7

Assessing and Enhancing Adaptive Capacity

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7.1. Introduction

This Technical Paper (TP) addresses the assessment and enhancement of adaptive capacity of both social and physical systems, so that these systems may cope better with climate change, including variability. Users will find guidance on a range of important activities, including the development of adaptive capacity for priority groups, the development of adaptive capacity indicators, and identification and assessment of key adaptation options. After outlining the relationship of this paper to other Adaptation Policy Framework (APF) TPs, the authors explain the key concepts of hazards, systems and adaptive capacity. In addition to listing the determinants of adaptive capacity and discussing the uses of indicators, this paper addresses the nature of current and future hazards, and – based on the five APF Components – outlines guidance on assessing and enhancing the capacity of systems (and populations) to adapt to these hazards. Examples and links to resources are provided throughout the text and in the Annex.

7.2. Relationship to the Adaptation Policy Framework as a whole

Since a distinguishing feature of the APF is its focus on adaptive capacity, this TP relates to all five Components of the APF process (Figure 7-1). In other words, the enhancement of adaptive capacity should be considered at all stages of the adaptation process.

- Component 1 (TP1), *Scoping and designing an adaptation project:* TP7 recommends assessing adaptive capacity in terms of the capacity of particular systems and groups to adapt to specific types of hazards. The question of defining systems and identifying hazards (i.e., "who adapts and to what?") is explored through Component 1. This question should inform the design of any adaptation strategy.

- Components 2 and 3 (TPs 3-6), *Assessing current vulnerability and Assessing future climate risks:* Vulnerability assessments must form the basis for strategies to enhance adaptive capacity. Similarly, the nature of adaptive capacity and appropriate adaptation strategies is partly determined by the nature of the hazards to which systems must adapt; factors relating to development, economic well-being, health and education status are important determinants of adaptive capacity.

- Component 4 (TP8), *Formulating an adaptation strategy:* Identifying existing adaptive capacity and developing strategies for enhancing capacity are essential prerequisites for designing and implementing adaptation strategies.

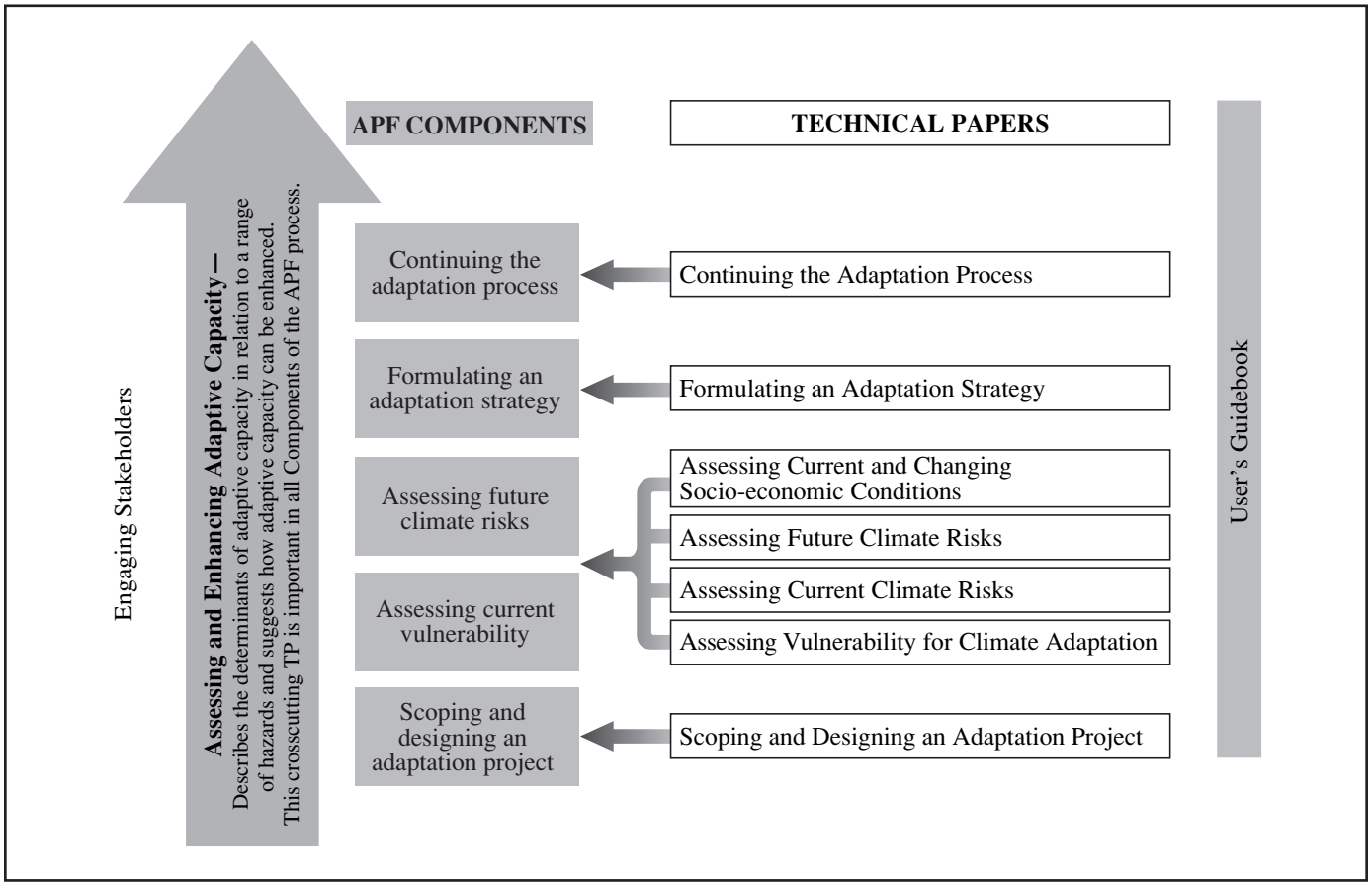

Figure 7-1: Technical Paper 7 supports all Components of the Adaptation Policy Framework

- Component 5 (TP9), *Continuing the adaptation process:* The processes of reviewing, monitoring and evaluating are important in maintaining levels of adaptive capacity. These processes can collectively identify where capacity development has succeeded or failed, and the extent to which it has been translated into actual adaptation.

- All Components (TP2), *Engaging stakeholders in the adaptation process:* Engaging stakeholders is the APF's other cross-cutting activity. Strategies to enhance adaptive capacity should engage stakeholders at all stages if they are to be successful and equitable.

7.3. Key concepts

The glossary contains short definitions of terms used throughout the APF, whereas extended definitions of important concepts for this paper are described here.

7.3.1. Adaptive capacity

Adaptive capacity is the property of a system to adjust its characteristics or behaviour, in order to expand its coping range under existing climate variability, or future climate conditions. In practical terms, adaptive capacity is the ability to design and implement effective adaptation strategies, or to react to evolving hazards and stresses so as to reduce the likelihood of the occurrence and/or the magnitude of harmful outcomes resulting from climate-related hazards. The adaptation process requires the capacity to learn from previous experiences to cope with current climate, and to apply these lessons to cope with future climate, including surprises.

