

Toward Decision-Relevant Information Systems for Adaptation to Climate Change in South Asia

Heather McGray, Ayesha Dinshaw, and Aarjan Dixit
World Resources Institute

Final Report to DFID for “Information for Climate Adaptation in South Asia: Identifying User Needs” project – June 29, 2012

Executive Summary

- As DFID and others design new investments in adaptation information in South Asia, they face a central challenge: it is not enough to support development of climate-specific data systems. A diversity of important social and environmental information also requires investment.
- The formatting and communication of information plays a critical role in its usability, and requires creative new approaches. However, it may not suffice to deliver information in a user-friendly form. Attention to political and institutional factors that shape information flow also is required to improve information use for adaptation.
- Research priorities for developing decision-relevant information for adaptation in South Asia include:
 - Political economy research on barriers to information use
 - Review of specific information needs within carefully bounded user communities
 - Evaluation of information use in community-based adaptation
 - Identification of critical social-ecological thresholds that climate change may affect
- Observation systems represent a vital informational foundation for adaptation. Investments in observation systems should:
 - Prioritize collection of data that helps describe the status of climate-sensitive resources, such as data on stream flow, soil moisture, and ground water
 - Prioritize collection of data that helps track key drivers of resource change, such as land use, water use, land rights, mineral resources, and population dynamics
 - Invest in institutional structures that can support system maintenance and use, not just in technology or technical skills
 - Include design of observation systems that support monitoring of adaptation itself
 - Ensure open access to data and information
- New information investments should address the absence of readily available tools, guidelines, and analysis that can directly support adaptation decisions in the region. Priorities include:

- Development of decision support tools for identifying and evaluating adaptation options
- Development of regional guidance on production and use of downscaled climate change projections, including “good practice” for communicating uncertainty
- Sustained dialogue between carefully bounded user communities and relevant information producers
- Capacity building support for the interface (boundary) organizations likely to play a key role in improving decision support

Introduction

In this paper the World Resources Institute (WRI) presents lessons and recommendations synthesized from recent research and convening activities supported by DFID under the project “Information for Climate Adaptation in South Asia: Identifying User Needs.” Our aim in sharing these reflections is to help shape upcoming investments in research and information systems in the region, such that those investments help deliver information that is useful to those responsible for decisions effecting adaptation to climate change in South Asia.

This project explored information as an input into adaptation decision making. Throughout the project we maintained a user-focused view of information, and user demand for information was considered from two main angles:

- (i) Improving information: Can we identify a core body of critical information that many users will want for adaptation decision making? How do we ensure that this “must have” information exists in South Asia and is made available to decision makers?
- (ii) Coping with imperfect information: Knowing that improvements in information may take some time, how can decision makers best leverage existing information? What approaches to adaptation best help them avoid delaying action?

We began by conducting a literature review on uncertainty as it relates to climate projections, downscaled climate models, and strategies for adaptation decision making. This desk research also looked into innovative adaptation strategies focused on robustness, such as Flexible Adaptation Pathways¹. We presented the results of this research at COP 17 in Durban, and held a roundtable of experts to provide feedback which further refined our thinking. We brought together all this research into a working paper, which also served as a background document for the workshop described below.

WRI interviewed global experts on these topics, as well as in-region decision makers, information producers,

¹ See Reeder, Tim and Nicola Ranger. “How do you adapt in an uncertain world? Lessons from the Thames Estuary 2100 project.” World Resources Report, Washington DC. Available online at <http://www.worldresourcesreport.org>, and the “Coastal Adaptation Decision Pathways” by the Australian Government available online at http://www.climatechange.gov.au/government/initiatives/australias-coasts-and-climate-change/adapting/~/_media/publications/adaptation/coastal-adaptation-decision-pathways.pdf.

and members of boundary organizations. The desk research and interviews helped clarify key issues that highlighted the challenge of such a broad project scope. To help make the project more concrete we commissioned five case studies from around the region. We also held a regional workshop, where we brought together several members of South Asian institutions engaged with producing and using information for adaptation decisions, as well as global experts on adaptation.

Table 1 outlines outputs produced under this project, which will be accessible online at www.wri.org/project/vulnerability-and-adaptation after August 2012.

