



DEVELOPMENT AND CLIMATE CHANGE

Participatory Scenario Development Approaches for Identifying Pro-Poor Adaptation Options





E C O N O M I C S O F A D A P T A T I O N T O C L I M A T E C H A N G E

Participatory Scenario Development (PSD) Approaches for Identifying Pro-Poor Adaptation Options

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ACRONYMS AND ABBREVIATIONS

EIA	Environment Impact Assessment
GCM	General Circulation Model
GHGs	Greenhouse Gases
GIS	Geographic Information System
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
NAPA	National Adaptation Program of Action
NGO	Non-governmental Organization
PRSP	Poverty Reduction Strategy Paper
PSD	Participatory Scenario Development
SMEs	Small and Medium-sized Enterprises
SRES	Special Report on Emission Scenarios
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change

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EXECUTIVE SUMMARY

A Joint Venture Consortium of ESSA Technologies Ltd. and the International Institute for Sustainable Development (IISD) was contracted by the World Bank's Social Development Group to design and implement participatory scenario development (PSD) workshops as part of the World Bank's Economics of Adaptation to Climate Change (EACC) Study. The ESSA-IISD consortium has been directly involved in the preparation and delivery of two sets of PSD workshops (Phases I and II) in three countries: Mozambique, Ghana, and Bangladesh. The consortium has also provided remote assistance for workshops in Ethiopia.

Participatory scenario development (PSD) is a process that involves the participation of stakeholders to explore the future in a creative and policy-relevant way. PSD is used to identify the effects of alternative responses to emerging challenges, to determine how different groups of stakeholders view the range of possible policy and management options available to them, and identify the public policies, or investment support needed to facilitate effective future actions. In this project, the primary function of the scenarios was to provide a framework and context within which different groups of stakeholders can better understand potential climate change impacts and to consider and discuss a range of possible adaptation options as well as the forms of public policy or investment support that are needed to facilitate effective adaptation. PSD approaches help to identify locally-relevant pathways of autonomous and planned adaptation in the context of development choices and decisions, while informing

actors of potential trade-offs and possible consequences of adaptation actions.

The applied PSD approach was an effective way to identify consequences of climate change and adaptation options that are relevant for the stakeholders. Furthermore, PSD allowed information to be gathered from a wide range of experiences in order to identify the necessary types of adaptation measures, their spatial allocations, and experiences with existing climate change impacts. The PSD approach is also well suited to explore different pathways and to reconcile different perspectives when addressing challenging issues including climate change impacts, adaptations and vulnerability. In donor and national planning contexts, PSD can be used to identify actions that provide multiple benefits in several sectors, exploring hard and soft adaptation options so the supported actions are complementary, creating scenarios on integration of adaptation measures, vulnerability reduction and development priorities to increase their effectiveness and relevance. In addition, PSD can be used to customize best practices appropriate to the situations, institutions and available capacities in each country.

Overall workshop design consisted of eight main building blocks in Phase I workshops and seven blocks in the Phase II workshops, applied in one-day or one-and-a-half day workshops. Each workshop was comprised of activities including presentations, group work and plenary sessions to help participants move from current challenges to identifying pathways of adaptation actions attainable under climate change scenarios and impacts. In all three countries, the workshop began with presentations by local experts that

characterized current challenges and a group activity focused on creating visions of future development for 2050. After outlining key aspects of climate change impacts in the countries, the groups estimated specific impacts of climate change on the future vision and adaptation options necessary to maintain the identified vision. Finally, participants focused on creating an adaptation pathway showing diverse priorities for adaptation actions over time and also prerequisites, synergies and trade-offs between the options and with other development priorities. Based on identified consequences of climate change, development challenges and priorities the following types of adaptation actions were identified:

1. Some of the planned development priorities and actions need to be accelerated and supported by investing in training and skill development to increase capacities for adaptation (i.e., improving basic health care services in areas prone to diseases such as malaria and diarrhea, which may be exacerbated by climate change; and promoting agricultural product processing and off-farm income generation).
2. Some of the on-going development programs and actions dealing with current impacts need to be intensified and applied to other regions that will be facing impacts in the future (i.e., alternative crops and rainwater collection, are currently often small-scale initiatives that should be expanded in areas where reduced rainfall and other impacts are expected because of climate change, by investing in equipment and increased capacity)
3. Review and modification of current resource governance rules and policies, including their enforcement, to assess their contributions to reducing or increasing adaptive capacities (i.e., water, forest and fisheries management, including conservation and sustainable management)
4. Measures that are not part of current development plans, but that are needed because of unidentified consequences of climate change and lack of capacities to address them (i.e., upgrading current dyke heights, building flood-resistant roads, early warning systems and emergency shelters)

It is crucial for all types of measures (development or adaptation-driven) to involve traditional decision-making authorities and decentralized structures and to consider traditional practices and communities' social networks when designing and implementing these responses.

In order to move forward with the above-listed actions, it is necessary to build capacities and develop new skills and increase the number of people in local and national institutions, so decision-makers have the capacity to design, implement and monitor the required actions. Gender inequalities and involvement of women in the decision making process is also essential in creating an appropriate and effective response, as women's marginalization in the decision making process is at odds with their primary role in many of the affected sectors.

Specific adaptation actions were identified in key sectors such as agriculture, forestry and water resources that result in direct impacts on human well-being, food security, drinking water availability and migration. Overall, participants suggested that adaptation measures in these sectors include relatively high-cost investments such as flood gates, dykes, flood-resistant roads, improving basic social services, but several soft investments were required in food production, processing and storage, as well as training in alternative skill sets. Significant improvements in governance including decentralization, increased participation, sustainable resource management and secured land tenure were listed as necessary preconditions to increase the adaptive capacity of communities and to utilize adaptation actions.

In terms of pro-poor adaptation actions, it is important to understand the key challenges faced by impoverished communities, including lack of food, deteriorating social networks, lack of basic services, housing and employment. Many of these challenges will be exacerbated by climate change, but responding directly to climate will not likely create significant improvements in the livelihoods of poor people. Key adaptation priorities identified by participants include: effective early warning systems and disaster preparedness, improving post-harvest services and water storage/water harvesting, and improving social protection, social services and safety nets with focus on urban and peri-urban areas.

1. INTRODUCTION AND OVERVIEW OF APPROACH

In March 2009 a Joint Venture Consortium of ESSA Technologies Ltd. and the International Institute for Sustainable Development (IISD) was contracted by the World Bank's Social Development Group to design and implement participatory scenario development (PSD) workshops as part of the World Bank's Economics of Adaptation to Climate Change (EACC) Study. This is part of a Global Study on the Economics of Adaptation to Climate Change (EACC), being led by the Environment Department of the World Bank. The EACC study is focusing on seven countries: Bangladesh, Bolivia, Ethiopia, Ghana, Mozambique, Samoa and Vietnam.

The ESSA-IISD consortium has been directly involved in the preparation and delivery of two sets of PSD workshops (Phases I and II) in three countries: Mozambique, Ghana, and Bangladesh. After each workshop, reports were developed outlining both applied approaches and outcomes of the workshops. The Phase II workshop reports also include outcomes from field studies and local PSD workshops conducted by local country teams in Ghana, Mozambique and Bangladesh. The consortium has also provided remote assistance for workshops in Ethiopia.

