship to the vulnerability of specific groups.

5. External Interventions and Local Institutions

Although the historical experiences and responses of communities and institutions to environmental risks are important to consider in crafting effective adaptation policies, it is useful to assess at somewhat greater length how institutions can facilitate external interventions designed to enhance local adaptive capacity. Such an examination is especially important for development organizations such as the World Bank who can deploy a variety of strategies to channel external support for adaptation.

A review of the United Nations Framework Convention on Climate Change (UNFCCC) database on coping and adaptation practices of local actors suggests that external interventions fall into four different groups.⁶ Perhaps the most obvious of these

is information about climate variability and change to help reduce unpredictability associated with climate-events and trends. Governments can provide such information effectively, as also information about different adaptation options and resources that might be available to help local actors adapt. A second set of external interventions are technical advances that may lead to higher crop or resource productivity, reduce costs of undertaking some adaptations, or improve the efficiency of existing adaptation practices. Financial and investment supports can make the adoption of technological changes more widespread, provide incentives to diversify, enable new infrastructure that can facilitate storage or diversification, or subsidize existing adaptation practices, and so forth. Finally, leadership and institutional interventions can help reduce the costs of collective action for communal pooling, or for any of the other classes of adaptation practices. Clearly, new funding flows are only one, if at times critical means to facilitate adaptation or enhance adaptive capacity.

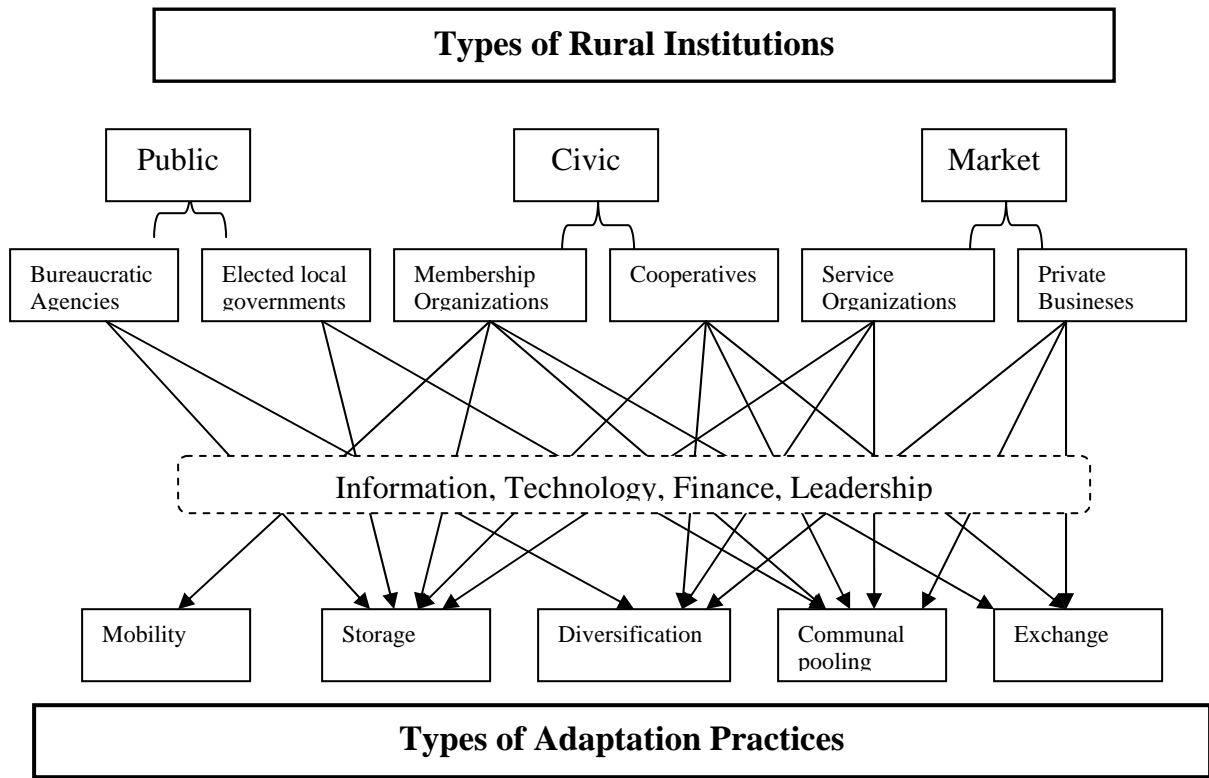


Figure 5: Institutional Mediation of External Interventions to Facilitate Adaptation

The figure above takes the right half of figure 1 as the domain relevant for external interventions and presents the four main external interventions to reinforce adaptation practices: information and training, technological innovation, financial investment, and leadership and institutional changes that reduce costs of collective action. These interventions can be viewed as mechanisms to provide resources necessary to enhance adaptive capacity. Whether they actually increase adaptive capacity of resilience

will depend on the manner in which they become available, the people who gain access to them, and the institutional means of their provision.