Table 1: Summary of Project Outputs

PRODUCT	DESCRIPTION
PowerPoint presentation: “Adapting to Climate Uncertainty in South Asia: What Information Can Help Decision Makers?”	By Heather McGray and Ayesha Dinshaw. Created for a side-event at COP 17, to present and gather feedback on early findings from the desk research portion of the project. Research focused on contending with uncertainty in climate models and adaptation decision making, and robust decision making strategies.
Working paper: “Information for Climate Change Adaptation: Lessons and Needs in South Asia”	By Ayesha Dinshaw, Aarjan Dixit, and Heather McGray. Background document for a regional workshop, co-hosted by WRI and Development Alternatives, to bring together users and producers of information for adaptation. Considers the barriers to information use for adaptation, the characteristics of information used in adaptation decision making, and new robust adaptation approaches.
Workshop summary paper: “Information for Climate Change Adaptation: South Asia Regional Workshop Summary Document”	Synthesis of discussions from the regional workshop co-hosted by WRI and Development Alternatives in Delhi in April 2012. Summarizes participants’ discussions about information needs, access to and integration of information, and information for adaptation options identification.
WRI Case study: “Information Use in Nepal’s National Adaptation Plan of Action”	By Aarjan Dixit World Resources Institute. Focuses on the approach used by the Government of Nepal to gather information about climate risks and coping strategies in order to identify adaptation projects t under the country’s National Adaptation Program of Action.
DA Case study: “Climate Adaptation Information Case Study: Applying Information for Adapting the Agriculture Sector in Bundelkhand, India”	By Mustafa Ali Khan and Anand Kumar, Development Alternatives. Describes an example of the process for accessing, processing and applying information for adaptation decision making in India’s agricultural sector.
TERI Case study: “Communicating modeled information for adaptation decision making: a case study from Northern India”	By Sreeja Nair, Suruchi Bhadwal and Sneha Balakrishnan, The Energy Resources Institute. Explores how adaptation-relevant information can best be disseminated to different users and audiences through an example from northern India.

We encountered a central challenge— the sheer diversity of information relevant to adaptation – throughout this body of work, and we will treat this before offering lessons and recommendations.

Challenge: The Diversity of Adaptation-Relevant Information

The body of information that could be considered “adaptation information” is large and varied. Time and again, throughout the project, interactions with experts, decision makers, our partners and other stakeholders highlighted the sheer diversity of information that may be relevant to a wide range of possible adaptation activities. A core need is to bound the scope of information under consideration by defining a decision-specific adaptation context as a point of reference. Information needs for adaptation are context-specific, just as adaptation activities must be tailored to a specific environmental, social, economic, political, and climatic context if they are to effectively reduce vulnerability.

Boundaries for the scope of this project selected by WRI and DFID, however, left the adaptation context wide open. Information needs were considered across sectors, at several scales, and in four countries in the large and diverse region of South Asia. The intent of this approach was to try to understand aspects of information needs that are particular to adaptation as an endeavor in itself, irrespective of context. The lessons and recommendations below represent our best effort at this task. However, we expect that adaptation information needs identified irrespective of context will leave many readers feeling unsatisfied. Rather than pinpointing a concrete “action agenda” comprised of recommendations on information products that should be produced and used, our main messages represent a set of themes or principles for identifying decision-relevant information. They produce a concrete information action agenda only when applied within a set of specific contextual boundaries.

A critical element of the way forward, then, is to pursue improvements in adaptation information within practical boundaries that narrow the scope of potentially relevant information. It is possible to define boundaries for adaptation information in many different ways – by place, sector, level of governance, ecosystem, or type of vulnerability driver, for example. Most important, however, is to use these (and other) criteria to define coherent communities of users with similar information needs. This approach to contending with the diversity of adaptation-relevant information was beyond the scope of the eight-month project presented here, but we hope that our lessons and recommendations will assist others to proceed in this way.

Lesson 1: Adaptation practice needs to move beyond climate change projections as its primary information input.

One of the project’s most significant findings is that information about future climate change is often not the most relevant type of information for adaptation decision making. Users often assume that information about potential future climate change is the most important information for adaptation. They want to know what change they are adapting to, and seek output from climate models to guide their choice of adaptation interventions. However, producers of such information are wary of it being used this way, given the high uncertainty associated with it, and the frequency with which this uncertainty is misrepresented or

misunderstood. Fortunately, detailed, accurate climate modeling information may not actually be necessary for taking effective action on adaptation. Emerging approaches to robust adaptation put other types of information front-and-center, instead of climate projections, but to pursue these, information users and producers need to look beyond the climate change projections. To do this in the region requires three things:

- *Broader awareness and capacity in the region around good practice in using global climate models.*

Our Delhi workshop summary paper discusses common errors in use of global climate models and the need to develop and disseminate regional good practice for downscaling. Perhaps more importantly, decision makers need a better understanding of what downscaled projections can and cannot provide, so they may better decide whether they need such information. Some do; for example, biologists interested in changing geographic niches for species that are spatially sensitive. But often decision makers want downscaled global models simply because they represent the most complex science available. Hence there is a great need for guidance on matching the adaptation decision-making context to information needed for making decisions. Once decision makers have more realistic expectations of climate models they will be better positioned to develop and implement approaches to adaptation that depend less heavily on uncertain predictions.