1.1 SUMMARY OF EACC PROJECT AND THE SOCIAL COMPONENT

The overall objective of the EACC Study is to help decision makers in developing countries to better understand and assess the risks posed by climate change, and to cost, prioritize, sequence and integrate robust adaptation strategies into their development plans and budgets in a context of high uncertainty, competing needs and potentially high future costs. In addition, it will inform the international community's efforts, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Bali Action Plan, to provide access to adequate, predictable and sustainable support and to provide new and additional resources to help developing countries, in particular the most vulnerable, to meet the costs of adaptation. The focus of this work is on government-led adaptation, encompassing responses ranging from planned activities such as public infrastructure investment, and changes in regulation or social protection measures, to community level adaptation decisions, all of which will be needed to respond to climate change in the context of other development challenges, and vulnerabilities, and existing development planning.

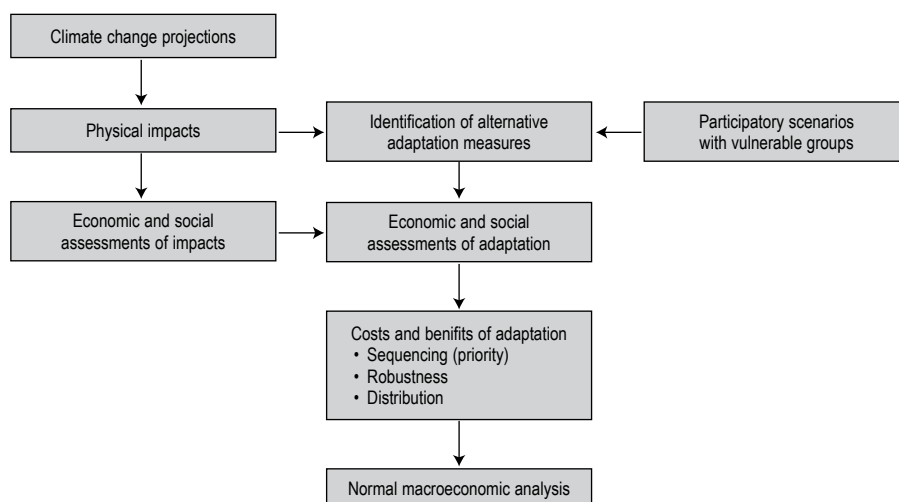
Key aspects of the Social Component of the EACC study include the following (Kuriakose et al., 2009):

- *A focus on the local level* to help understand local costs and benefits. This is necessary to help inform macro-level efforts to increase local adaptive capacity by channeling investments where they are most needed.
- *A focus on vulnerable and disadvantaged socioeconomic groups*, as the most vulnerable groups are likely to be those most dependent on a single or a narrow range of climate-sensitive livelihood sources. Assessing the local-level costs and benefits of adaptation responses is essential to understand how to improve support for increased adaptive capacity of the most disadvantaged groups.
- *Engaging vulnerable groups in collaborative analysis of what adaptation means in particular contexts and for distinct groups of people* by using participatory analysis to uncover what may be plausible means of adapting to these likely future climate trends as well as the pros and cons of alternative adaptation options.
- *Building on existing adaptive responses* to include the costs and benefits of existing adaptation practices and to scale up or multiply existing adaptation responses to create effective adaptation pathways; such pathways are likely to be those that progressively reduce the degree of dependence on climate-sensitive livelihood sources (e.g., through livelihoods diversification).
- *Soft as well as hard adaptation options* to help create comparative estimates of technological and infrastructure-oriented adaptation options versus institutional and educational or skills-based adaptation options that are missing from current efforts on costing adaptation.
- *Ground-truthing analysis provided by the sectoral analyses* focused on bottom-up approaches to inform technical and policy experts in their priority setting for planned adaptation interventions.
- *Triangulation between different data sources* because the social component allows for validation of data through the triangulation from various sources, including use of participatory methods, and quantitative approaches.

1.2 PARTICIPATORY SCENARIO DEVELOPMENT APPROACH AS A PART OF THE EACC-SOCIAL STUDY

Participatory scenario development (PSD) is a process that involves the participation of stakeholders to explore the future in a creative and policy-relevant way.

FIGURE 1.1. SCHEMATIC METHODOLOGY (ECONOMICS OF ADAPTATION TO CLIMATE CHANGE STUDY)



PSD is used to identify the effects of alternative responses to emerging challenges, to determine how different groups of stakeholders view the range of possible policy and management options available to them, and identify appropriate public policies and investment support necessary to facilitate effective future actions.

In this project, the primary function of the scenarios is to provide a framework and context within which different groups of stakeholders can better understand potential climate change impacts and consider and discuss a range of possible adaptation options, as well as the forms of public policy or investment support that are needed to facilitate effective adaptation. PSD approaches help to identify locally relevant pathways of autonomous and planned adaptation in the context of development choices and decisions, while informing actors of potential trade-offs, and possible consequences of adaptation actions.

An important aspect of this applied research approach is to determine:

how different groups of stakeholders especially the vulnerable and disadvantaged groups view the range of possible adaptation options open to them; and the forms of public policy or investment support that are needed to facilitate effective adaptation including both technological and infrastructure-oriented adaptation options and necessary institutional and educational/skills-based development based on the views number of stakeholders' groups in the studied countries.

To facilitate this, PSD workshops were undertaken with multiple stakeholders, including local experts, government officials and representatives of social groups particularly vulnerable to the consequences of climate change. Country workshops mapped out alternative, robust adaptation pathways that combine a variety of adaptation options in plausible sequences. Each of these alternative pathways, in turn, will likely have different implications both for the overall costs of adaptation, and for the distribution of costs and benefits among groups within society. These issues were then further investigated and validated with the stakeholders.

2. THEORETICAL FOUNDATIONS

2.1 OVERVIEW OF PARTICIPATORY SCENARIO DEVELOPMENT

When focusing on developing adaptation responses to climate change, efforts may target the global, continental or country scale to attempt to determine the necessary resources, including overall demand for technologies, money and information, but it is also beneficial to investigate the views or needs of local communities and their diversity, capacity and other development priorities when identifying relevant adaptation options. Decreasing human vulnerability by adapting to climate change is a multifaceted undertaking. Challenges not only lie in the physical elements of adaptation design, but also in understanding the human dimensions of climate change impacts. Scenario approaches can be used to assist in linking climate impacts information with local and regional scale adaptation mechanisms by connecting them with overall development challenges and priorities.

Scenarios provide an opportunity to explore the future in the context of climate change at different scales. Scenarios are neither predictions of socio-economic development nor impacts of changing climate; rather they are plausible descriptions of how the future may possibly develop, using recognizable signals from the present and assumptions about how current trends will progress (UNEP, 2002). Scenarios can be used for multiple purposes, including to (Jaeger et al., 2000):

- aid in recognition of “*weak signals*” of change;
- avoid being caught off guard—“*live the future in advance*”;
- challenge “*mental maps*”;
- understand the world better, and make better decisions;
- raise awareness;
- test strategies for robustness using “*what if*” questions;
- provide a common language; and
- stimulate discussion and creative thinking.

The ultimate aim, in most cases, is to:

- provide better policy or decision support; and
- stimulate engagement in the process of change.

In scenario development, we distinguish two basic methodological approaches—forecasting and backcasting. Forecasting methodologies are often utilized for envisioning future development based on past experiences within the boundaries of existing social institutions (Tansey et al., 2002). Unlike predictive forecasting methodologies, another scenario development approach that does not reveal what the future will likely be, but indicates the relative feasibility and implications of different policy goals (Durbach & Stewart, 2004). Backcasting is an explicitly normative approach involving working backwards from a particular desired future set of goals to the present, in order to determine the physical feasibility of the future goals and the policy measures that would be required to reach it (Robinson, 2003). In this framework, the desired future conditions

are envisioned and steps are then defined to attain those conditions, rather than taking steps that are merely a continuum of present methods extrapolated into the future. Backcasting is particularly useful when (Holmberg and Robert, 2000; Dreborg, 1996):

- the problem is complex;
- major changes are needed;
- dominant trends are part of the problem; and
- the scope is wide enough and the time horizon is long enough to leave considerable room for deliberate choice.