Again, using the data from the UNFCCC database on coping strategies (see table 9 below), the figure suggests that public sector institutions are more likely to facilitate adaptation strategies related to communal pooling, diversification, and storage owing to their command over authoritative action, and ability to channel technical and financial inputs into rural areas. Civic sector institutions may be more flexible than those in either private or public sector because of the ability to redefine goals and adopt new procedures. Depending on need they can help strengthen all the different adaptation strategies. Finally, private sector organizations, because of their access to financial resources, are more likely to have greater expertise in promoting exchange and diversification, but may also be able to advance communal pooling if one takes into account not-for-profit service organizations.

6. Adaptation, Institutions, and Livelihoods Framework: Case Evidence

This section uses evidence from two sets of cases – those in the UNFCCC coping strategies database, and in the National Adaptation Programmes of Action (NAPAs) to comparatively assess the role of local rural institutions in facilitating adaptation. Both data are based on the work of the UNFCCC which is perhaps the most important framework international treaty on climate change. Most countries joined the UNFCCC more than a decade ago to begin to consider what can be done to reduce global warming and cope with inevitable climate changes. The Kyoto Protocol was an addition to the UNFCCC and commits its signatories to more powerful and legally binding measures. The UNFCCC secretariat supports institutions involved in the climate change process, particularly the Conference of Parties and other subsidiary bodies (http://unfccc.int/essential_background/items/2877.php).

The UNFCCC database on coping strategies provides a useful review and summary of 118 cases of adaptation worldwide.⁷ These cases form a useful empirical basis for examining the distribution of adaptation practices, the role of local institutions in facilitating adaptation, and how institutions mediate between external interventions and improvements in local adaptive capacity. These cases are distributed across 46 countries, with the preponderance of the cases from Africa (45) and Asia (58). The specific adaptation strategies identified and discussed in the 118 cases can be classified either as individual illustrations or examples of combinations of the five different categories of adaptation practices described earlier: mobility, storage, diversification, communal pooling, and exchange (Annex Figure 1 at the end of the paper shows the distribution of the adaptation cases around the world).

6.1 Analysis and observations of the UNFCCC data

The evidence in the cases presents some useful, even provocative patterns. Perhaps the most interesting ones concern the near complete absence of mobility in the examined cases (see table 4), and the occurrence of exchange only in combination with at least one other type of adaptation practice. It makes intuitive sense that as an adaptation practice, exchange should be possible only when households and communities have also adopted other adaptation practices to make something available for exchange. Table 4

also suggests that the most common classes of adaptation responses are diversification and communal pooling on their own, and diversification and exchange as a pair.

Table 4: Frequency Distribution of Different Classes of Adaptation Practices (N=118)			
Class of Adaptation Practice	Corresponding Adaptation strategies	Frequency*	
Mobility	1. agropastoral migration 2. wage labor migration 3. involuntary migration	2	
Storage	1. water storage 2. food storage (crops, seeds, forest products) 3. animal/live storage 4. pest control	11	
Diversification	1. asset portfolio diversification 2. skills and occupational training 3. occupational diversification 4. crop choices 5. production technologies 6. consumption choices 7. animal breeding	33	
Communal pooling	1. forestry 2. infrastructure development 3. information gathering 4. disaster preparation	29	
Exchange	1. improved market access 2. insurance provision 3. new product sales 4. seeds, animal, and other input purchases	1	
Storage and diversification	Examples of combinations of adaptation classes are drawn from the strategies listed above.	6	
Storage and communal pooling		4	
Storage and exchange		5	
Diversification and communal pooling		4	
Diversification and exchange		25	
Unidentified		2	
Total			

- The data also show other interesting patterns.
1. In nearly all cases, *local institutions are required to enable households and social groups to deploy specific adaptation practices* (see table 5). In 77 cases, the

- primary structuring influence for adaptation flows from local institutions. In 41 cases, local institutions work in conjunction with external interventions.
2. In all cases *where external support is present, it is channeled through local formal and informal institutions to enable adaptation.* The inference is evident – *without local institutions, rural poor groups will find it far costlier to pursue any adaptation practice relevant to their needs.*
 3. Table 5 also reveals a somewhat unexpected pattern in the UNFCCC data -- *when rural institutions work in conjunction with external interventions, it is more likely that the distributional orientation of adaptation practice benefits will be the collective rather than the individual household.*