- *Greater attention to information other than climate projections.*

This includes current and historical climate information, as well as environmental, socio-economic, and socio-ecological information, which are increasingly recognized as important fields in making adaptation decisions. There is also a great need to gather information about the impacts of adaptation projects that have already been implemented, or autonomous adaptations. Capturing information about how interventions are altering the baseline of vulnerability is a vital task that will require longitudinal studies.

- *Recognition that politics affect information use.*

In addition to moving beyond climate change projections, to some extent we also should move beyond focusing on information itself. Decisions are not made in a vacuum, and information is only one of many components needed for making effective decisions. Often, the existing power dynamics in society can influence the flow or use of information in decision making. For example, the Nepali NAPA drew more on local information than on technical climate change information, in large part because of “buy-in” from ministry representatives to the information gathering process. Likewise, the case study from Sri Lanka (unpublished) highlights the importance of leadership, coordination, and institutional mandates in generating and applying information. The key lesson is that those who wish to promote better production and use of information may need to attend less to the information itself than to the institutional and political contexts in which information is used. Sometimes information can be actively adjusted to these contexts; in other cases, the context itself may need to change before information can be effective.

The institutional and political context of decision making is one reason why adaptation-relevant information is not easily transferable across different times and places. Rather than trying to create information that applies

across a range of contexts, it may be more fruitful to pay attention to how information is tailored, targeted, and finally integrated into decision making. These processes may prove more easily transferable than the information itself.

Lesson 2: Improving information use in adaptation decisions requires more attention to format and communication of information.

When many people think of improving information for adaptation, they think first about gathering and analysis of data. However, the format of information, how it is communicated, and how accessible it is matter a great deal for whether and how it gets used in decision making. A simple example is the collection of mortality data at the right time scale: if mortality data is only available annually it cannot be linked to weekly or monthly data about weather events to make correlations explicit.

The complexity and uncertainty associated with information for adaptation makes formatting and communication especially difficult. Efforts on information format and communication may be greater than in some fields, but this is not an insurmountable challenge. WRI's work suggests that several boundary organizations in South Asia are developing methods for tailoring climate information to facilitate communication with decision makers at several levels. These boundary organizations tend to be NGOs serving as intermediaries and working through an iterative process to figure out how best to communicate information with a particular audience. Efforts in the region to date appear to have focused to a great extent on community-level communications, with less attention being paid to creating products intended to support more formal decision making at national, sub-national and sectoral levels. As exemplified by TERI's case study, appropriate communications for information users at these different levels can be quite distinct.

Central to the challenge of communicating and formatting information for adaptation is the need to appropriately express the uncertainty and assumptions inherent in a piece of information. The issue of uncertainty has been well researched by the scientific community, and there is a fairly good understanding of types of uncertainty, especially regarding models and downscaled climate projections. However, much of this information is too technical to be easily communicated to people outside of modeling or scientific communities, and typical quantitative statements about uncertainty are not well understood by non-scientific audiences. One piece of feedback received at the COP 17 presentation as part of this project was that formal knowledge on uncertainty feels unwieldy and irrelevant to people who frame their adaptation work around reducing vulnerability.

Similar to the gap between researchers on the topic of uncertainty and users of uncertain information, another divide between information producers and users can be seen in the case of scenario development. It appears challenging to ensure that future scenarios are seen as relevant by stakeholders who have pressing, near-term development or livelihood priorities. One factor that could enable successful development and use of scenarios is very simple communication, such as using 'what if' scenarios as done in the TERI case study. Communicating about things stakeholders can relate to, such as observed climate trends, can also help bridge the communication gap that occurs when discussing climate change with a range of stakeholders.

Unwillingness of government offices to share information also constrains efforts to make information available for use in adaptation decision making in South Asia. During interviews and the workshop, researchers and information purveyors consistently cited challenges around information about politically sensitive topics, such as trans-boundary water flows. The BCAS case study commissioned for this project could not be published, due in part to a culture of secrecy associated with projects commissioned under the Bangladesh Climate Change Trust Fund (BCCTF). Despite a right-to-information act passed in 2009, researchers were frequently denied project documents for analysis. To date they have obtained documents for only 10 projects out of 66 that have been funded by the BCCTF.