In order to fully explore opportunities from scenario approaches, growing attention is being devoted not only to the developed scenarios, but also to the scenario development process. This includes increasing emphasis on stakeholders' involvement in developing scenarios - referred to as the participatory scenario development (PSD). Over the last years, a number of arguments in favor of participation in scenario development have been developed in the literature, where participation helps to (Volkery et al., 2008; Patel et al., 2007; Stirling, 2006):

- support the democratic rationale for intrinsic social desirability of equity of access, empowerment of process, and equality of outcome, with the aim of countering the exercise of power;
- give access to practical knowledge and experience, learn about new problem perceptions and identify new challenging questions;
- gather more diverse, extensive and context-specific bodies of knowledge in order to take more careful and explicit account of divergent values and interests; as such, participation is reasoned as being a means to an end rather than an end in itself;
- bridge gaps between the scientific communities and governments, businesses, interest groups or citizens, thus providing a reality check for research assumptions and methodology;
- improve communication between scientists and stakeholders and facilitate collaboration and consensus-building on problem-solving and;
- increase the salience and legitimacy of the scenario and thus the acceptance among end-users, which helps maintain public credibility and trust in the developed scenarios and involved institutions; thus

providing for more effective implementation of decisions taken by providing greater legitimacy and justification.

To date, scenario approaches in climate change research have mainly focused on impacts and mitigation actions to identify scenarios of potential levels of greenhouse gases (GHGs), based on projections of future socio-economic development, global emission scenarios (SRES scenarios) and to investigate potential feasibility of implementation of different mitigation targets and actions. The IPCC Special Report on Emission Scenarios (SRES) provided explicit linkages between development choices and the level of GHGs, illustrating that development decisions could considerably alter the level of future emissions and thus climate change impacts (Nakicenovic 2000). In the context of climate change mitigation, the ULYSSES project involved citizens in climate policy debates in an urban context (Kasemir et al., 2003) and in the COOL project policy-makers, business and industry representatives and NGOs discussed potential scenarios of long-term options for far-reaching GHG emission reductions (Kerkhof and Wiczorek, 2005). Recently, Shaw et al. (2008) applied the PSD process in British Columbia, Canada, which focused on development scenarios of local futures under different IPCC scenarios. In this context, the research team and local stakeholders developed visualized future socio-economic scenarios based on the IPCC SRES scenarios.

Combining qualitative stakeholder and quantitative expert information (i.e. climate change projections and impacts) in PSD offers unique opportunities to mix good data, scientific rigor, imagination and expertise from different perspectives (Volkery et al., 2008). Qualitative techniques help to encourage discussion, deliberation, exchange of thoughts and identify different views on the types of responses to climate change available, based on stakeholders' views, experiences and resources. The desire is also to reveal deeper meanings and values, facilitate the framing and re-framing of perceptions and conceptions of problems, resulting ultimately in greater social learning (Patel et al., 2007). However, currently available studies show different degrees of participation in scenario development varying from involving stakeholders as reviewers of the scenarios

developed by experts to having stakeholders developing and assessing the feasibility of the scenarios. These different levels of participation also include consultations with stakeholders on specific local challenges and drivers to guide the experts' scenario development and to provide an important "reality check" for the researchers about developed scenarios (Schroter et al., 2005).

Experiences from case studies conducted on climate change in Europe and North America, show that to be effective in designing responses to climate change, the participatory process should involve local knowledge in creating locally-relevant responses that are the combination of development choices, adaptation options, and capacities. Furthermore, the process should help to create learning opportunities for stakeholders about the impacts of a changing climate and their implications at the local level. It is desirable that the PSD process is designed in a way that promotes collaboration between researchers and stakeholders to help balance the biophysical risks associated with climate change and the social risks and issues such as local well-being, capacity and long-term development. Integrating climate impacts and adaptation into local development by using scenario approaches provides opportunities to express uncertainty surrounding climate change as a degree of choice that exists for stakeholders with respect to local development choices (Bizikova et al., in press). In this way, stakeholders may express their views about possible responses instead of perceiving uncertainties of climate change projections as an obstacle for action.

To ensure effective participation, it is also necessary to think about appropriate time horizons and how the climate projects and model outcomes are presented to stakeholders. Van de Kerkhof (2004) defines these elements as the issues of distance and involvement:

- In the case of distance, the question is, does the approach enable participants to distance themselves from short-term concerns and focus on wider long-term issues? For example, consider a situation in which researchers want to discuss climate change with a business owner or a manager of a reservoir, who have their particular planning horizon. Can the exercise enable them to think outside of a near-term operational frame and think in terms of 30 to 50 years in the future?
- Involvement is a measure of whether there was successful transfer of information to the dialogue participants from the scientists or the technical staff. In other words, did the technical or background materials teach new concepts or knowledge to the participants? Also, is there a balance between distance and involvement?¹

In the context of climate change adaptation, creating future scenarios can lead to the identification of the range of possible adaptation options, as well as the forms of policy or investment support that are needed to facilitate effective adaptation, but also to the realization that current operational and planning practices may need to be re-examined, and current vulnerabilities reconsidered, as part of a larger process of defining and implementing local-scale desired development priorities. The following three questions become especially important (Bizikova et al., 2009):

- What if? In a scenario of climate change and development, what kinds of local impacts may occur? Without absolute certainty regarding future climate conditions, can we consider consequences of various combinations of climate change and local development choices?
- So what? Do the impacts of climate change scenarios make a difference? When these impacts are presented to stakeholders, such as farmers, community members, irrigation purveyors, municipal planners, business leaders or engineers, the dialogue can turn to whether or not the identified impacts make a difference to their vision of the future. Current planning processes may consider population growth or changes in important industries or market conditions. The climate change impact scenarios represent a new set of climate statistics translated into a physical (and possibly an economic) impact. Could climate change impacts hinder long-term efforts to meet local development goals?
- What can be done? How can development priorities be defined for the study area? What adaptation measures should be considered? How can these become "mainstreamed"

¹ This could be also enhanced by using visualizations and images to visualize climate change scenarios and response options and in this was enhancing relevance to decision-makers and community interests (Shaw et al., 2009).

into development decisions? How can development measures, emission reduction and necessary adaptation measures become part of this without creating a new vulnerability? If climate change scenarios can be translated into parameters that are relevant to stakeholders in their planning context, then it should be possible to start a dialogue about adaptation, mitigation, and development that would be different from the initial planning scenario, but still be plausible.

Based on our experiences and guidance from the above-discussed literature, we can summarize the key steps of the PSD in this particular context of climate change in the following steps:

1. **Defining the scope of the scenario process:** Changing climate will affect diverse areas and sectors in different ways and the impacts will increase with progressing climate change. For example, a generic question could be: under available projections of climate change, how might the community adapt its plans and policies to make the most of their potential future developments?
2. **Identifying key factors shaping the local development:** Gathering information about our current system will help us to understand the feasibility of certain measures in the short and long-terms and the capacity gaps with regard to development and adaptation needs. Key factors may include economic sectors, population changes and migration, access to basic services, poverty levels and available infrastructure.
3. **Developing scenarios:** Based on discussions of how the identified factors will evolve in the future, identifying a long-term target vision and a series of sequential decisions to attain that vision.² Only internally consistent combinations, i.e., those where developments in one factor did not contradict developments in another, are considered. For the development of scenarios different techniques can be used such as collages or index cards (Figure 2.1).
4. **Introducing boundary conditions and reviewing scenarios:** The identified scenarios should be carefully examined for their potential to determine climate change impacts on the attainment of local development visions by creating a dialogue on the “what if” question. Can the change or trend in the

biophysical indicators such as future rainfall patterns, sea level rise, or changes in the number of consecutive hot or cold days be addressed within the future scenarios? This includes identifying impacts of climate change on the local environment and human well-being and then identifying adaptation options and “so what” questions.