Table 5: Distribution of Benefits from Adaptation Practices for Different Types of Local Institutions (N=118)			
	Individually oriented benefits from adaptation practices	Collectively oriented benefits from adaptation practices	Total
Local institution functioning in conjunction with an external intervention	15	26	41
Local institutions without external interventions	55	22	77
Total	70	48	118

Source: UNFCCC Coping strategies database

Table 6 below indicates the distribution of the different adaptation practices according to the two ecological regions of interest: drylands and coastal areas. The information in the table suggests that at least in the context of the UNFCCC data, storage, and diversification are more often distributed in semi-arid areas as compared to adaptation strategies based on communal pooling. One reason for this may be the greater possibility of sudden and disastrous climatic hazards in coastal regions (storm surges, storms and cyclones, and coastal flooding compared to failure of rains or erratic rainfall which for all their suddenness unfold more slowly than a storm or a flood).

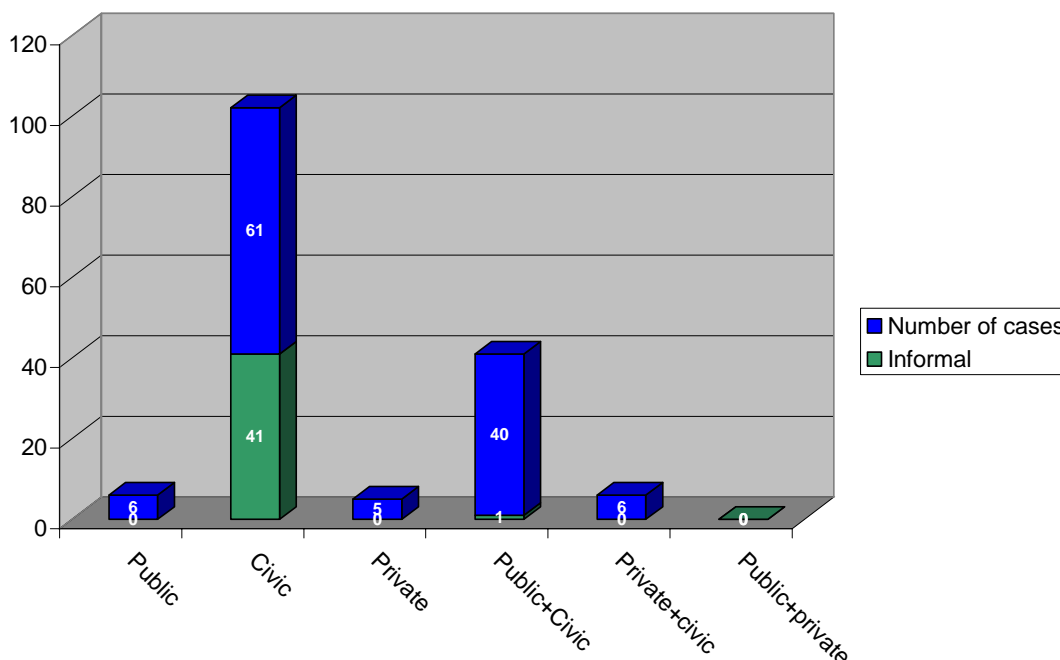
Table 6: Distribution of Adaptation Strategies by Ecological Context (N=97)*			
	Semi-Arid areas	Coastal areas	Total
Storage	8	1	9
Diversification	18	7	25
Communal pooling	8	17	25
Storage and diversification	3	1	4
Storage and exchange	5	0	5
Diversification and	15	7	22

exchange			
Other	4	3	7
Total	61	36	97
The remainder of the 118 cases in the Coping strategies database were from highland, irrigated, or cold regions. Source: UNFCCC Coping strategies database			

Given the importance of institutions to adaptation practices, it is critical to attend to three issues. The first concerns the distribution of institutional types (public, private, civic) in facilitating local adaptation. The second relates to how different types of institutions relate to different classes of adaptation practices. The third issue concerns the importance of understanding the distribution of different types of institutions in relation to their mediating role for external interventions. Table 7, 8, and 9 provide an initial assessment in regards to these three questions on the basis of the UNFCCC data.

Table 7 provides a summary of the institutional involvement in adaptation practices at the local level. Two points stand out about the information in this table. The first is that a combination of civic and public+civic institutions are the ones most commonly involved in facilitating adaptation to climate change. Private or market institutions have played a relatively small role in facilitating or reinforcing adaptation. This pattern both highlights and echoes a common complaint in writing on climate change – that it is one of the most prominent examples of market failure. The data on coping strategies from the UNFCCC also indicates that private and market actors have been relatively uninvolved in initiatives that would enhance the ability of local actors to adapt to climate change. This finding is simultaneously a challenge and opportunity to identify ways of creating incentives and partnerships involve the private sector and market actors more intimately in facilitating adaptation.