Lesson 3: More effective production, dissemination, and use of information for adaptation may require changes in institutional structures.

In addition to better formatting and communication, improving the quality and usefulness of information requires attention to institutions. We saw this time and again in our research:

- An institutional innovation in Nepal's NAPA process enabled "bottom-up" flow of local information to inform development of a national plan.
- Failure to coordinate across institutions in Sri Lanka prevented application of the country's best sea-level data to the challenge of adapting coastal management.
- NGOs served as "interface organizations" in India, translating climate science into user-friendly information at the local level.
- Researchers from around the region lamented the disincentives in their institutions to conduct interdisciplinary work to support adaptation.

Given time and resource constraints, our work could not approach a comprehensive treatment of how institutional factors affect information for adaptation. It would, however, be a fruitful area for additional inquiry. With regard to institutions, our work raised three central questions for the region, which are explored below in turn.

- *What types of institutions can best take responsibility for improving production and dissemination of information so that it is accessible and useful?*

Relevant types of institutions can broadly be categorized by function: those that support observation systems; those that analyze data to produce information; and those that translate, communicate, and disseminate information to end users. These can be government institutions, civil society actors, research institutions, or private-sector players. Important questions to ask include whether institutions that currently inhabit this space for adaptation have proven successful; why or why not; and what might enable them to succeed.

The workshop and case studies under this project highlighted the third set of functions – translation, communication, and dissemination – as especially important, given the complexity and newness of adaptation.

The notion of “interface organizations” (often called “boundary organizations”) as critical institutions for this function received significant attention during workshop discussions. An interface organization facilitates information flow, and acts as an “honest broker” to bridge the gaps between scientists, policymakers, non-governmental organizations, and local stakeholders. To date in South Asia, the interface role for adaptation has been played largely by NGOs, which have served as significant drivers of action on the adaptation challenge.

The workshop paper provides several recommendations on strengthening institutions currently performing interface functions, with particular attention to those involved in adaptation efforts in the agriculture sector. Many of these organizations are stretched thin in terms of staff capacity, and lack necessary technical skills such as climate modeling. Moreover, many have a grant-dependent business model, which may not support sustainability of adaptation interface activities over the long-term. Up-scaling and/or replication may require developing models for private sector engagement or strengthening of adaptation support capacity in governmental interface organizations such as agricultural extension agencies. Most likely, the appropriate institutions for playing an interface role over the long term will vary from country to country and sector to sector.

- *How do adaptation information needs differ among users at local, sub-national, and national levels of governance?*

Decision makers determine the information needs of their institutions, and they want information that is particular to their specific decision-making processes. In this way, the “level” at which they work becomes a potentially important characteristic that defines their information needs.

For example, in the TERI case study on northern India, fact sheets about socio-economic projections, along with projections for food and water supply/demand and implications for health, were useful in engaging district-level institutions with questions on climate impacts and adaptation options. On the other hand, in the WRI case study on Nepal, information about coping capacities and impacts due to existing climate variability at local levels were used to inform urgent national adaptation priorities. Decision makers will need a variety of information to make adaptation decisions, including information about conditions and activities occurring at more local levels.

- *How can institutional incentives shift to improve information-sharing, coordination, and integration of diverse types of information?*

This question was discussed extensively at the workshop. Participants identified a greater focus on interdisciplinary research as an important need in the region. Such research could help create better indicators to define resilience and adaptive capacity, and provide context to ensure the sustainability of adaptation interventions over time. In order to enable interdisciplinary research, new incentives are needed, such as special interdisciplinary fellowships and universities having pay parity with private research organizations.

The need for coordination between government agencies, ministries, and schemes was also strongly noted at

the workshop. Lack of incentives, as well as institutional and human capacity, were often cited as factors limiting this coordination in South Asia. This issue is clearly showcased in the Sri Lanka case study (unpublished), where lack of coordination between government agencies has resulted in several information gathering recommendations from the previous Coastal Zone Management Plan remaining unfulfilled. An example of successful cross-sector coordination was the Thematic Working Groups that were created during Nepal's NAPA process. The Ministry of Environment created six Thematic Working Groups (on water and energy, agriculture, forests and biodiversity, public health, urban settlements, and disaster risk reduction), each consisting of government employees of different line ministries.

Lesson 4: South Asia has a lot of activity and interest in integrating different types of information for adaptation, but little consensus so far regarding what integration processes work best.