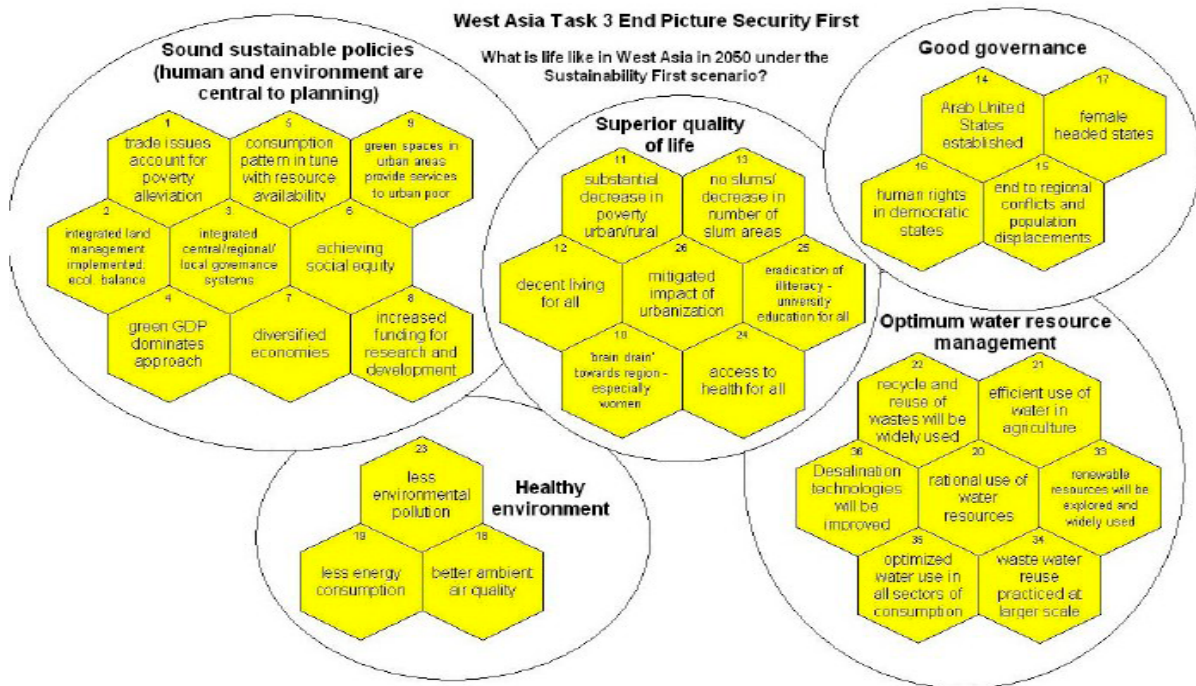
5. **Identifying policies and developing strategies:** If we want to be effective in responding to the scenarios, both short and long-term actions need to be identified. This includes identifying policies that create the environment needed for moving from scenarios and identified adaptation measures to concrete actions.

2.2 KEY QUESTIONS FOR EACC-SOCIAL INVESTIGATION AND IMPLICATIONS FOR PSD DESIGN

A growing number of studies about climate change impacts and adaptations are available, but often they do not address changing local development choices and priorities, or describe the influence that such changes might have on local adaptation. As noted in Robinson et al. (2006) and Bizikova et al. (2008), there are two ways to think about the linkages between responses to climate change and development: 1) to focus on identifying the responses to climate change and then mainstreaming them into development plans (seeing development through climate change lens), and 2) to emphasize that climate change responses are rooted in the existence of different socioeconomic and technological development paths (seeing climate change through a development lens). This means that climate change responses become part of a portfolio of measures that represent a new development pathway. This could include, for instance, specific actions designed to reduce high intensity development in vulnerable areas such as high risk zones for flooding or drought, to promote development of basic services and to create opportunities for off-farm income and ensure access to markets. In practice, however, it has not been easy to effectively link local and regional development with climate

² A vision refers to a moving target guiding the self organizing, innovative forces of a society, forces that otherwise would remain diffuse. It differs from a goal in that it is a tangible image of a future society without being subject to fierce arguments about exact definitions that characterize the operationalization of goals (Jaeger et al., 2000).

FIGURE 2.1. EXAMPLES OF OUTCOMES OF VISION DEVELOPMENT IN HUNGARY AND FOR ASIA.



Source: Bizikova et al., 2009 and UNEP/IIISD (2005).

change impacts and adaptation and allow long-term development priorities to shape adaptation responses.

Therefore, in this project we considered both short and long-term development priorities and the identification of climate change impacts and adaptation. The key questions that guided the workshops can be summarized as follows:

1. What are the adaptation options to the impacts of climate change that are considered relevant for the stakeholders in the context of other development priorities and challenges? Are there specific options that are important in order to address the needs of vulnerable and disadvantaged groups?
2. What are the key sectoral adaptation measures (including infrastructure, agriculture, forestry and health care) and key institutional, capacity and skill development measures needed to promote effective adaptation, especially for vulnerable groups?
3. What are the major trade-offs and synergies between identified adaptation options on vulnerable and disadvantaged groups?
4. How can adaptation options be linked to an internally consistent and robust sequence of actions over short, medium and long-time horizons that respond to current and future impacts of a changing climate, while paying attention to the overall development context of the specific location?

3. WORKSHOP DESIGN AND PROCESS

3.1 ORIGINAL DESIGN OF WORKSHOPS: KEY EXERCISES

Based on the key elements of scenario development, major lessons learned on participation during scenario development and the focus of EACC-Social component, the objectives of the PSD (Phase I) workshops were defined as follows:

1. To identify existing and alternative adaptation options which are relevant for the different livelihoods and correspond to the current and future development challenges that the different regions and vulnerable groups are, or likely will be facing based on the knowledge and experiences of various stakeholders.
2. To identify integrated and robust adaptation pathways that (i) prioritize adaptation measures and desired investments; and (ii) recognize synergies and trade-offs between these investments.
3. Explore what types of sectoral and institutional measures stakeholders feel would be required to facilitate the integration of adaptation actions into local projects and practices.

The overall workshop design (Phase I) consisted of eight main building blocks. Each of them involves different activities including presentation, group work and plenary sessions to help participants to move from current challenges to future visions that are attainable under climate change scenarios and

impacts. The key elements of the workshop are presented in 3.1.

This approach was applied to Phase 1 workshops as a one-day workshop in Ghana and Bangladesh and as a 1.5 day workshop in Mozambique. In all three countries, the workshop began with introductions, an overview of the content of the day and information about the general format in which the workshop's activities would occur. Following a brief presentation of the agenda, participants were informed that much of the day would be spent in small group discussion, and that the outcomes of each break-out session would be used to inform a broader, more inter-regional plenary discussion of national adaptation in the latter half of the afternoon. During each workshop, participants were divided into four groups, which were divided by easily recognizable/commonly used divisions that participants could easily understand. The Bangladesh working groups were divided by region (Coastal, Northeast, Northwest, and Urban), as well as the Ghana groups (Northern Savannah, Forest, Transitional and Coastal Savannah). The Mozambique working groups represented livelihood groups (Fisheries, Agriculture, Forestry and Trade).