The expression of adaptive capacity as actions that lead to adaptation can serve to enhance a system's coping capacity and increase its coping range (TPs 4 and 5) – thereby reducing its vulnerability to climate hazards (TP3). The adaptive capacity inherent in a system represents the set of resources available for adaptation, as well as the ability or capacity of that system to use these resources effectively in the pursuit of adaptation. Such resources may be natural, financial, institutional or human, and might include access to ecosystems, information, expertise, and social networks. However, the realisation of this capacity (i.e., actual adaptation) may be frustrated by outside factors; these external barriers, therefore, must also be addressed. At the local level, such barriers may take the form of national regulations or economic policies that hinder the freedom of individuals and communities to act, or make certain adaptation strategies unviable. However, many models of capacity development (UNDP-GEF, 2003) consider regulatory and policy framework to be internal to the system.

Capacity development refers to the process of enhancing adaptive capacity, and is discussed as a key Component of adaptation. The role of capacity development is to expand the coping range and strengthen the coping capacity of a priority system with respect to certain climate hazards, and thus to build the capacity of the system to adapt to climate change, including variability. Many social service agencies view capacity development as a change-management process (UNDP-GEF, 2003) within a governance framework; in this case, as defined by the determinants of adaptive capacity (TP9). As such, adaptive capacity development is viewed as a central goal of most adaptation strategies.

7.3.2. Key Components of adaptive capacity

Information on the nature and evolution of the climate hazards faced by a society – both historical climate data and data from scenarios of future climate change – is key to enhancing adaptive capacity.

On the other hand, information on socio-economic systems, including both past and possible future evolution, is important. Within these evolving socio-economic and developmental contexts, viable adaptation strategies can be designed. Adaptation and capacity development strategies must also be acceptable and realistic, so information on cultural and political contexts is also important.

The implementation of adaptation strategies requires resources, including financial capital, social capital (e.g., strong institutions, transparent decision-making systems, formal and informal networks that promote collective action), human resources (e.g., labour, skills, knowledge and expertise) and natural resources (e.g., land, water, raw materials, biodiversity). The types of resources required and their relative importance will depend on the context within which adaptation is pursued, on the nature of the hazards faced, and on the nature of the adaptation strategy.

Adaptation strategies will not be successful unless there is a willingness to adapt among those affected, as well as a degree of consensus regarding what types of actions are appropriate. Adaptive capacity, therefore, depends on the ability of a society to act collectively, and to resolve conflicts between its members – factors that are heavily influenced by governance.

Adaptive capacity can be undermined by a refusal to accept the risks associated with climate change, or by a refusal of key actors to accept responsibility for adaptation. Such refusals may be ideological in nature, or the consequence of vested interests denying the existence of risks associated with climate change. Large-scale structural economic factors and prevailing ideologies, therefore, play a vital role in determining which adaptations are feasible.

7.3.3. Scales of adaptation

At the national or state level, governments and institutions will undertake a combination of **planned** and **reactive** adaptation, in which lessons learned from past hazard events are incorporated into forward-looking adaptation strategies. Climate projections

will play a key role in planning for future climate change, facilitating anticipatory adaptation to new hazards and informing ongoing adaptation to familiar evolving hazards. Historical records will be of great value in identifying climate trends and "early warnings" of climate change. Clearly, climate information will be vital in planning adaptation strategies, and a system's capacity to adapt to climate change will be heavily influenced by its ability to collect and interpret such information.

Nonetheless, it must be recognised that adaptation will ultimately be a localised phenomenon. It will be driven by the need for people to adapt to the local manifestations and impacts of climate change, which will be mediated by geography and local physical, social, economic and political environments. Individuals tend to adapt in a reactive and often haphazard manner. At the local level, adaptation is a complex process that "emerges" as social systems reorganise themselves, in a largely unplanned fashion, through a series of responses to external stresses. Top-down, prescriptive strategies to undertake planned adaptation are therefore only a partial solution. Governments, non-governmental organisations (NGOs) and other bodies should address how they can enhance the capacity of systems (people) to adapt reactively and autonomously by creating enabling environments for adaptation. Such an approach must recognise that people will pursue adaptation strategies appropriate to their individual circumstances, and that adaptation may be unpredictable.

7.3.4. Systems and hazards

Adaptive capacity is most easily perceived in terms of the capacity of a particular **system** to adapt so as to better cope with a particular climate **hazard** or set of hazards. A system may be a region, a community, a household, an economic sector, a business, a population group, or ecological system. Systems will be exposed to varying degrees to different climate hazards, defined in TP4 as events with the *potential* to cause harm. Hazards are physically defined here, and it is the interaction of a climate hazard (e.g., a drought, windstorm, or extreme rainfall event) with the properties of an exposed system – its sensitivity or socially-constructed vulnerability – that results in a particular outcome (TP3; Adger and Kelly, 1999; Brooks, 2003; Pelling and Uitto, 2001). Three principal hazard categories may be identified:

1. **Discrete recurrent hazards** including simple and complex hazards (as described in TP4).
2. **Changes in mean conditions** occurring over years or decades (e.g., continuous increases in mean temperature), or desiccation (e.g., such as that experienced in the Sahel over the final decades of the 20th century).
3. **Singular or unique hazards** such as shifts in climatic regimes associated with changes in ocean circulation; the paleo-climatic record provides many examples of abrupt climate change events associated with the onset of new climatic conditions that prevailed for centuries or millennia (Roberts, 1998; Cullen et al., 2000; Adger and Brooks, 2003).

Climate change will likely be associated with all three categories of hazard, although the manifestations of climate change will vary geographically and over time. In the short term, perhaps the most likely changes will be in the frequency and severity of familiar recurrent hazards. The capacity to adjust to such changes in frequency and severity – and to support systems so that they can adapt to the altered levels of hazard – will be critical.

Changes in mean climate conditions will likely to be associated with changes in extremes. But adaptation to gradual change will be necessary in some cases, e.g., in certain agricultural systems where gradually increasing evapo-transpiration rates affect water demands. Gradual changes in mean conditions may ultimately result in the breaching of critical thresholds, beyond which a system's ability to cope is compromised (TP5).

7.3.5. Ecological systems

Much of the discussion in this TP refers to human systems and the role of human behaviour in mediating adaptive capacity. However, practitioners may also be concerned with the adaptive capacity of ecological systems, or coupled social-ecological systems. For unmanaged ecological systems, adaptive capacity will depend on factors such as biodiversity and migration potential. In a system with high biodiversity there may be more potential for species to occupy new niches created by changed environmental conditions or the loss of other species, although the loss of keystone species may have dramatic implications for the survival of ecosystems. Ecosystems that are geographically constrained will be less able to adapt to change than those that have space to migrate with shifts in climatic zones. Migration of ecosystems in response to shifts in climatic zones will also be limited by the growth rates of their constituent flora; rapid shifts in climatic zones may exceed rates at which such systems can migrate in response to an expansion of favourable climatic conditions.