Throughout South Asia we see adaptation actors beginning to grapple with the challenge of bringing together different types of information. Typically, the aim of this integration process is to provide a more complete and realistic representation of current vulnerability, potential future climate impacts, and/or practical options for adapting. Relevant data and information come from a broad range of disciplines, sources, and sectors. The process of choosing, obtaining, and integrating it is no small challenge, either analytically or practically.

There are two parts to integrating information: what information is to be integrated (for example, the units of analysis for two pieces of information need to match in order to be integrated), and how it may best be integrated (the mechanisms by which the integration process will work). These “what” and “how” pieces vary to a great extent depending on the factors across which integration is occurring, including sectors, geographic scales, users, impacts, institutional structures, and methodologies.

At this time, the practice of integrating information for adaptation in the region feels organic and experimental. Those striving to develop more integrated information products are working through trial and error, without standardized procedures or off-the-shelf analytic tools. To some extent, this reflects the reality that the region (and the world) is still in quite early stages of learning to adapt, so we cannot expect much consensus on process or content for information synthesis. At the same time, the trial-and-error approach has many advantages, given the need to tailor use of information to location-specific contextual factors. The process of experimenting with integration of information should be seen as a foundation upon which to build, not a preliminary stage through which the region should pass.

A clear theme emerging from experimentation to date is the centrality of stakeholder participation in the information integration process. Participation in decision making is important for promoting legitimacy in the process of integrating different information sources, given the risks associated with uncertainty in those sources and the variability of stakeholders' risk tolerances. Participatory methods may also promote time- and resource-efficient integration of the diverse array of relevant information types. Especially in the community-based adaptation activity, the stakeholder participation process serves as the point of integration for various pieces of information. However, little systematic analysis has yet been done on the participatory integration methods being tested, and those responsible for these processes tend to either “get stuck in the weeds” when

discussing their approaches, or to fall back on broad generalizations. Both make it challenging to identify and replicate successes.

For example, TERI case based in the northern India passed through an interesting evolution. It began as a case study about identifying vulnerability factors and adaptation interventions through integration of “top-down” climate and socio-economic models with “bottom-up” stakeholder perceptions about climate change. Use of the top-down/bottom-up dichotomy to describe information flow commonly serves as shorthand among adaptation practitioners across the globe. However, through much of the case research, it was still very difficult to pinpoint what information was elicited from the bottom up.

Instead, as the case evolved through review and iteration, the focus on information turned back repeatedly to the process of communicating top-down information in a format relevant to local stakeholders. “Integration” consisted of these stakeholders internalizing the modeled information and linking it to their own observations and priorities within their communities’ activities under the HighNoon project. There was no clear external process of delivering information from the bottom up for formal analytic integration with the top-down models. This led the authors, ultimately, to re-frame the case study around formatting and communication of modeled information. Integration took place in the minds and deliberations of stakeholders, and had to be treated as a ‘black box’ by researchers, given the information available.

Related to the challenge of integration, is the frequent mis-match of information across different scales. For instance, information about how water is regulated is generated at a national level, but information about water use is collected at the local level. We need better systems to converge information across these scales. Two of the case studies considered issues of aggregation: the PILF case study (unpublished) highlights how the Sri Lankan Coastal Conservation Department is interested in developing more local-level hazard maps in order to aggregate information into a national-level plan. The WRI case study explores how Nepal’s Ministry of Environment used an institutional innovation to aggregate local information collected through participatory consultation to inform national urgent and immediate priorities for adaptation under the NAPA development.

As noted above, the structure and function of institutions play a key role in enabling or disabling effective integration of information. Coordination and information flow among institutions has a significant political dimension, which deserves attention moving forward. There is also a need to better identify which institutions need to change or strengthen in order to facilitate better integration, and how they should develop the capacity to build upon the experimentation process thus far.

Lesson 5: Simply understanding the problem will not lead to development of solutions.

To date, the vast majority of information for adaptation has focused on describing the climate change problem through research on climate change impacts and assessments of vulnerability. Our work has found a range of stakeholders in South Asia increasingly frustrated with this situation. It is time to move beyond problem definition to develop information products and decision support tools that help shape solutions. These solutions take the form of options for adaptation interventions. Stakeholders ultimately want to know what

their “menu” of options is, or how to develop such a menu; the effectiveness of the different options; how to implement them (including know-how and other inputs that will be needed); and the cost of the options (at implementation and over time). Cost includes not only the monetary cost, but also trade-offs that may be necessary.