The workshop included presentations by local experts' to characterize current challenges, present climate impacts and outline key aspects of adaptation to climate change, followed by a discussion on developing a future vision (elements no. 2 and no. 3). Each group was charged with the task of developing a vision for one of the regions or livelihood groups. We also encouraged the groups to focus on the situation of vulnerable people during the visioning exercise. The groups used large Post-it notes to record each future vision until 2050. Each group

described their vision in plenary. In defining their vision, participants were asked to use a 2050 time horizon, and to reflect on long-term development goals and aspirations. The focus was on depicting an optimistic, yet realistic future for the people considered most representative of the region, giving particular emphasis to vulnerable groups such as women, children, and the rural poor.³ The groups then used large colored index cards to record the key aspects of each vision, and arranged them on a large piece of flipchart paper to be presented and discussed in plenary session (Figure 3.1). Finally, groups were asked to summarize their vision in a clear and concise vision statement of no more than 2–3 sentences each.

Following the development and brief presentations of the visions for each region, presentations by local experts attempted to challenge the visions by presenting projected climatic boundary conditions out to the year 2050. Based on this, the groups estimated specific impacts of climate change on the future vision. The focus was on assessing the attainability of the vision under the boundary conditions represented by the impacts of a changing climate.

In considering the potential impacts, the groups were also asked to suggest relevant adaptation options that might help to mitigate any adverse impacts and capitalize on any opportunities presented. Once again, participants summarized major impacts and recommended adaptation options on a sheet of flipchart paper (Figure 3.2).

Before presenting their impacts and adaptation options back to plenary, each group was first asked to think about an “adaptation pathway” that could accommodate all of the suggested adaptation options. Groups were encouraged to start thinking about the relationship between different adaptation options, as they occur in the near, medium, and longer term futures. Once participants had a chance to reflect on the pathway exercise in their groups, they presented their impacts and adaptation posters as well as their adaptation pathway to the plenary. A concluding, plenary discussion was held focused on prerequisites for implementation of identified actions.

³ See *Facilitator’s Briefing Pack* (p. 10) for a more detailed description of the Vision Exercise.

FIGURE 3.1. MAIN ELEMENTS OF THE PSD WORKSHOP DESIGN

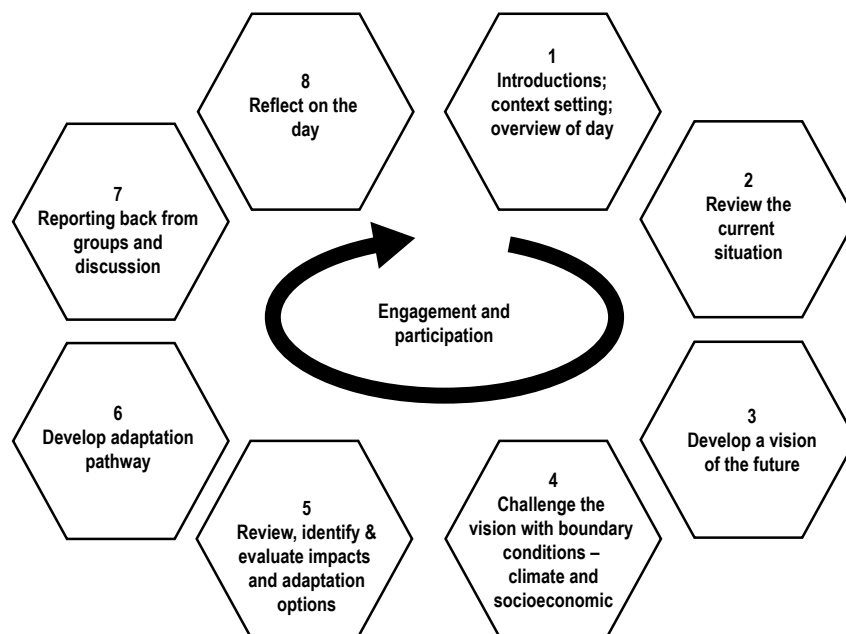
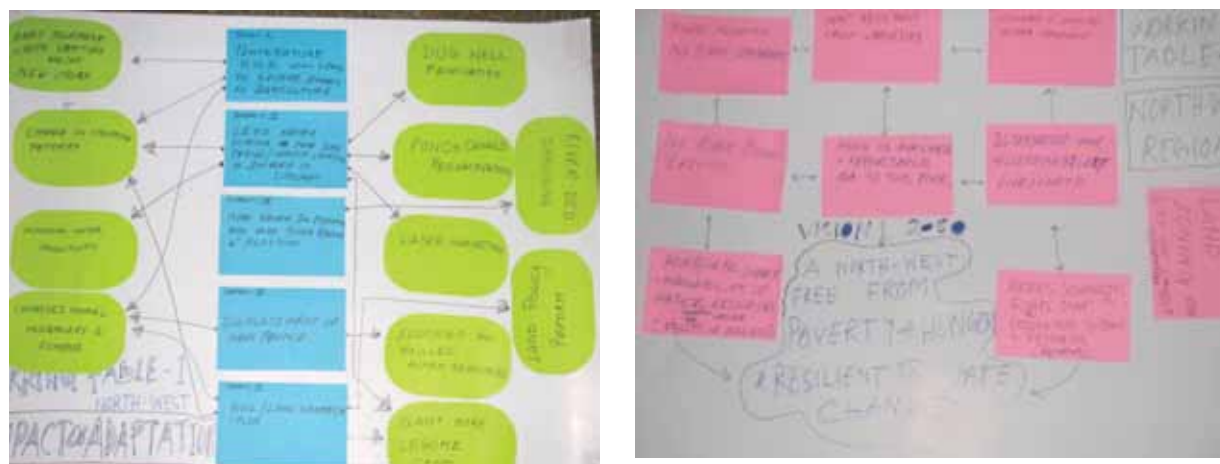


FIGURE 3.2. FUTURE VISION (LEFT) AND IMPACTS OF CLIMATE CHANGE AND ADAPTATION OPTIONS (RIGHT) FOR NORTHWEST OF BANGLADESH (2050)



3.2 CAPACITY-BUILDING OF COUNTRY TEAMS

A major focus of this project was to build capacity of country teams so that they have the necessary skills to conduct further PSD workshops. Overall, the country teams have necessary skills and capacities needed to conduct the PSD workshop; however, the levels of capacity vary between countries. Some country team members have been involved in participatory projects such as participatory poverty appraisals, food security assessment and focus groups. Some members of the country teams are more focused on working with models and data and have had less experience with workshop facilitation. A major challenge of PSD workshops is the interdisciplinary nature that requires a broad-range of input information such as economic and social projections, outputs from climate models and projections of climatic variables over long time horizons. This information needs to be presented in a way that participants can understand and applied in the context of the regions or livelihood groups that they are focused on. It should be noted that it was not within the scope to build capacity in visualization development, and therefore country teams will need further

support in this area if they are to engage in further workshops.

The capacity-building was adjusted to the levels of experience in the particular country. Major capacity building activities included:

- a facilitation training to help each country to facilitate participatory workshops, which included training techniques for small group facilitation, moderating session times and coordinating diversity of activities including presentations with groups activities and plenary sessions;
- a visualization training to help participants use the developed visualizations and basic information on how to create their own materials, for example, how to create a basic GIS-map from available online sources and national data sets. GIS training was not given; and
- an introduction of different participatory approaches including group activities that can be used to elicit stakeholders' views about climate change, future development and adaptation options. We also discussed the ESSA-IISD team experiences with these types of approaches and

how they could be applied in the context of climate change.