Figure 6: Formal vs Informal Institutions in Adaptation



Another salient pattern in the data is that local level civic institutions, when functioning on their own often tend to be informal institutions. However, when public institutions are involved in adaptation practices, their relationship is far more often with formal civic institutions (see the distribution of formal and informal institutional arrangements for adaptation as reflected in the bars for civic and public+civic in figure 6 above). One of the implications of this data is that there are potentially significant gains to be made by identifying ways of encouraging informal processes through formal interventions to facilitate adaptation and greater adaptive capacity. Box 6 for example, provides one instance of such interactions where the formation of an informal collective group and initiation of small acts of joint action led to a more thoroughgoing effort at adaptation. In light of the data suggesting a lack of cases where formal interventions take advantage of informal processes at the local level, the lesson of the case in box 6 becomes even more interesting.

The second issue concerns how different types of institutions correlate with particular combinations of adaptation practices. The UNFCCC data does not provide detailed evidence on the subject. It is nonetheless possible to generalize in a preliminary way based on its information about how public, civic, and private rural institutions connect with different classes of adaptation practices (see table 7).

	Public	Civic	Private	Public and civic	Private and civic	Total
Storage	0	8	0	3	0	11
Diversification	0	19	1	12	1	33

Communal pooling	4	11	0	14	0	29
Storage and diversification	0	2	0	2	0	4
Storage and exchange	0	4	0	1	1	6
Diversification and exchange	0	13	4	5	4	26
Other	2	4	0	3	0	9
Total	6	61	5	40	6	118
Source: UNFCCC coping strategies database.						

Table 7 provides an empirical substantiation of the information presented visually in figure 4. Although the UNFCCC database does not provide enough information to make a detailed assessment of the subdivisions within the broad categories of public, private, and civic institutions, it does suggest that public and market institutions do not promote mobility,⁸ that public institutions are only infrequently associated with market exchange processes promoting adaptation; and that when market actors are involved in adaptation practices, it is likely that they would assist exchange based efforts.

Given the overall distribution of institutional arrangements through which adaptation is facilitated at the local level, it is not surprising that much of the institutional action is focused around civic and a combination of public and civic institutions. A few points are still worth highlighting from the information in this table (the relevant cells have the numbers in bold in table 7). The first is that civic institutions and partnerships between civic and public institutions seem to occur more frequently to promote diversification and communal pooling. There are relatively few instances of civic institutions promoting storage or mobility, or for that matter a combination of different adaptive strategies. In contrast, much of the involvement of private institutions and the partnership between civic and private institutions seems to focus on the promotion of diversification and exchange. This is an expected finding in many ways – one expects market actors and processes to be most suited for exchange-based activities, and indeed this is also the finding in the data.

Table 8 provides a summary overview of how public, civic and private institutions mediate external interventions to promote adaptation. It focuses on the 41 out of the 118 cases in the dataset that clearly show the involvement of external actors in promoting adaptation (see table 5). The total number of cases is too small, therefore, to make broad generalizations, but in looking at the distribution of the specific cases based on the main patterns in the data, there are some useful lessons to be derived.

Table 8: Local Institutions and their Mediation of External Interventions to Promote Adaptation (N=41)					
	Public	Civic	Public and civic	Civic and private	Total
Information	0	2	8	0	10
Technical inputs	2	4	1	0	7
Financial support	2	0	6	1	9

Information/Technical inputs	0	4	2	0	6
Technical Inputs and financial support	0	4	1		5
Other	0	2	2	0	4
Total	4	16	20	1	41
Source: UNFCCC Coping strategies database					

The information in the table above suggests that the major external interventions to support local adaptation efforts have focused on providing information and financial support. There are fewer cases in which a variety of external interventions have been combined to facilitate adaptation, and in no case have external actors provided strong leadership or attempted local institutional reconfiguration to support adaptation. A closer look at the data explains these patterns. The vast majority of cases of information provision and financial support concern adaptation practices related to disaster preparedness, early warning systems about failure of rains, and private or public infrastructure that could withstand climate hazards such as floods and storms. Certainly, the role of external interventions in promoting adaptation is not exhausted by these three types of adaptation to the threat of climate change. As indicated by the list of specific adaptation strategies in table 4, itself only a subset of the different types of adaptation practices that rural populations have already been attempting, there are many more ways in which external support can reinforce adaptation efforts and support institutions that are shaping, facilitating, and reinforcing local adaptation efforts. The conclusion is inescapable that external forms of support focus on an incredibly small slice of the huge diversity of adaptation mechanisms that local actors and institutions are inventing and attempting.