Adaptation in ecosystems may be promoted by human actions, such as the creation of migration corridors through urban or agricultural areas, and the avoidance of fragmentation. It may also be possible to relocate certain species, and even whole ecosystems, to areas that are more favourable to their survival under changed climatic conditions. Adaptive capacity may also be enhanced by the reduction of non-climatic stresses related to factors such as pollution and resource exploitation; the promotion of sustainable development is thus likely to enhance the adaptive capacity of ecosystems. However, it should be recognised that most ecosystems are managed to some extent, and an approach that views sustainable development in terms of coupled ecological and social systems is likely to be more fruitful than one that attempts to separate "human" and "natural" systems in most instances.

7.3.6. Risk frameworks for adaptation

The impacts of a climate hazard on an exposed system are mediated by that system's vulnerability (TP3). The determinants of

vulnerability will depend on how a system is defined – and where its boundaries are drawn – but may include social, economic, political, cultural, environmental and geographic factors. The risk posed to a system may be viewed as a function of the nature of the hazard faced and system's vulnerability (Brooks, 2003). The vulnerability of a system to climate change will be inversely related to the capacity of that system to respond and adapt to change over time; a description of a system's vulnerability to climate change (i.e., vulnerability integrated over time) will therefore require a knowledge of that system's adaptive capacity, in contrast to a description of the instantaneous vulnerability of a system at a given time, e.g., the time of onset of a short-lived hazard event. Risk may be measured probabilistically, in terms of the likelihood of a particular outcome (outcome risk) or the likelihood of a particular hazard event (event risk) (Sarewitz et al., 2003). Alternatively, risk may be measured in terms of indicators of outcome, e.g., the number of people killed, injured or displaced, or the economic losses resulting from climate hazards over a particular period. The purpose of capacity development and adaptation strategies is ultimately to reduce risk, or to prevent the exacerbation of risk in the face of increasing hazards. Risk indicators are therefore useful in terms of assessing the success of strategies designed to enhance adaptive capacity.

7.3.7. Indicators of adaptive capacity

Indicators of risk say little about the processes that make systems and populations vulnerable and determine whether they can adapt to evolving climate hazards. Indicators of adaptive capacity, however, are more difficult to identify than indicators of risk, as adaptive capacity is not directly measurable. Recognising this difficulty, UNDP-GEF (2003) uses a score card (subjective) approach for assessing changes in capacity attributable to a project.

Capacity development projects should consider the role of external or contextual factors that affect systems, but are outside of their control, as well as internal factors operating within systems that may be directly addressed through interventions to enhance adaptive capacity. Whether a factor is internal or external depends on the scale of the system in question. For example, national level data used to develop adaptive capacity indicators could represent internal factors if the scale of analysis is national and external factors if the scale is local. In the project context, the team needs to make a judgment as to whether the factors are internal or external to the system boundary.

At the national level, adaptive capacity is strongly related to factors such as health, literacy and governance (Brooks et al., 2004). These, in turn, are related to economic development, although the nature of these relationships is complex and the subject of debate. Health, literacy, governance and economic wealth are representative of a country's overall development status; they are determined, to a large extent by the national development context, and thus contribute to the context within which sub-national scale systems must adapt. It might be well beyond the scope of most adaptive capacity development projects to affect national economic development, national governance, and the investment of central government in health and literacy. Capacity development projects might choose to address such factors at the local scale where they can be particularly effective in developing the capacity of highly vulnerable communities.[1]

If capacity development projects choose to operate at sub-national scales, they should address a range of factors that are important at the local level. The factors that represent adaptive capacity will be determined to a certain extent by the nature of the hazard(s) faced and by the characteristics of the system or population in question (e.g., the types of livelihoods that sustain the communities in question). For example, the factors that determine whether small-scale rural farmers can adapt to drought will not be the same as the factors that determine whether wealthy owners of waterfront properties can adapt to flooding, although there may be some common factors (e.g., the availability of information).

It is therefore not possible to provide a list of "off-the-shelf" indicators to capture universal determinants of adaptive capacity that are useful at the project level. Appropriate indicators for assessing adaptive capacity must be tailored to each case. These may be identified by asking the following nine questions. (The four key questions for the identification of adaptive capacity indicators are in bold; the other questions should have been addressed in the previous TPs. Annex A.7.1 contains sample responses to these questions.)

1. What is the nature of the system/population being assessed?
2. What are the principal hazards faced by this system/population?
3. What are the major impacts of these hazards and which elements/groups of the system/population are most vulnerable to these hazards? (See TP3 for vulnerability mapping/assessment.)
4. Why are these elements/groups particularly vulnerable? (See TP3 for how vulnerability is constructed.)
5. What measures would reduce the vulnerability of these elements/groups?
6. **What are the factors that determine whether these measures are taken?**
7. **Can we assess these factors in order to measure the capacity of the system population to implement these measures?**
8. **What are the external and internal barriers to the implementation of these measures?**

[1] However, capacity development efforts must also be sustainable in the sense that the benefits of a project can last beyond project completion. While desirable in themselves, efforts to improve health and literacy, for example, may provide only temporary adaptation benefits where there is a lack of state-supported infrastructure to provide continuity after a project has finished. Teams must therefore judge for themselves which factors may be effectively addressed and which should be viewed as providing the context or limits within which the project must be carried out.

Box 7-1: Identifying indicators to assess adaptive capacity and barriers to adaptation to flooding

Using the question-based approach outlined in Section 7.3.6, a team might identify the groups most vulnerable to flooding in a particular community or region. They conclude that vulnerability might be reduced by a combination of relocating certain groups to less exposed areas, and introducing and enforcing stricter building codes.

Indicators of capacity to adapt through these measures might capture awareness of flood risks, willingness of people to move, availability and affordability of housing in less exposed areas, and ability of local authorities to impose financial penalties on developers building in flood-prone areas or failing to incorporate measures to make new buildings more resilient. In certain developing countries where people build their own dwellings, the affordability and availability of the materials required to build more flood-resistant housing will be an indicator of their capacity to adapt, as will a knowledge of appropriate building design. A combination of quantitative and qualitative indicators would be required to assess the above factors (TP6).

External barriers to adaptation might include the lack of new land available for relocation, or limitations placed on local authorities by central government, preventing the introduction and enforcement of building regulations. (Insufficient financial resources and certain social factors might also prevent the enforcement of regulations.) Population density might be a quantitative indicator of such barriers, and political autonomy (most likely a qualitative indicator, perhaps based on results of surveys of local decision makers).

Internal barriers to adaptation might be the unwillingness of people to move away from flood-prone areas (due to the nature of their livelihoods), the high prices of land or property, or a lack of awareness of the risk of flooding under anticipated changes in climate. The latter two barriers might be addressed through the provision of social housing, loans or grants, and awareness-raising (education). The first barrier might be mitigated by supporting alternative livelihoods that do not require proximity to flood-prone areas. In this circumstance, team members must closely examine the impacts on the local economy and on food security. In a society where literacy rates are low, awareness-raising would be best pursued through non-printed media; the developmental context influences the nature of the capacity development activities.