Finally, lessons learned from the interaction and capacity-building activities with the country teams are summarized in the PSD Capacity Development Manual. The manual provides a detailed outline of how to design, organize and implement a PSD workshop based on experiences and lessons learned throughout this project.

3.3 WORKSHOP PLANNING WITH IN-COUNTRY CONSULTANT TEAMS AND WORLD BANK STAFF

Discussions and planning with in-country teams and World Bank staff began several weeks before the actual workshop by email and phone conferences. The focus of these discussions were to inform country teams about the up-coming missions and the workshops, identify country teams' basic preferences in the outlined workshop agenda, assess data availability for visualizations and decide next steps in the workshop preparation.

In each country, the total activities spanned one week, including pre-workshop trainings, usually a one day workshop and final day focused on evaluating the workshop. The training focused on familiarizing the representatives from the countries with the workshop process and content; reviewing necessary facilitation skills and discussing roles of visualizations in delivering the workshops and in helping participants to understand current and future challenges of climate change. These discussions were revisited after the workshop on day five to modify the workshop agenda and to identify targeted visualizations both for the local and national levels based on the experiences of the country representatives during the completed workshop on day four.

During days one to three, we provided a detailed overview of the workshop elements with examples of their applications in different contexts along with suggestions for potential changes to accommodate their application in different countries. We also provided the participants with specific examples of potential outputs that will be created during each activity. Participants shared their experiences with similar activities and made suggestions for modification based on the country context. This

included changes in reviewing the current situation, selecting sectors for the future vision and outlining adaptation pathways. This training also included in-depth discussion about the possible focus of the future workshops including geographical and sectoral issues.

In general, workshops need to address geographically-specific socio-economic issues and also climate impacts that can significantly differ between and even within countries. The workshops also need to provide comparable results for each country and across involved countries. We made modifications to the agenda to reflect on country needs, to define groups based on the situation in the country and in some cases country teams also created a list of suggested sectors for the workshop so each group could focus on the similar sectors.

During days two and three, we reviewed and developed key facilitation skills and gave guidance on group work and key issues for plenary sessions. We also shared our lessons learned from similar workshops in which IISD and ESSA members were involved in the past. Participants discussed visualizations and information needed to develop the scenarios. We concluded the discussions by identifying key visualizations, changes in the agenda to accommodate these visualizations and specific issues in the countries that need to be considered in order to ensure successful workshop delivery.

Although the five day Phase I mission was in part a training and capacity building mission, the exchange of knowledge and ideas was a two-way process, which resulted in a number of suggested improvements to workshop preparation, design, and outcomes. Below is a summary of key lessons and recommendations for future workshops.

Workshop planning and preparation:

- Communications and preparations between in-country teams and out-of-country teams must start well in advance of the mission dates and continue on a regular basis both pre- and post-mission. Country teams should be informed of expected roles and responsibilities and provided all relevant materials at minimum one (1) week prior to mission dates in order to review and comment.

- Workshop planning meetings should take place at a neutral, third-party location, so as to ensure maximum participation and availability of all members involved in the workshop planning sessions, with minimum distractions.
- More individual preparation time needs to be provided prior to the workshop, particularly for the preparation of presentations. It may be better to schedule less time for group work and meetings on the days leading up to the workshop, allowing for individuals or smaller groups to attend to specific tasks.

Workshop design:

- Overall, it remains difficult to adequately cover all of the material in a one-day workshop, particularly as each activity requires progressively more thought and could benefit from longer periods of reflection and discussion.
- The plenary discussion throughout the day, and closing comments from each activity, need to continually relate the discussion from the previous activity to the next activity, and to the broader objectives of the workshop. This will serve to improve participants' understanding of the purpose of, and the relationship between, each activity throughout the day.

3.4 DESIGN REVISIONS: ADAPTATION OPTIONS AND ADAPTATION PATHWAYS

A major impetus for revising the original workshop design was the time constraint to complete all the 8-steps of the original PSD workshops, particularly the limited time available to discuss the adaptation pathways exercise. We considered it useful to design the workshops in the Phase II in a way that built on the results of the Phase I workshop and local PSD workshops conducted in the countries. Given the modified framework for the Phase II PSD workshops, the objectives of the workshop were revised as follows:

1. To identify existing and alternative adaptation options which are relevant for the different livelihoods and correspond to the current and future development challenges that the different regions and vulnerable groups are or likely will be facing

based on the knowledge and experiences of various stakeholders.

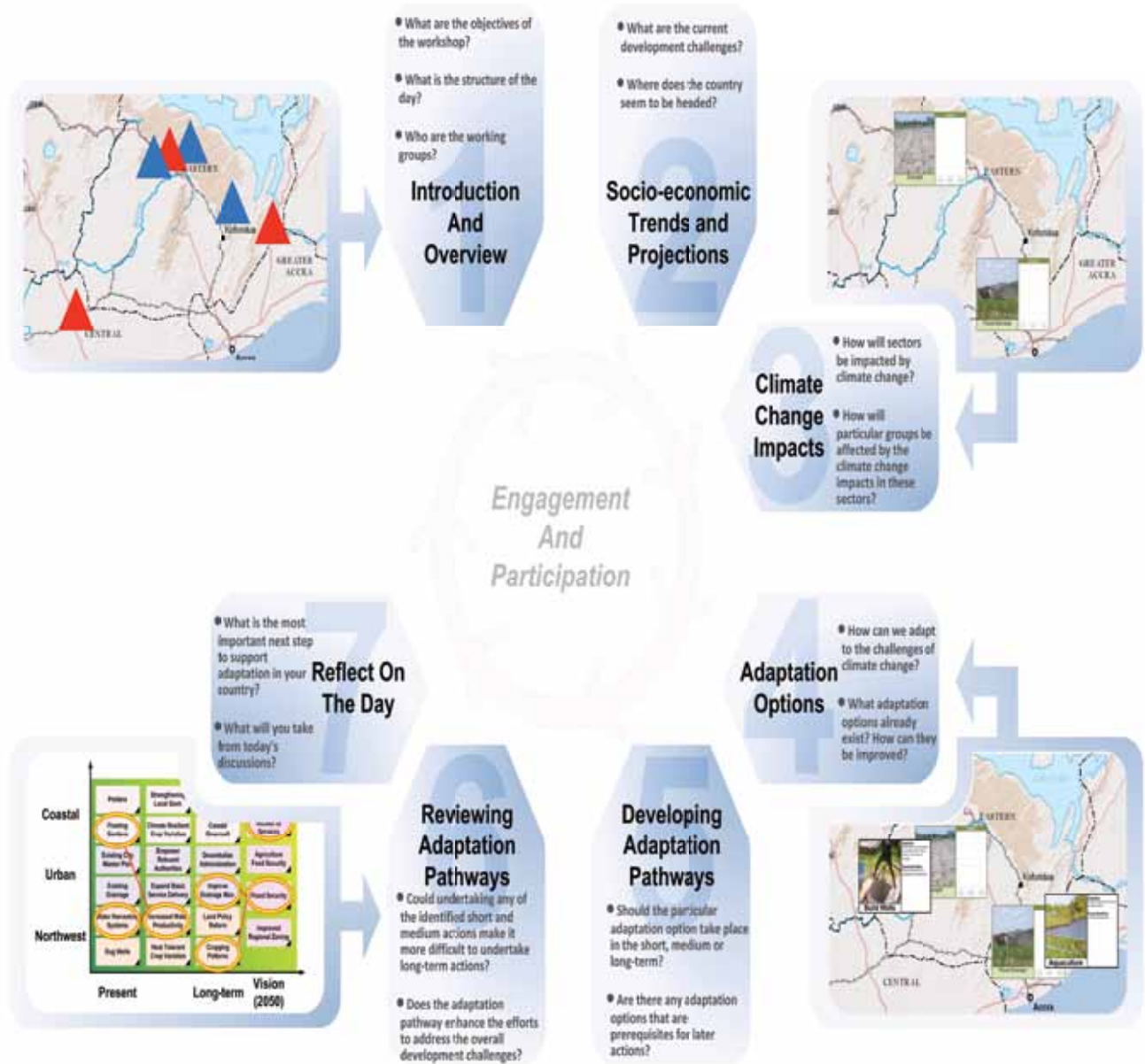
2. To identify integrated and robust adaptation pathways which (i) prioritize adaptation measures and desired investments and (ii) recognize synergies and trade-offs between these investments.
3. To explore types of sectoral and institutional measures stakeholders feel would be required to facilitate the integration of adaptation actions into local projects and practices.
4. To validate and prioritize the outcomes from previous workshops especially those focusing on key impacts of climate change and potential adaptation actions needed to address the impacts from the perspective of diverse livelihoods, regions and vulnerable groups.