The menu of options will always be context-specific. Ultimately, a finite set of options needs to be developed for a specific adaptation decision being taken by a set of actors in a particular place and time. Typically, that menu is developed through a participatory process that draws upon a vulnerability assessment that is equally tailored to the specific context. However, stakeholders want research, tools, and guidance that could provide additional input to developing the menu. For example, stakeholders are interested in further information about:

- Current coping strategies: who is doing what, how, and to what effect? For instance, the Thematic Working Groups in Nepal researched current coping strategies, but there has been no evaluation of those strategies. It will require long-term studies over a decadal time scale to get this information.
- Findings from monitoring and evaluation studies to understand what adaptation initiatives are succeeding elsewhere – and most importantly, why?
- What criteria should be used to choose among options, and how should these criteria be best used? Some criteria that are often discussed include costs, trade-offs, and the uncertainty associated with the success of a particular adaptation option.

The question of criteria for evaluating adaptation activities is an extremely interesting one, and is currently shifting quite significantly at the global level. There are a growing number of examples of activities that build near-term resilience but may set communities on development pathways that predicate new sources of vulnerability as the climate changes. Using criteria such as robustness and flexibility can help support development and selection of options that balance near-term needs with long-term risks. Failing that, they can at least help make near- versus long-term trade-offs more transparent. Participation is critical for ensuring that long-term vulnerabilities are not increased by implementing particular adaptation options.

Moreover, robust decision making and other promising approaches to ‘managing uncertainty’² that have begun gaining traction in the adaptation discourse globally appear to have not yet arrived in South Asia. For this project we were unable to find good examples of adaptation interventions in the region that were explicitly framed as decisions based on criteria such as flexibility and robustness. However, we encountered several examples of adaptation work that used multiple scenarios as a basis for planning. The use of multiple adaptation scenarios is essentially the heart of robust decision making. Use of scenarios in adaptation decision making and applicability of robustness and flexibility as decision-making criteria are areas clearly needing further research.

² This is explored in depth by Suraje Dessai, University of Leeds and Rob Wilby, Loughborough University. A clear, concise example of their work on this is “Robust adaptation to climate change” available at:

http://www.climatesoutheast.org.uk/images/uploads/Robust_Adaptation_to_CC_Wilby_2010.pdf

Exploring these approaches to choosing adaptation options requires a significant shift in the treatment of uncertainty in the adaptation discourse. The debate needs to move from whether uncertainty is present and what it looks like, toward how to manage uncertainty within a decision-making framework. There also needs to be a move toward questions surrounding the risks associated with different options.

This is a subtle but important distinction, and there are models of doing so from other decision-making arenas. For instance, when one visits a doctor, the doctor does not focus on the uncertainty of the health issue but on the risks associated with the approaches available to manage the uncertainty.

Recommendations

Based upon the five lessons above, WRI makes this set of recommendations for adaptation information investment in South Asia. We aim throughout these recommendations to foster user-driven, decision-relevant information systems.

1. A Social Science Research Agenda

Producing decision-relevant adaptation information requires that ongoing research on climate system dynamics be complemented by new research that helps understand the social dimensions of climate change in the region. WRI's work points to four areas of social science research that are needed if user demand for information is to be fully understood and met:

- a. **Political economy research on barriers to information use.** It is important to question simplistic assumptions that more information, better information, or development of user capacity will necessarily lead to more effective use of information in decision making. Researchers should explore how power dynamics affect information flow, especially regarding key actors' incentives to seek, provide, or use adaptation-relevant data and information. So often, information specialists will say, "The politics got in the way," and leave it at that. But power and politics *are* possible to analyze, and such analysis can yield useful ideas for interventions that can have a strong impact. For example, we know little about why staff at the Sri Lanka Ports Authority has been reluctant to share sea-level data with the Coastal Conservation Department, but if we understood that reluctance, we could consider options for remedying it.

Fruitful areas of inquiry include the role of institutional structures, legal mandates, civil society demands, and budgetary flows in shaping incentives for producing and using needed information at the national and sub-national levels. These incentives are especially important to understand for adaptation, since cross-sector information flows so often face political economy barriers.

b. **Identification of specific user communities' information needs.** Further survey and interview research into user needs should seek to understand users' existing challenges (whether climate-related or not) and types and sources of information they typically use to address them, as well as what additional information or other resources they may want for addressing climate change. Such research should define user sets within practical boundaries in order to generate actionable findings. For example, Tribbia and Moser (2008) conducted a review of information needed by California coastal managers in planning for sea level rise³. Similar work could systematically identify the needs of relevant user groups in South Asia, such as:

- District officials planning local-level adaptation in Nepal
- Rural farming households in semi-arid regions
- Development agency staff designing food security strategies
- Parliamentarians
- Urban land-use planners in mid-sized cities across the region
- Project developers under the Bangladesh National Climate Change Trust
- Members of basin management authorities or equivalent bodies
- Strategists at major food product corporations that have suppliers in the region

Given the diversity of user sets that could be defined for South Asia, the scope of this research is potentially huge. Defining appropriate boundaries for targeting influential user sets is not necessarily simple, and may require country by country engagement of researchers and stakeholders familiar with the domestic decision-making context. However, the overall approach is likely to be cost-effective (especially relative to the expense of climate research), and would rapidly yield policy-relevant findings.

c. **Evaluation of information use in community-based adaptation.** The body of community-based adaptation initiatives in South Asia is sizeable, diverse, and – after roughly ten years of testing and implementation – relatively mature. Moreover, the treatment of information about climate change and vulnerability is often one of the factors that distinguish between community-based adaptation and other forms of community-based natural resource management. For this reason, it presents fertile ground for exploring information flow and use, but to date has not been examined through rigorous research. The time is right for a significant review of this work in the region, with an eye to critical information questions:

- What has been learned about how best to deliver climate information to communities? Are there practices that should be replicated or curtailed?
- Through what processes do community members integrate new climate

³ John Tribbia, Susanne C. Moser. 2008. "More than information: what coastal managers need to plan for climate change". *Environmental Science & Policy*, Volume 11, Issue 4, Pages 315-328. Available online at: <http://www.sciencedirect.com/science/article/pii/S1462901108000130>

information with their existing knowledge and traditional sources of information? To what extent do these processes support treatment of uncertainty and long-term decision horizons?

- What role does information play in community-based adaptation decisions? Is it contributing concretely to planning and action? What new information flows could support more rapid scale-up of community-based adaptation?

d. **Identification of social-ecological thresholds.** If the region is to move toward new robust adaptation approaches, decision makers will need to be able to evaluate potential adaptation options in light of critical thresholds. For example:

- Under what climatic conditions would water supply fail to meet demand in a growing city?
- At what level of reduced rainfall does traditional agriculture become unviable in a particular rural region?
- What factors might cause temporary migration in the wake of a typhoon to become permanent?

Answers to these questions – and to many others like them – require a mixture of a) basic research into the dynamics of key ecological and social systems, as well as b) capacity for more applied socio-economic analysis, such as projecting growth in water demand.

2. Re-Thinking Observation Systems

Observation systems represent a critical foundation for adaptation. Without basic monitoring of the climate and of critical natural resources, adaptation has no point of reference. However, establishment of technically sound, well-resourced meteorological and environmental observation systems should be considered “necessary but not sufficient.” The long-term success of such systems for adaptation requires an expanded definition of what “observation systems” investments entail. Key priorities include:

- a. **Observe more than just weather.** This project makes clear that many users prioritize environmental information to help them track the status of key ecological resources as climate change and other stressors loom larger. Critical variables include stream flow, soil moisture, and ground water. They also want to track key drivers of change in those resources – land use, water use, land rights, mineral resources, and population dynamics. Understanding these drivers represents an observational challenge that engages multiple disciplines, and requires investment in national statistics bureaus and environment ministries, as well as meteorological services.
- b. **Invest in institutions, not just technology or technical skills.** Getting observation right has institutional and political dimensions, which should be put front and center in any strategy to

improve observation systems. For example, preparations for improving observation systems should be accompanied by rapid institutional analyses to clarify existing incentive structures for sustained implementation and good data-sharing and management. Technical support should include attention to who is responsible for maintaining systems and the factors that shape their behavior and choices, rather than simply fixing equipment failures or assuming that technical training will lead to improved maintenance.

- c. **Learn to observe adaptation itself.** Monitoring of adaptation to date has taken place primarily in the context of discrete projects of limited duration. This kind of monitoring may help explain the impact of a particular planned intervention, but its narrow focus makes it poorly suited to decision-relevant tracking of adaptation progress in the development context. A broader, long-term process of tracking key variables is needed if, for example, city officials are to understand how the effects of annual flooding change over time. Whereas project-level monitoring focuses largely on the project's intended objectives, adaptation observation systems would focus more broadly on the status of communities, their resources, and their critical systems, so that *unintended* outcomes (autonomous adaptation, shifting effectiveness of coping strategies, changes in vulnerability due to development) are less likely to be overlooked.