The tables and figures above allow several inferences based on the information contained in possibly the largest existing database on local adaptation strategies. These inferences concern the distribution of five adaptation strategies as discussed earlier in this paper, the distribution of these strategies in different regions, the relationship between adaptation strategies and local institutions, and the relationship between different types of local institutions and how they mediate external interventions to facilitate adaptation. Three of the more important implications of these data are worth reiterating. 1) local institutions are critical to the successful pursuit of local and implementation of externally facilitated adaptation strategies. Without the support of local institutions, it is highly unlikely that adaptation can even be pursued, let alone pursued successfully. 2) Civil, and informal institutions are key mechanisms to achieve most forms of adaptation, and to enhance adaptive capacity. They play an extremely important role in adaptation both in semi-arid and in coastal regions, albeit for different kinds of adaptation options. But they seem necessary components of any externally introduced intervention to enhance adaptive capacity, often in collaboration with other types of institutions. 3) Available data do not possess sufficient detail to make fine distinctions about the characteristics of institutions that are most important in pursuing adaptation, but they still suggest the highly underexploited strengths of the private sector and market forces in helping enhance adaptive capacity in marginal environments.

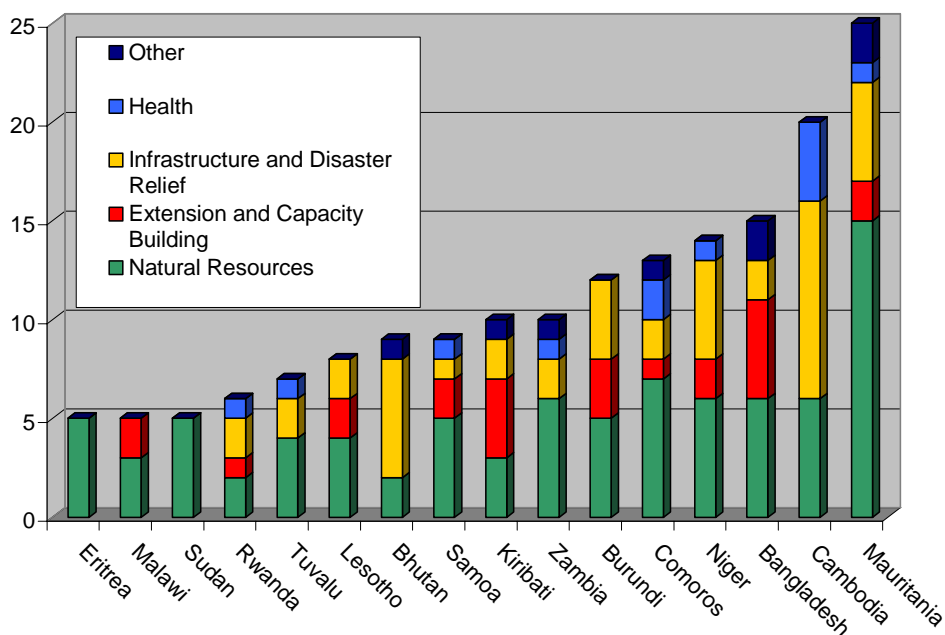
The analysis of the data also provides some key insights in relation to external interventions for adaptation. It suggests that interventions need to be channeled through

appropriate local institutions, and that partnerships between civil society and public institutions have been extremely important in helping local populations adapt to environmental variability. The data also suggests a potentially significant role for partnerships involving private and civil society institutions, especially in relation to adaptation strategies relying on exchange mechanisms.

6.2 Discussion of the NAPA cases

The adaptation projects collected in the National Adaptation Programs of Action (NAPA) documents have been developed by ministries of environment in different countries. They represent the most extensive and serious policy effort to date to identify priority areas for adaptation interventions. These cases present an opportunity to examine how existing efforts to plan for climate change address the role of institutions in adaptation. The NAPA documents provide information from 16 countries about the high priority adaptation projects chosen by the relevant government agencies in these countries. Collectively, these country governments identified close to 170 small and large projects with diverse objectives and implementation mechanisms. A common process of identification and prioritization was used in each country to identify and select the most important adaptation projects for the country governments. The figure below presents basic information about these projects concerning their thematic focus and numbers.