9. How can capacity constraints be removed from key barriers to adaptation?

Indicators may also be developed to assess the extent of external and internal barriers (Box 7-1).

Indicators might be used to map the geographic and social differentiation of adaptive capacity within a region or community, e.g., examining the variation in capacity at the household level, based on factors such as income and dependency ratio. Alternatively, indicators representing aggregations at the regional level might be used to compare capacity across different regions and to monitor its evolution over time. Regional-level indicators might include overall population density, transport network density, regional income and inequality, the nature of economic activity, etc. The development of local-level indicators will benefit from stakeholder participation: local people are generally the best equipped to identify factors that facilitate and constrain their own adaptation. In the project context, pragmatism is paramount when choosing a set of key indicators (TP1 contains criteria for selecting indicators).

Indicators may be quantitative, representing a measurable quantity, such as population density or average income, or qualitative, representing factors such as the principal type of economic activity in a region, or people's perceptions of risk. TP6 discusses both quantitative and qualitative approaches.

7.4. Guidance on enhancing adaptive capacity

Since enhancing adaptive capacity is a process that cuts across all adaptation activities, the sections below provide guidance about each of the other Components. The process of enhancing adaptive capacity will be relevant to all projects, regardless of the approach. However, for projects using the *adaptive capacity approach* – distinguished by the identification of capacity development as its primary objective – it is possible to structure an assessment around the guidance provided below and in other TPs. (TP1 Section 1.4.4. contains information on selecting an approach).

7.4.1. Component 1: Scoping and designing an adaptation project

What is the adaptive capacity priority of the project, and what is the specific capacity enhancement goal?

The nature of a project that enhances adaptive capacity will depend on the nature of the system or systems targeted by the project (TP1). A project might target the general apparatus of government to raise awareness of the need for adaptation and for mainstreaming adaptation issues into the policy process at all levels of government. However, most projects will be less ambitious in scope, targeting specific systems, regions or population groups that are at greatest risk from climate

change, and/or sectors that are particularly important to a national economy. A project should start by identifying the priority system, the existing and/or potential hazards that threaten the system, and the timescales over which these hazards are likely to unfold. Priority systems, regions and populations might be identified on the basis of risk associated with existing climate hazards (Section 7.4.2), or with potential future hazards, as identified using climate change scenarios (Section 7.4.3).

Once the system and risks have been identified, the project team should consider the project's adaptation objective (TP1). For example, is the objective to make economic or agricultural systems more resilient, to reduce mortality from climate-related disasters, to prepare for specific, anticipated future manifestations of climate change, etc.? The aim of a capacity development project should be to increase the ability of systems to adapt, and of individuals and groups to design and implement adaptations. A capacity development project might be broken down into the following activities:

- identify a range of adaptations;
- prioritise adaptations based on their efficacy, feasibility and acceptability;
- remove barriers to adaptation;
- identify who is to act for planned adaptations.

Once these elements have been addressed, the team should be able to implement specific adaptation strategies. These might be single, large-scale planned projects, or multiple, diverse responses – the latter would be undertaken in a more ad-hoc, reactive way by individual agents. The role of "autonomous" adaptation should not be neglected; in past societies, adaptation to environmental variability and change has largely emerged in an unplanned manner as individuals responded in a variety of ways to change as it happened.

A real-world example set of questions about the early stages of the scoping process is provided in Box 7-2.

7.4.2. Component 2: Assessing current vulnerability

What adaptive capacity already exists to reduce current vulnerability to recurrent hazards?

In many countries, vulnerability to existing hazards is significant. In such cases, capacity development projects should seek to enhance the ability of systems and populations to cope with these hazards. Failure to address existing hazards will undermine longer-term adaptation strategies, as damage from present-day climate extremes can reduce economic and social development and undermine a country's resource base. Furthermore, in the short to medium term, climate risk is likely to be associated with hazards similar to those of recent record, although with varying frequency and severity over time. Enhancing its capacity to cope with and adapt to such hazards will enhance coping and adaptive capacity with respect to near-term climate change. Table 7-1 provides examples of measures in place to respond to different types of current hazards.

For projects using the adaptive-capacity approach, it is possible to develop an adaptive capacity baseline. Since there are few clear, quantitative indicators of adaptive capacity, this baseline will generally be constructed from qualitative indicators. (TP6 contains a discussion about the selection and use of qualitative indicators, or for use of a score card approach, see UNDP-GEF, 2003).

Capacity development for adaptation to existing climate hazards will be most effective when it is carefully targeted at the systems and populations most at-risk from climate hazards, where risk is a function of both vulnerability (TPs 3 and 4) and exposure to hazard (TPs 4 and 5). Combined hazard-vulnerability mapping projects can be of particular use, as these identify regions and groups with high vulnerability, as well as "hot spots" (i.e., elevated socially-determined vulnerability and climate hazard; TP3, Annex A.3-5). Information from mapping projects can also identify which types of hazard should be addressed in terms of capacity development projects. Prioritisation may also be undertaken

Box 7-2: Adaptation guidance for local authorities in the United Kingdom

The United Kingdom Climate Impacts Programme (UKCIP) offers guidance to local authorities in adapting to climate change (UKCIP, 2003, p.1). It encourages local authorities to ask themselves the following questions:

- Do you know how climate change could impact your area?
- Do your current policies, strategies and plans include provisions for the impacts of climate change?
- Can you identify and assess the risks from climate change to your services?
- Are developments with a lifetime of more than 20 years required to factor in climate change?
- Does your Emergency Planning Service take into account climate change?
- Are you addressing climate change in your local community strategy or community plan?
- Have you briefed your elected members on any key risks arising from climate variability and long-term climate change?

Addressing the above questions will significantly enhance institutional adaptive capacity at the local level. The report also lists potential impacts of climate change on local government authority services and potential adaptation responses, and is a useful template for other similar communities.

Table 7-1: *Types of current hazard and adaptation responses*

	Familiar discrete recurrent hazards	**Existing trends**
Principal types of adaptation response	• Combined reactive and anticipatory (planned and autonomous)	• Responsive (autonomous assisted/facilitated by policy)
Examples of hazard	• Floods, droughts, wind storms, heat waves, cold waves, extreme rainfall events, hail storms, dust storms	• Increased evapo-transpiration, long-term reductions in rainfall (e.g., Sahel), increases in minimum temperatures, rising water tables, salinisation of aquifers
Who acts?	• Government, planning bodies, communities, individuals	• Communities and individuals, planning bodies
Measures to enhance adaptive capacity	• Establish monitoring networks • Assess historical data and case studies (identify successful and unsuccessful adaptations) • Disseminate information on successful adaptations • Develop short-range forecasting capacity • Improve access to credit and insurance • Encourage autonomous adaptation • Prevent maladaptation through regulation • Enforce environmental regulations • Assess adaptation needs (including technological needs) through stakeholder engagement	• Establish monitoring networks • Assess historical data and past/existing adaptations (identify successful and unsuccessful adaptations) • Disseminate information on successful adaptations • Develop long-range forecasting capacity • Assess adaptation needs through stakeholder engagement • Create "enabling environments" to encourage further adaptation

on the basis of recent historical outcomes from climate hazards. (Box 7-3 has additional information on prioritisation using various data sources).