During the Phase II workshops, the key focus was to move from identifying a list of impacts of climate change and potential adaptation responses, to developing an adaptation pathway. An adaptation pathway is an internally consistent and robust sequence of adaptation actions to be taken over a particular time period at a national, regional or local level. It responds to the current and future impacts of a changing climate, paying attention to the overall development context of the specific location. Devoting more time to creating the pathway involved facilitating effective input from participants on priority adaptation interventions, synergies, trade-offs, and implications for vulnerable groups over time, in order to maintain and achieve existing development goals for the country. The workshop design was streamlined into a 7-step model (Figure 3.3).

In addition to improving the focus on adaptation and adaptation pathways, as well as the use of more interactive and engaging impact and adaptation options cards (presented in the next chapter), results from local and regional Phase I workshops were integrated into the Phase II national workshops. Although the specifics of how each country can best integrate local level results differs from country to country, the ESSA/IISD team used recorded results from Phase I workshops to design the impact and adaptation options cards to be used by groups in Phase II.

In this revised workshop, participants were not tasked to develop their own future visions.

FIGURE 3.3. PSD WORKSHOP STRUCTURE FOR PHASE II WORKSHOPS



Instead, the workshop began with two presentations on socio-economic projections and climate change, which helped to provide context and structure for the remainder of workshop activities. These steps were complemented with a discussion on vulnerability and vulnerable groups. The purpose of the discussion was to introduce a vulnerability framework and its key elements in order to help inform and guide workshop activities, ensuring that participants were thinking about development challenges and the projected changes in the context of those most vulnerable. As a result, immediately following the presentation on socio-economic trends and climate projections, participants were led through an exercise of identifying key criteria for defining vulnerability in the country

In order to identify how climatic changes impact different regions, participants were divided into groups based on geographical areas (Ghana and Bangladesh) and livelihood groups (Mozambique); each group received a large-scale topographic map of the area to identify the vulnerable areas and by using a set of impact cards followed by a set of adaptation cards outlining the major projected impacts of climate change and potential responses. The cards were designed using data collected from previous workshops. The purpose of the impact cards is two-fold:

- i. to help illustrate/visualize the potential impacts of a changing climate and adaptation actions at the individual, household and community scale (alongside the severity of the impact, as well as secondary and tertiary impacts; and
- ii. to help structure groups' discussions on relating key impacts and adaptation with key vulnerable areas for their particular livelihood group.

Once all relevant and significant adaptation options were identified for each region/sector, participants were asked to select six adaptation options that they prioritized as the most critical given limited resources. Once selected, participants were asked to prioritize them based on what they perceived needed to happen first within the short-term, followed by the medium- and long-term. The resultant "pathway", once combined with the priorities of all five groups, formed one internally consistent and robust sequence of adaptation actions to be taken over time at a national, regional or local level.

This resulted in the development of a national adaptation pathway using the prioritized interventions from each of the groups. Groups then reviewed the pathways and identified specific actions required to ensure that the needs of vulnerable groups are adequately addressed, and not excluded from the benefits of potential adaptation actions.

3.5 INPUTS TO WORKSHOPS: DEVELOPMENT AND USE OF VISUALIZATIONS

A visualization is an image, diagram, or animation, which can provide a strong means to communicate otherwise broad-brush information on impacts and vulnerability to future climate change.⁴ A substantial literature is now developing on the visualization of the impacts of climate change, much of which can vary dramatically in associated cost and time to develop, data intensity, and visual impact. However, in general, the use of visualization material allows for the summary of large amounts of technical information for use by non-technical audiences in a manner which is engaging and emotive in driving behavioral change.

For the purposes of the PSD workshops, visualization materials were used to help participants construct future scenarios (or "visions"), identify projected climate change impacts using different spatial scales, and explore adaptation options to address adverse impacts. The development and use of different visualization materials depended on the availability and accessibility of the necessary data, software, hardware, and technical skills, as well as available time and budget.

A detailed description of the visualization materials used in these workshops, along with suggestions for other materials, along with information on the source of data can be found in the Capacity Development Manual that accompanies this report.

In the series of six workshops undertaken in this project, the following visualization materials were used:

⁴ Thornton, P. (2009), "Visualizing Vulnerability and Impacts of Climate Change", International Development Research Centre (IDRC) Working Paper Number 23, Ottawa, Canada, March 2009.

1. Topographic Maps
2. Social Issues Poster
3. Impact and Adaptation Cards
4. Climate Change Projections Poster

For the Phase II workshops, all of this information, except the impact and adaptation cards, was also presented to each participant in a participant handout, which also gave an overview of the EACC project, explained concepts such as PSD and vulnerability. This was a useful reference to participants both during the workshops and after. For general reference throughout the day, a large poster of the workshop structure (3.3) was also developed for the Phase II workshops. This was also included in the participant handout.

Topographic Maps

Topographic maps typically contain common natural and cultural features, including administrative boundaries, place names (e.g. cities), major transportation networks, water bodies, relief or elevation, and various other country-specific layers. In a PSD workshop, topographic maps provided a user-friendly reference map that both the facilitator and the participants could refer to throughout the day. In particular, facilitators used the topographic map when discussing regional distribution of social indicators, areas most vulnerable to climate hazards and impacts, and locations of existing adaptation options and/or pilot projects within the country. Workshops generally had a large topographic map of the whole country, and those workshops with regional rather than sectoral breakout groups (Ghana and Bangladesh) had smaller regional topographic maps that they used in their group-work activities.

In addition, topographic maps were sometimes used as part of the ice-breaking activity at the beginning of the workshop day, whereby participants can use the map to indicate where they are from, where their family is from, or where in the country they feel they are most knowledgeable about. The result is a quick overview of the distribution of geographic knowledge and/or interests in the room. This information was sometimes used to help divide groups based on areas that participants might be most knowledgeable about.

Social Issues Poster

Where the data existed, social issues posters were used to provide a comprehensive overview of key development indicators for the country or particular regions of the country. The purpose of a social issues poster was to present participants with a baseline “snapshot”, or “picture”, of the current development challenges facing an area (poverty, health, education, etc.), before presenting them with the associated challenges related to a changing climate. The intention was to help participants understand that climate change is not occurring in isolation of other social and environmental stressors. Rather, climate change will react alongside existing development challenges, and in most cases, will act to exacerbate the existing stresses on both the natural and human environments.