Figure 7: Sector-wise NAPA Adaptation Projects

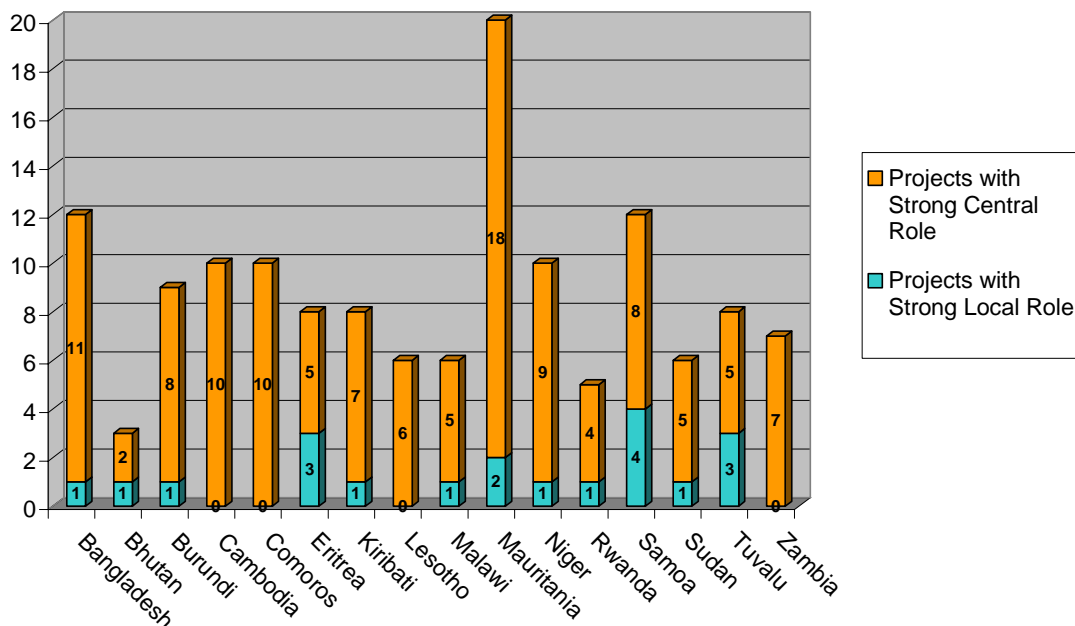


The figure shows that the largest number and proportion of adaptation projects are focused on sectoral issues related to improvements in natural resources related activities such as in agriculture, forestry, water conservation and irrigation, and in the development of infrastructure and disaster relief. Very few of the countries have identified urban impacts of climate change or new research on the best means of adaptation as high priority areas needing support.

Although a detailed analysis of these projects along the lines of the UNFCCC database is not possible given the nature of information presented in the NAPA documents, it is still possible to make basic comparisons that point to the ways the policy process has worked in different countries to engage with local institutions in the urgent issues surrounding adaptation in the context of climate change. First, in contrast to the actual instances of adaptation described and enumerated in the UNFCCC database, most of the projects in the NAPA documents seem far more aimed at building the capacity of national governments and agencies to coordinate adaptation, to provide services to the general population, or to create infrastructure rather than to strengthen the capacity of local actors and institutions to undertake adaptation. Figure 8 provides information on two areas of concern to this study – the extent to which selected high priority projects focus on communities, and the role they identify in the project design for community or local level public, private, or civic institutions.

Thus, local institutions are incorporated as the focus of adaptation projects in just about 20 percent of the projects described in the NAPA documents. The limited focus on local actors is especially striking when it comes to the anticipated role of local level institutions in adaptation. Only 20 of the 173 projects described in the NAPA reports identify local level institutions as partners or agents in facilitating adaptation projects. Indeed, given this minimal level of attention to local institutions – even for projects that

Figure 8: Relative Importance of Local Institutions in NAPA Adaptation Projects



are focused on agriculture, water, forest management, fisheries, small scale infrastructure, and capacity building for which local institutions could be viewed as basic components of an adaptation strategy – it is perhaps unnecessary to develop a refined argument about local institutions and adaptation. Despite widespread consultations that went into the production of the NAPA documents, it appears that the process was attentive in only a limited manner to the historical experiences of adaptation, indigenous or local adaptation

strategies, and forms of local and cross-scale vulnerabilities of marginal peoples. In any further efforts to develop national adaptation plans the potential role of local civic institutions and institutional partnerships both at the local level and across multiple scales must receive much greater attention than it has hitherto received.