Case studies can also illuminate examples of "good practice" in terms of risk management (see the case study section), and lessons may be learned from examples of successful adaptation/vulnerability reduction from other contexts (e.g., from other countries). Box 7-4 briefly summarises an example of successful adaptation in the African Sahel.

7.4.3. Component 3: Assessing future climate risks

What capacity will societies have to adapt to future hazards?

Current socio-economic, political and environmental conditions, described (depending on the project approach) in terms of current vulnerability and existing adaptations, represent the project baseline (TP1, Section 1.4.3). Adaptive capacity will exist within current socio-economic, political and environmental contexts, as discussed in TP6. The capacity to adapt to a given set of hazards may be enhanced or reduced over time, depending on development pathways. The use of socio-economic scenarios to assess how vulnerability, and by extension adaptive capacity, may change over time under different development trajectories is also discussed in TP6.

Vulnerability to climate change over significant time periods (years to decades) is crucially dependent on the ability to adapt to the manifestations of climate change. The determinants of vulnerability and adaptive capacity will vary to some degree depending on the nature of the climate changes being experienced – e.g., agricultural adaptation to drought will be a very different process from adaptation of settlements to increased flooding; in reality, even the vulnerability approach to risk management will require some knowledge of what hazards are likely to be associated with future climate change. In the absence of detailed data from climate models and scenarios, it is not unreasonable to extrapolate from existing conditions. At least in the near term, climate change is likely to be associated with changes in the frequency and severity of historically familiar hazards. Consequently capacity development is likely to be most useful if it focuses on these hazards. Nonetheless, such a strategy should be augmented by efforts to gather information on potential climate change as projected by climate models, and also on recent observable climate trends which may act as "early warnings" of further changes to come.

The capacity to adapt to future climate hazards will be enhanced by the following measures:

- Develop an understanding of possible future climate hazards based on model projections and climate scenarios where these are available.
- Where the above are not available, focus on the types

Box 7-3: Data sources and prioritisation of systems

The following sources can provide valuable information on hazards, vulnerability and current adaptations, and adaptive capacity at the sub-national level, assisting the identification of high priority systems, regions and populations:

- National vulnerability assessments
- National Adaptation Programmes of Action (NAPAs)
- Vulnerability and hazard assessment and mapping projects

If these sources are not available, prioritisation might be undertaken using records of climate-related disasters – if available – from national statistical agencies, government departments, NGOs, or research organisations. Data on climate disaster-related mortality, displacement, total economic impacts, and other adverse outcomes, can be useful in identifying the areas at greatest risk for climate change hazards. Where data is limited or unavailable within a country, project teams might wish to use the following international databases:

- Emergency Events Database (EM-DAT) (http://www.cred.be/emdat) contains data relating to a variety of disaster types, including those with a climatic Component, for most countries. See Brooks and Adger (2004) and Brooks et al. (2004a, b) for applications of EM-DAT to studies of climate risk and vulnerability.
- DesInventar database (http://www.desinventar.org/desinventar.html) contains sub-national data on disaster outcomes for selected countries in the Americas.

These data sources may be used to prioritise regions, systems and population groups for capacity development projects, based either on the distribution of adaptive capacity, or on the need for capacity development to improve outcomes from climate hazards. For example, in high-risk regions that exhibit persistently high negative outcomes (in terms of mortality, displacement, economic losses, etc.), the question-based approach outlined in Section 7.3.6 may be used to (a) identify determinants and indicators of adaptive capacity and (b) design capacity development and adaptation strategies. Adaptive capacity indicators and measures of outcomes from climate hazards can be used to monitor the success of these strategies. Indicator identification and monitoring of success will be greatly assisted by consultations with stakeholders: those affected by climate hazards will be best placed to identify the factors and processes that determine their capacity to adapt, and also to assess the success of strategies aimed at enhancing this capacity (Box 7-5).

Box 7-4: Agricultural adaptation in the Sahel

During the final decades of the twentieth century, inhabitants in parts of the Sahel (northern Nigeria and parts of Niger) successfully adapted to both drought and economic liberalisation, as reported by Mortimore and Adams (2001). The devastating drought of the early 1970s led to substantial loss of human life, and also resulted in widespread loss of livelihoods, transforming sections of Sahelian societies. Nonetheless, since the 1970s, agricultural systems have been transformed through a process of autonomous adaptation. With the abolition of subsidies on farm inputs, and in the face of uncertainties in world markets, many farmers have moved away from export agriculture, instead exploiting local markets. Agricultural diversity has increased as more integrated systems of farm management have been adopted. Livestock numbers have increased, and artificial fertilisers have been replaced with animal manure. Soil and water conservation measures have been introduced. Household incomes have also diversified, with non-farm income increasing in importance.

Other countries and regions facing drought might look to such examples when addressing adaptation to existing climate hazards or future climate change. The Sahel can provide examples of the successful adaptation of agricultural systems to increasing aridity and rainfall variability in a semi-arid environment, conditions which might be faced by other regions in the future. The cases described by Mortimore and Adams (2001) and other authors demonstrate the importance of local (informal) markets. In communities in which state-fixed prices are too low to act as incentives for agricultural innovation, adaptation has not occurred, and people have instead migrated to cities. In government-sponsored efforts to promote food security, programmes should encourage agricultural adaptation by supporting local markets, rather than focusing on export agriculture. (See Annex A.7.1 for additional information.)

Table 7-2: *Types of future hazard and adaptation responses*

	Future discrete recurrent hazards	Future trends	Future singular events
Principal types of adaptation response	• Initially anticipatory (planned, policy driven); also reactive when hazards are realised	• Responsive and anticipatory (planned and autonomous)	• Anticipatory (planned, policy driven), reactive if/when events occur
Examples of hazard	• Floods, droughts, wind storms, heat waves, cold waves, extreme rainfall events, hail storms, dust storms	• Warming, cooling, desiccation, sea-level rise	• Changes in thermohaline circulation, ice-sheet collapse, glacial dam-bursts, abrupt warming/cooling, circulation shifts
Who acts?	• Government and planning bodies	• Communities, individuals, government and planning bodies	• Government and planning bodies
Measures to enhance adaptive capacity	• Establish monitoring networks • Develop forecasting capacity • Develop ability to assess climate model output • Build resilience to existing hazards	• Establish monitoring networks • Develop forecasting capacity • Develop ability to assess climate model output • Create enabling environments	• Participate in global climate monitoring programmes • Develop ability to assess climate model output • Develop contingency plans for dealing with impacts of singular events

of hazards that are familiar from the recent historical record, while gathering more quantitative information on possible future climate hazards from modelling studies, scenarios and analysis of recent trends.

- Develop an observational capacity to identify trends that may constitute "early warnings" of climate change.
- Adopt a vulnerability-based approach to risk management that is nonetheless informed by a prioritisation of hazards based on the above considerations.
- Create an environment in which adaptation is possible by disseminating information about climate change and its potential consequences, and addressing uncertainty.
- Engage stakeholders to discuss and formulate strategies to increase the capacity to adapt to future climate change.