Adaptation observation systems would necessarily cut across disciplines, and would build upon existing observation systems, including national census efforts, meteorological observation, and environmental monitoring. Like those systems, adaptation observation would support both research efforts (see above) and policy and action at many levels of governance. Such monitoring systems are particularly important in the context of trying to understand when systems may be approaching critical thresholds.

The near-term information challenge is to identify key variables to track in different contexts, since relevant units of analysis will differ, for example, between a flood-prone urban system and a semi-arid rural system. Early steps toward development of adaptation observation systems in the region could include:

- review of project-level adaptation monitoring systems
- review of longitudinal research on development outcomes
- surveys or convening to identify variables associated with stakeholders' priority thresholds in particular contexts

- d. **Ensure that the public can easily access data and information.** Given the complexity of adaptation and the strong need for effective public engagement, adaptation-relevant information must be made easily available to the public. While the legal basis for the right to information has seen significant improvements in the region over the past several years, implementation of public access provisions remains weak in many countries. For example, challenges with accessing public information stymied work under this project on several occasions, and left our Bangladesh case study unpublished. Investments are needed in

initiatives that build the capacity of governments to make information accessible and of civil society to demand and use information for adaptation.⁴

3. Toward Effective Decision Support

Many of the information needs identified through our work focus on the absence of readily available tools, guidelines, and analysis to support adaptation decisions. Priorities include:

- a. **Foster dialogue between information users and producers.** In conjunction with systematic research into the information needs of users, active engagement of information providers with well-defined user communities provides the foundation for developing practical decision support tools. Carefully facilitated iterative dialogue can identify specific tools or information products that both meet the needs of users and can be feasibly produced by information providers. As in recommendation 1.b. above, the first step is identification of priority user communities in the South Asian countries, together with producers and providers of relevant information.
- b. **Focus on information for identifying and evaluating adaptation options.** Among the many decision support needs, demand is especially strong for information tools that support identification and evaluation of adaptation options. Many stakeholders seem to hope that “menus” of adaptation options for particular places, sectors, or contexts can be developed to simplify identification of possible options. An inventory and evaluation of existing strategies for coping with climate variability in rural communities across the region could provide the basis for one such menu.

Current approaches to identifying and selecting options, especially in the community-based adaptation context, focus on a step-by-step process that starts with understanding vulnerability. Such processes have the advantage of linking solutions to known, place-specific drivers of vulnerability, and may have strengths in taking account of different stakeholders’ different risk tolerances through an organic process. However, they provide little guidance to decision makers as to what options can be considered, and what their strengths and weaknesses may be. Formal tools to provide this guidance become more important as adaptation moves up from the community level, and will need to help evaluate options along several criteria:

- Match options appropriately with key vulnerability factors
- Support multi-scenario planning and robust decision making, so that the long-term effects of climate change on the consequences of a near-term action can be considered.

⁴ See, for example, www.accessinitiative.org

- Make explicit the social and environmental costs of options (as opposed to only economic costs).
 - Ensure that “out-of-the-box” options (including those that use ecosystem services and social protection) are on the table alongside technological ones.
- c. **Develop regional guidance on downscaling and uncertainty.** Consensus principles or guidance on regional “best practice” for downscaling by a regional group of climate scientists and adaptation experts should be developed as a next step to address some of the poor use of climate models seen in adaptation initiatives around the region. Such a consensus document should be translated into user-friendly briefs, technical guidelines, and training materials for project developers, policymakers, and other consumers of climate projections, who are currently not well positioned to distinguish good information from poor. Users also need products that help build their understanding of when downscaled projections are helpful, when they are unnecessary, and how robust adaptation approaches can help address the lack of reliable downscaled projections.

An important supplement to these products should be development and documentation of approaches to appropriately communicate uncertainty to different stakeholders. Such communications are not simply a matter of labeling information with scientific metrics of uncertainty, but rather a creative process of making uncertainty clear and relevant through graphics, maps, simple scenarios, games, or other accessible formats.

- d. **Build the capacity of “interface organizations” to address climate change.**

Interface, or boundary, organizations are likely to be key players in developing and applying the above-mentioned decision support tools and processes. Which organizations need investment, and in what form, will vary by country and sector. A next step would be to inventory organizations playing this role in the agricultural and water management sectors, with an eye to their existing work on climate change and general strengths and weaknesses. A key question, for which answers will vary by country, is whether NGO-driven interface activities should be strengthened and expanded under existing institutional arrangements, or whether emerging lessons from the non-governmental sphere can be transferred for replication by governmental or private service providers.