The analysis of the information on high-priority projects selected by relevant ministries in the least developed countries as identified by the UNFCCC brings home the enormous ground that still has to be covered by the national planning process in relation to adaptation and local institutions. Despite an explicit commitment to grassroots processes and institutions that has been articulated in the NAPA process, the actual documents and projects have paid relatively limited attention to rural institutions. Not only do most projects not incorporate local communities and institutions in adaptation plans, little evidence of consultation and coordination between the local and national level can be seen in the descriptions of the selected high-priority projects. Given that only a small proportion of all NAPA documents have been finalized at present, there is both an opportunity to redress this gap in the process by identifying how rural institutions can play a more defining role in projects targeted toward rural areas, and to provide guidelines for other attempts to develop adaptation interventions in which interactions among institutions would be important to analyze and understand.

7. Conclusion

Impacts of ongoing climate change will greatly increase the vulnerability of poorer, more marginal households in developing world. The planetary scale of climate change notwithstanding, its impacts will be spatially highly differentiated – increasing average temperatures will hide a diversity of variations in impacts on regions, communities, and households. This is because vulnerability to climate change is socially and institutionally determined, even when provoked biophysically. This is why adaptation to the inevitable impacts of climate change is unavoidably local, and it is also why local rural institutions have a critically important role in promoting effective adaptation and enhancing adaptive capacity of vulnerable rural populations.

Despite the critical importance of rural institutions in shaping the adaptive response of humanity to climate change and variability, the literature on the subject is in its infancy. This paper has presented a framework to understand the role and importance of institutions in adaptation and examined this framework in light of evidence from the largest available database on adaptation and coping strategies in the context of climate change. It has also examined 18 available national-level policy statements on adaptation to assess the extent to which they attend to local institutions in devising adaptation plans.

The paper suggests that if adaptation is unavoidably local, it also always occurs in an institutional context. Rural institutions are crucial in shaping adaptation and its outcomes. They are crucial as mediating bodies that connect households to local resources, determine how flows of external support will be distributed among different social groups, and link local populations to national policies and interventions. In this context, the existing role of public and civic local institutions needs special emphasis. The analysis of local institutions in the context of adaptation suggests the need to highlight five areas in which institutions are significant for thinking about climate adaptation.

One, institutional partnerships are central to local adaptation practices. Support for such partnerships can greatly enhance informal institutional processes through which adaptation occurs. Partnerships among local public and civil society institutions are associated more closely with adaptation practices related to diversification and communal pooling. Partnerships between private and civil society institutions are relatively uncommon and need greater encouragement. They tend to be more closely associated with exchange and storage based adaptation practices. Mobility, although often neglected in the literature on adaptation is essential to deal with high levels of climate variability.

Although local institutions play a critical role in supporting adaptation, the intensity of adverse future climate impacts is likely to increase – thereby also increasing vulnerability and reducing existing adaptive capacity. External interventions in the form of new information and technology aimed at improving coping capacities, institutional coordination for better articulation (connections among institutions) and improved access (connections of institutions with social groups), and inflows of finances support for local leadership will be critical to strengthen local institutional capacities.

Different social groups and individual households have varying levels of access to existing institutions. Vulnerable groups in general have lower institutional access than do those who are more powerful or better off. Before external support for greater adaptive capacity is made available, therefore, an analysis of the nature of institutional linkages and access for different social groups becomes critical. Only after a clear understanding of such relationships is available should particular institutions be selected as intermediaries for channeling resources.

Existing national plans for adaptation seem to have attended only in a limited fashion to the role of local institutions in designing, supporting, and implementing adaptation. However, if adaptation is inevitably local, there is a great need to involve local institutions more centrally in planning for and implementing adaptation policies and projects. At the very least, there must be far greater coordination between adaptation policies and measures adopted by institutions and decision makers at the national level, and their counterparts at the local level.

As climate change and its impacts become more obvious, it is increasingly important to integrate concerns for managing risks faced by households and communities into earlier concerns for growth, poverty alleviation, equity, and sustainability. The paper refers to the need for integrating climate risk management in development as adaptive development. Adaptive development will require a greater role for local institutions in both planning and implementation of development projects. Because the state of knowledge is sparse about the most effective ways in which institutions can facilitate local adaptation, no blueprints can be advanced for planning adaptive development. An adaptive perspective on development will require the willingness to experiment, capacity to take the risk of making mistakes, and flexibility to make space for social and institutional learning.