Table 7-2 frames these and other measures for enhancing adaptive capacity, in relation to the types of future hazards to which they can respond.

7.4.4. Component 4: Formulating an adaptation strategy

What measures, policies and strategies enhance adaptive capacity and encourage autonomous adaptation?

The aim of capacity development projects is to create resilient and flexible systems that will be better prepared to adapt autonomously (i.e., without external intervention). Capacity enhancement will also facilitate the efficient implementation of adaptation strategies by reducing obstacles and making people more receptive. These principles should be at the heart of methods to enhance adaptive capacity, which are a prerequisite to implementing adaptation strategies and measures (Section 7.4.5).

Capacity development strategies must be tailored to the systems where adaptation is to be promoted (identified in Components 1 to 3) and to the climatic, environmental, socio-economic and political contexts within which these systems exist, e.g.,:

- Nations that experience little damage from existing climate variability will wish to concentrate on enhancing the adaptive capacity of systems that are likely to be vulnerable to anticipated future hazards.
- If substantial uncertainty exists as to the nature of future hazards, the focus would be on enhancing the resilience of economically or culturally important systems; in such cases, projects will focus on the issues raised in Component 4.
- Countries that suffer frequent losses as a result of existing climate variability will wish to focus, at least initially, on enhancing the capacity of systems and populations to increase their coping range with respect to familiar hazards (focusing on Component 2). These countries will also need to consider how strategies that deal with current hazards may incorporate measures to deal with future risks.

Box 7-5: The importance of awareness raising for capacity development

Awareness raising is important as it helps stakeholders and decision makers recognise the need for adaptation, and promotes willingness to engage in the identification, prioritisation and implementation of adaptation options. Decision-makers and stakeholders need to understand the risks climate change poses to their society; people will not pursue potentially disruptive and expensive adaptation strategies unless they are convinced that they are necessary. Scepticism concerning the reality of climate change may need to be overcome through the dissemination of information relating to the science of climate variability and change, including considerations of uncertainty. There is a need for clear communication by scientists to decision makers and stakeholders about the nature of anticipated climatic changes and the risks they pose to society. Training in science communication, as well as funding of scientific research is desirable, as is the formation of databases of explanatory materials for use in public education and communication with policy makers and others.

Awareness raising will also be facilitated by the keeping of reliable, detailed meteorological records, which may be used to identify climatic variations and trends on multi-decadal timescales. Climate scenarios and socio-economic scenarios will also be useful for visualising the potential impacts of climate change and their implications for stakeholders. The development of seasonal forecasting ability will also enhance the capacity of those in climate sensitive sectors such as agriculture to adapt. Forecasts will become increasingly important in the event of increased interannual climatic variability, particularly where agriculture depends on the planting of crops to take advantage of a short-lived wet season. Uncertainty must be addressed explicitly in seasonal forecasts and in long-range climate change scenarios, and the dissemination of this information should be undertaken by an adequately staffed and funded meteorological or climate change unit. Dissemination might be via public service broadcasting, particularly where there is a large, widely dispersed rural population and where literacy rates are low. In such areas, access to information will be enhanced by measures such as the distribution of free or very low-cost wind-up radios.

The principal elements of the capacity development process are as follows (Yohe and Tol, 2002):

- Raise awareness of the risk associated with the hazard (Box 7-5).
- Identify a set of possible adaptation options, including those that may be undertaken by actors at a range of scales, from institutions and government to communities and individuals (discussed in TP8).
- Prioritise options based on their efficacy, feasibility and acceptability (discussed in TP8).
- Remove barriers to adaptation within the system being addressed (discussed in TP9).

Some adaptation options will involve considerable planning and co-ordination, while others may be undertaken on an ad hoc basis. These latter, "autonomous" adaptations can be encouraged by providing an economic, regulatory and policy environment in which people are likely to pursue these options, rather than through coercive measures. Examples might be (i) encourage agricultural diversification through grants, loans, subsidies on specific farm inputs, and support local markets, or (ii) provide incentives via local tax regimes for people to settle in less hazard-prone areas.

How can we identify and prioritise adaptation and capacity development options?

One of the most common needs is the capacity to design integrated policy packages that sufficiently identify trade-offs, synergies and conflicts among key sectors. An initial shortlist of options for adaptation/capacity development may be drawn up, based on considerations of what is appropriate and technically feasible within the existing socio-economic and political context. Involving stakeholders from the outset reduces conflict (TP2). The short-listed options can then be prioritised based on how likely they are to be effective (efficacy), how easy they are to implement (feasibility), and how acceptable they will be to those affected by them (acceptability). To a large extent, feasibility and acceptability might be based on considerations of cost, although non-financial criteria must also be considered (TP8). Prioritisation might therefore be performed using a multi-criteria analysis, or by seeking consensus among the stakeholders. Although the latter approach is less likely to lead to conflict, consensus might be difficult to achieve. Different interest groups will exhibit preferences for certain adaptation options, and the resolution of inter-group conflicts will be central to the adaptation process. Clearly, fostering dialogue and nurturing a culture of consensus may be important in enhancing adaptive capacity (Box 7-6). For practical examples of prioritisation of options, see Yohe and Tol (2002).

What constraints might there be on adaptive capacity?

A number of adaptations may be feasible and effective for a system or population that needs to increase its ability to cope with a climate hazard. However, for various reasons, these options may not be acceptable. In such cases, acceptability represents an important constraint on adaptive capacity. For example, building a dam to buffer a region against drought – by storing and providing water for domestic, industrial and agricultural use – may be unacceptable for social and ecological reasons. Its construction may displace people, destroy valued ecosystems, or inundate culturally important areas. Alternatively, it might be prohibitively expensive, or threaten the

Box 7-6: Adaptive capacity and participatory decision-making

Stakeholder involvement (TP2) in the identification and prioritisation of adaptation options is absolutely vital, since to be successful, adaptation measures must be acceptable to those who are to implement them. Where there is no consensus as to the feasibility and acceptability of these options, the capacity to adapt will be very limited, and what adaptation does occur will be constrained by conflict.

The origin of a capacity development initiative is an important factor in the commitment of decision makers and stakeholders. When the impetus for adaptation comes from, and is generally acceptable to, both the government and stakeholder communities, progress is likely. Alternatively, if the adaptation agenda is imposed by external groups – without local representation – community buy-in will be difficult to achieve. The role of external groups should be to support locally-driven initiatives for adaptation strategies. An opportune time to develop such initiatives is after crises (e.g., cyclones, droughts, or floods). At these times, political and social awareness of environmental change issues is high, and resistance to adaptation strategies is low.

The exclusion of poor and marginalised members of society from the decision-making process is likely to lead to further undermining of their socio-economic status that may, in turn, lead to social conflict and political instability. This is particularly likely if adaptation measures involve displacement. Further marginalisation may also lead to environmental degradation, as the extremely poor are forced to use resources in an unsustainable manner in order to survive. Strategies with such consequences are as likely to be maladaptive as they are to help adaptation. Adaptive capacity is strengthened by the existence of networks and mechanisms that encourage participation and prevent marginalisation.

In the relationship between society and the state, capacity development should take the form of engagement between civil society, in the form of stakeholder groups, and local and national government. Stakeholder representatives should come from all sections of society likely to be affected by climate change, or by the implementation of adaptive measures. Stakeholder groups with little or no historical power to influence decision-making should be represented, and the fact that adaptation may create "winners and losers" must be recognised. A wide variety of stakeholders should participate in adaptation policy formulation, and in the case where those who share concerns and interests regarding climate change have no framework for collective representation, they should be assisted in building such networks. People are far more likely to support adaptation strategies if they feel their views have been taken into account.

Decision makers might have to weigh the interests of those who will be physically displaced against those who stand to profit economically from the implementation of the adaptation measure. In such circumstances, adaptive capacity will be enhanced by the existence of formal mechanisms for addressing such conflicts of interest, and through the pursuit of conflict management strategies. Those who will be most adversely affected by an adaptation measure should have a greater input, in addition to offers of compensation.

TP2 provides guidance on stakeholder engagement; additional information is provided in the UNDP/GEF handbook listed in the references (UNDP/GEF, 2004).

security of communities downstream. It may also lead to reduced stream flow in neighbouring downstream countries, and become a source of potential political conflict. In such a case, acceptability represents the "weakest link" in terms of adaptive capacity. If building a dam were the most effective, or only, adaptation measure available, efforts might be made to remove the barriers to its implementation. Such efforts might involve the relocation of threatened settlements (perhaps augmented by financial compensation), ecosystems or heritage sites, or the negotiation of water management agreements with neighbouring countries. The first step towards enhancing adaptive capacity is identifying the "weakest link" of the system in terms of its capacity.

Alternatively, an adaptation measure may be effective and acceptable, but might not be feasible due to technological limitations. What is technically feasible for one country may not be feasible for another. Similarly, cost might be the deciding factor, making certain measures feasible in wealthy countries but impossible in poor nations, again emphasising the importance of developing adaptation solutions that are appropriate to local circumstances, with input from stakeholders.

Capacity constraints might also originate from outside a country's borders. For example, options that require restructuring economic policy at the national level may be vetoed by creditor nations or international financial institutions, which often dominate the economic policies of highly indebted developing countries. These constraints are much more difficult to overcome. Even where a country has a significant degree of economic independence, those running capacity development projects at a sub-national scale are likely to have little influence over national economic policy. Their efforts will be better

employed by promoting local measures to facilitate autonomous adaptation, particularly if they are concerned with a single locality or with a sector that does not make a large contribution to the national economy. (TP9 contains additional discussion on dealing with potential constraints.)

What policy considerations are important in capacity development strategies?

Policies aimed at enhancing adaptive capacity must achieve a balance between strong regulations to prevent maladaptation (e.g., steering development away from flood plains) and measures to encourage adaptive behaviour. Policies should provide individuals, communities and organisations with sufficient flexibility to pursue adaptation strategies appropriate to their circumstances. Restrictive policies must be carefully targeted to avoid undermining adaptive capacity. New policies should be assessed in terms of their potential impacts on adaptive capacity, particularly for groups and systems that already exhibit high vulnerability and/or exposure to climate hazards. The impacts of policies on systems and communities in sensitive ecosystems, such as coastal and riverine zones, should be given special attention. Policies designed to address issues at a regional scale can have unforeseen effects at local scales; cross-scale linkages should therefore be examined in a "policy impact assessment" process.

7.4.5. Component 5: Continuing the adaptation process

How can efforts to enhance adaptive capacity be sustained and improved over time?

Once a strategy has been developed and barriers to adaptation addressed, adaptation measures can be implemented. Of all the APF Components, this is one of the most complex. It requires the capacity to recognise opportunities for mainstreaming adaptation into on-going processes. TP9 suggests actions that can be taken to facilitate adaptive capacity.

Adaptation measures must be ongoing, and strategies to encourage and facilitate adaptation should not be seen as "one-off" measures. For this reason, it is important that the adaptation strategies be assessed on a continual or regular basis. Reviewing, monitoring and evaluating the success of adaptation strategies is addressed in detail in TP9. The following questions are important to the adaptation learning process:

- Are the strategies working – i.e., are they as effective as anticipated at reducing vulnerability and/or effectively managing risk?
- Once implemented, are the adaptation strategies still viewed as acceptable – i.e., are there any unexpected negative consequences of these strategies that reduce their acceptability?
- Are the strategies as feasible as was anticipated – i.e., are there any previously unforeseen difficulties in their implementation?
- Has adaptive capacity really been increased?
- Are people more willing and better able to pursue autonomous adaptation?

Assessments of the success of adaptation strategies and capacity development programmes, and the modification of such strategies where necessary, will benefit from the following activities:

- Meteorological monitoring, which provides information on the evolution of hazards.
- Monitoring outcomes (mortality, morbidity, displacement, economic losses), which enables project teams to assess the success of adaptation strategies. Improvements in outcomes under conditions of constant or increasing hazards is indicative of effective adaptation; even where outcomes apparently do not improve, adaptation may be working if hazards are increasing in severity and/or frequency (TP9).
- Monitoring of vulnerability and adaptive capacity using indicators, which can yield direct information on the impacts of adaptation strategies, even in the absence of hazard events (e.g., where strategies are designed to increase resilience to, or prepare for, anticipated future hazards) (TP9).
- Stakeholder involvement in the assessment process, which can offer valuable feedback on whether adaptation and capacity development strategies are proving successful, as well as on any unforeseen consequences of these strategies (TPs 2 and 9).

Monitoring the success of adaptation and capacity development strategies is necessary, but not sufficient, to ensure that the adaptation process continues effectively. In addition, adaptation strategies must be flexible, and able to incorporate new information on climate hazards and on socio-economic and environmental systems. Given the high degree of uncertainty in both climate and socio-economic scenarios, it is highly probable that, as new information becomes available and our understanding of the climate system and processes of adaptation improves, existing strategies will need revision or updating. A flexible approach is required to prevent societies from becoming "locked in" to policies and procedures that may prove inappropriate in the mid- to long-term. A danger in large-scale, long-term projects is that political inertia and vested interests encourage their continuation, even if it becomes apparent that they are inappropriate, or that better alternatives are available. Adaptive capacity will be enhanced if accompanied by policies that require their future modification and revision. (TP9 provides additional discussion on continuing the adaptation process.)

7.5. Conclusions

In its broadest context, the APF treats adaptive capacity as a change management process. In other words, adaptation will only occur if the system is able to adjust its characteristics or behaviour, so that its coping range is expanded under future climate, including variability. However, external barriers to

adaptation often exist and the adaptation process does not automatically occur if capacity in the system is constrained. It follows that an adaptation project can be designed to catalyse a change process if the key capacity constraints are removed. In a given system, it is necessary to understand the Components of the change process in terms of: "Who needs to adapt?" "To which climate risks?" "What are the barriers to adaptation?" "What are the capacity constraints of the adaptation process?"