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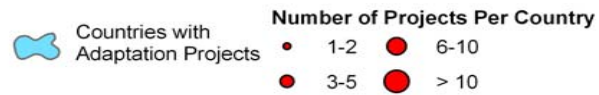
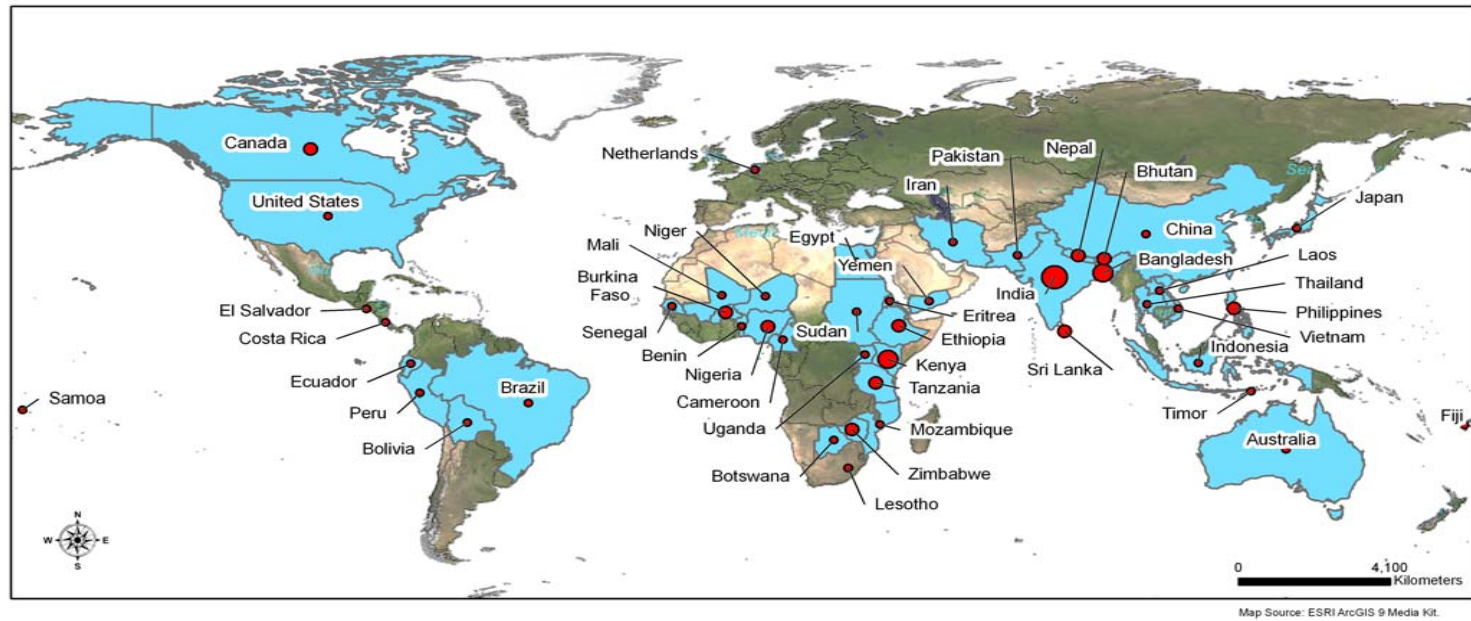
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Number of Adaptation Projects per Country



Annex Figure 1: Distribution of adaptation cases in the UNFCCC Coping Strategies Database

Notes

¹ But see Glantz 1990. Climate change began to take on significant international policy significance especially after 1995 when the second assessment report of the Inter-Governmental Panel on Climate Change (IPCC) announced that “human activities were having a ‘discernible’ impact on climate” (Schneider and Lane 2006: 25). See also Watson et al. 1998 and Hardy 2003. Some observers argue that the IPCC’s estimates of warming and its likely disastrous impacts may in fact be conservative.

² This note uses “rural poor” as a general term to refer to the more marginalized and disadvantaged, and often the most vulnerable social groups in rural areas.

³ This uncertainty is primarily the result of the scale at which projections about climate change can be made through General Circulation Models (GCMs), the main source of information about future changes in climate.

⁴ In focusing on both adjustment and coping strategies, the paper broadly follows the definition of adaptation as used by the Inter-Governmental Panel of Climate Change (Adger et al. 2007: 719-20).

⁵ Adger et al. 2007: 396 provide a somewhat different justification for the need to adapt.

⁶ The UNFCCC has developed a database on local coping and adaptation strategies that provides selected information on adaptation practices, external interventions, and local institutions from nearly 40 countries. It is the most comprehensive database on adaptation strategies in existence and forms a useful basis for a systematic examination of adaptation strategies globally.

⁷ The total number of discrete cases in the UNFCCC database is 138. However, a number of the cases are essentially duplication of information, especially in the water harvesting and forest sector. To reduce redundancy, I eliminated some of the cases that did not bring any new information to bear on the analysis.

⁸ Note that the UNFCCC database does not provide cases of wage labor diversification and mobility or agropastoralist migration as instances of adaptation strategies.