A prerequisite to enhancing adaptive capacity is the baseline analysis of adaptive capacity to cope with current climate. Because adaptive capacity cannot be directly measured, it is characterised by examining potential changes of the sensitivity of human and ecological systems to climate. A capacity assessment includes an examination of the willingness and resources necessary to adapt to climate hazards. An assessment should avoid the potential pitfall of trying to identify a comprehensive list of quantitative capacity indicators. It is more important to understand and to characterise the adaptation process in a pragmatic manner.

Following the guidance in this paper, project teams should be able to produce some of the following:

- A list of priority systems and target groups most in need of adaptive capacity development (TPs 1, 3 and 6).
- A set of qualitative indicators that characterise adaptive capacity within and between systems, population groups and regions (TPs 3 and 6).
- A shortlist of realistic options for adaptation and adaptive capacity development for a priority system/population facing a particular hazard or set of hazards (TP8).
- A set of preferred adaptive capacity development options based on considerations of feasibility, efficacy and acceptability, identified in consultation with stakeholders (TP8).
- A strategy for implementing the preferred adaptive capacity development options involving significant stakeholder involvement, frequent review of progress, and assessment of options for revision (TPs 2, 8 and 9).

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ANNEXES

Annex A.7.1. Capacity to adapt to drought in the Sahel

The question-based approach to identifying indicators of adaptive capacity is illustrated below using the example of drought in the African Sahel. The indicators are suggestions; the example is a general one and does not relate to any specific country or region. A combination of quantitative and qualitative indicators is suggested (qualitative indicators are identified in the text). Most indicators represent the local scale, but in some cases, national-level indicators, representing interactions across scales, are also identified. The example draws on the work of Mortimore and Adams (2001).

Note that the UNDP-GEF (2003) approach differs from the example below. In the latter, evidence that adaptation has occurred is required. A score card rather than specific indicators is used.

What is the nature of the system/population being assessed?

- Rural livelihoods, including small-scale farmers and pastoralists

What are the principal hazards faced by this system/population?

- Drought

What are the major impacts of the hazard(s) and which elements of the system/population are most vulnerable to these hazards?

- Food shortages, famine, loss of livelihoods, rural-urban migration, economic losses.
- Rural poor, isolated communities, small households, pastoralists.

Why are these elements/groups particularly vulnerable?

- Poor households are unable to afford food when production fails.
- Isolated communities are often inaccessible or overlooked in terms of aid distribution; opportunities to exploit local markets for income diversification and to seek temporary salaried work in urban centres are limited.
- Labour availability for agricultural tasks is determined by household size, age and sex of household members, and options for bringing in labour from outside the household.
- Once pastoralists lose their animals they are reliant on aid or forced to resort to begging, at least in the short term. Pastoralists are often marginalised by governments that prefer sedentary populations and favour settled agriculture.

What adaptive measures would reduce the vulnerability of the above groups?

- Agricultural innovation to promote resilience.
- Improved transport networks and accessibility of isolated communities.
- Development of local markets.
- Increased resource sharing (including labour).
- Recognition of and support for pastoral groups – availability of grazing, mobility. Shift to livelihoods based on animals better adapted to drought, e.g., from cattle to sheep goats, camels.

What capacity exists to implement these measures?

- Agricultural innovation requires financial and human resources, technical and/or traditional knowledge, availability of crop and livestock varieties for diversification. In the Sahel, farmers have opportunities to sell produce. People are more likely to invest in agriculture if they are secure in their tenure. *Indicators: household income and size, dependency ratio, biodiversity, prices of farm inputs and outputs, land ownership, economically-active population, knowledge of traditional farming practices (qualitative indicator).*
- Isolation can be tackled locally by strengthening links between communities, or by government, e.g., building roads. These require good community relations and public investment respectively. *Local level indicators: settlement density, road density, "social capital" indicators. National level indicators: political accountability and representation of region, financial and technical resources.*
- Local markets can be developed through subsidies and controls on imports and commodity prices, although these might be politically unacceptable. Deregulation and the removal of price controls – where prices of agricultural goods are artificially low – may also stimulate local agricultural and economic development. Transport networks will also facilitate local trade and exchange. *Local level indicators: price of agricultural outputs, road density. National level indicators: political representation, economic autonomy* (e.g., *linked to debt).*
- Resource sharing is most likely to occur where community relations are good and traditional social institutions are strong. *Indicators: indicators of community cohesion (e.g., crime rate).*
- The ability of pastoral groups to access pasture and water is, to a certain extent, determined by geography and the nature of the local or regional physical environment. However, their capacity to adapt by exploiting new areas or retreating to more productive areas is often limited by restrictions on their movement due to agricultural expansion, political marginalisation and the existence of national boundaries. A shift from cattle to other animals requires that the latter are available, affordable and culturally acceptable. *Local level indicators: rate of agricultural expansion, per cent of land area covered by rangeland, water availability*

(e.g., well density), livestock prices, proximity to national borders. National level (qualitative) indicators: internal and external conflict, relations between pastoral groups and ruling groups.

What barriers are there to the implementation of these measures?

Some constraints to the realisation of adaptive capacity have been mentioned above, where they are generally represented by the "national level" indicators. These national level indicators represent processes and factors that provide the broader political or economic context for local adaptation, and which may be viewed as external to the local systems in which adaptation occurs. Constraints on the realisation of adaptive capacity may result from economic policies that affect the price of farm inputs or outputs (e.g., imported foodstuffs that compete with farm output). These policies may be the result of conditions imposed on a country by creditor nations or international financial institutions. In such a case, adaptive capacity might be developed at the local level by recognising these economic barriers and developing alternative livelihood strategies. At the national level, capacity might be enhanced by a renegotiation of debt repayments or by a rethinking of relationships with international financial institutions. These financial interventions should have greater focus on regional co-operation and reduced emphasis on integration into the world economy, allowing the government to support local markets and livelihoods.

While isolated communities are likely to be vulnerable in terms of livelihood and food security, and lacking in adaptive capacity, their isolation might also mean that they are less adversely affected by factors such as cheap imports that undermine local markets. Multiple and opposing consequences of strategies to enhance adaptive capacity should be assessed; poorly-conceived strategies can undermine adaptive capacity if they have unforeseen consequences.

Further constraints on developing adaptive capacity might be the result of internal conflict (e.g., mitigating against long-term planning and/or investment and preventing regional co-operation). Conflict in neighbouring countries, which might result in border closures, may hinder the mobility of pastoralists. While nomadic groups are generally highly adapted to variable rainfall, anecdotal evidence suggests that their capacity to adapt in some Sahelian countries was constrained as a result of their displacement by sedentary agriculture, which expanded northward into marginal areas during the wet 1950s.

If constraints on adaptive capacity can be identified, capacity development and adaptation may be pursued. Such development and adaptation may either occur within the context of those constraints – recognising which options are realistic – or through a strategy that involves the removal of constraints where feasible and desirable. The latter strategy will often involve intervention at the governmental and international levels.