Impact and Adaptation Cards

In designing a PSD workshop, impact and adaptation cards (in place of traditional brainstorming techniques and mental mapping) can be used to introduce an engaging style by which impacts and adaptation options can be quickly identified by participants in an interactive and timely way.

In the phase II workshops, following the identification of vulnerable areas, groups were provided first with a set of impact cards followed by a set of adaptation cards outlining the major projected impacts of climate change and potential responses (Figure 3.4).

The cards were designed using data collected from phase I workshops. The purpose of the impact cards was two-fold:

1. to help in illustrating/visualizing the potential impacts of a changing climate and adaptation actions at the individual, household and community scale (alongside the severity of the impact, as well as secondary and tertiary impacts; and
2. to help structure groups’ discussions on relating key impacts and adaptation with key vulnerable areas for their particular livelihood group.

Once all relevant and significant adaptation options were identified for each zone, participants were asked to select six adaptation options that they prioritized as the

most critical given limited resources. Once selected, participants were asked to prioritize them based on what they perceived needed to happen first within the short-term, followed by the medium- and long-term. The resultant “pathway”, once combined with the priorities of all five groups, formed one internally consistent and robust sequence of adaptation actions to be taken over time at a national, regional or local level.

projected changes in temperature and precipitation, in order to help inform discussions on future climate change impacts and adaptation options. Given existing datasets (from 1950 to 2000) and General Circulation Model (GCM) data, wall posters with a number of different maps were designed to show participants how the future might look differently under a scenario of climate change. Examples of maps used include:

Climate Change Poster

Where appropriate information was available, climate change wall posters were used to show participants

- Baseline annual average precipitation between 1950 and 2000
- GCM modeled precipitation in 2050
- Precipitation difference between baseline and 2050

FIGURE 3.4. EXAMPLES OF IMPACT AND ADAPTATION CARDS USED IN GHANA



- Baseline annual average temperature between 1950 and 2000
- GCM modeled temperature difference between baseline and 2050
- Temperature difference between baseline and 2050

Sources and availability of climate change data varied significantly between countries. Although there has been a substantial amount of work done in most countries using the various General Circulation Models (GCMs) which exist, the challenge was been in down-scaling the data in such a way that is accessible and meaningful for provinces, administrative and agro-ecological zones, and communities.

3.6 OTHER INPUTS TO WORKSHOPS: EACC SECTOR PRESENTATIONS; LOCAL PSD RESULTS

Because the workshops were strongly centered on participatory approaches, the involvement of country teams in conducting the actual workshops had crucial importance for their success. We can distinguish between the types of support as follows:

- Organizing the workshop including helping with booking the venue, inviting participants and assisting with logistics such food and hotels for the participants during the workshop
- Providing opening speeches for the workshops; these were given by the leaders of the country teams and by the representatives of the World Bank including Robin Mearns, Anne Kuriakose and Carina Bachofen (The World Bank, Social Development Department, Washington DC), Stephen Mink (World Bank, Washington D.C.) and Peter Kristensen (World Bank, Accra, Ghana). These contributions were very important for the workshop success, because the participants got direct information about how the outcomes of the workshop and their contribution will be integrated with other components of the EACC study
- Introducing socio-economic and climate change projections for the countries by country team and consultants. Through the presentation of projections of climate change, participants were made aware of the constraints imposed by climate change on addressing existing development challenges within

the country. By taking this approaches local teams and consultants provided examples and specific consequences of projections for the countries that requires relatively deep knowledge of the country's situation

- Most of the local team members and consultants were also involved in reviewing and commenting on the final workshop reports so the reports provided accurate information
- Country teams and consultants were very supportive, and they provided useful information about the actual workshop presentations, suggestions for the group activities that fit the county context and putting the workshop into the context of other on-going initiatives in the country.

3.7 DESCRIPTION OF WORKSHOP PARTICIPANTS

Workshop participants were invited from diverse professional and personal backgrounds to both regional and national level workshops where the ESSA/IISD consortium was present. As the PSD approach to planning for climate adaptation is founded in principles of pro-poor adaptation, part of the objectives of a PSD workshop is to ensure a bottom-up process representative of the needs of those most vulnerable to climate change. As a result, workshop invitation lists attempted to target both vulnerable groups, and representatives of vulnerable groups, to ensure these objectives were successfully fulfilled.

Contrary to the above-mentioned objective, workshop participants from Phase I were composed of predominantly government representatives from environment, and environment-related (agriculture, land, water, etc), departments, with limited direct representation of vulnerable groups. This was noted by the design team, as well as the in-country teams, as a challenge in the design of Phase I. As a result, a global email was distributed to all in-country teams in advance of Phase II workshops to ensure a more conscious effort to secure the attendance of vulnerable groups (i.e. community members from climate change 'hotspots'), and/or more representatives of vulnerable groups (i.e. development NGO's) to the table (Appendix 6), particularly at the upcoming national-level workshops for Phase II.

The result was a more diverse mix between government, non-government, research organizations, and community members who attended Phase II national-level workshops. In Ghana and Bangladesh, alongside strong representation from the NGO community, community members who had attended a local or regional PSD workshop, were asked to attend the national PSD workshop to ensure that their needs and desired responses to climate change, were sufficiently addressed and represented. The result, in combination with the integration of local PSD workshop results at the national level workshops, was a more distinct and bottom-up process which engaged stakeholders from all different backgrounds in a more holistic and productive dialogue around adaptation.

TABLE 3.1 LIST OF PSD WORKSHOPS CONDUCTED BETWEEN JUNE–OCTOBER, 2009

<i>Date(s)</i>	<i>Location</i>	<i>Total number of participants*</i>
June 11, 2009	Accra (Ghana)	31
June 29, 2009	Dhaka (Bangladesh)	32
July 15–16, 2009	Xai Xai (Mozambique)	46
August 26, 2009	Maputo (Mozambique)	26
September 2–3, 2009	Accra (Ghana)	28
October 7, 2009	Dhaka (Bangladesh)	36

* Excluding World Bank, or ESSA/IISD staff, as well as the in-country Facilitation Team members.

4. COUNTRY RESULTS AND DISCUSSION

4.1 RESULTS FROM GHANA

4.1.1 Understanding Current Challenges and Vulnerabilities

Understanding the current situation and challenges that people in Ghana are facing is important when identifying consequences of climate change and developing adaptation responses. Key development challenges identified during the workshops included rapid depletion of natural resources, lack of proper infrastructure, increased incidence of diseases such as sexually transmitted diseases and malaria and other water-borne diseases coupled with

limited health care services, loss of soil fertility as a result of overuse and unsustainable agricultural practices, deforestation, rapid and uncoordinated urbanization and poverty. These challenges can also be linked to increasing rates of migration often accompanied by a lack of basic services, unemployment, and limited access to resources including food, water and shelter in in-migrating areas whereas areas of out-migration suffer from lack of labor.

In the context of climate change, vulnerability is a function of the character, magnitude, and rate of climate variability to which a system is exposed, its *sensitivity*, and its *adaptive capacity*. Major elements of vulnerability in Ghana are outlined in Table 4.1.

The identified vulnerable groups in Ghana included food-crop farmers especially in rain-fed areas; fisher

TABLE 4.1 KEY DRIVERS OF VULNERABILITY TO CLIMATE CHANGE IN GHANA

	Vulnerability driver	Example of vulnerability
Exposure	Nature and frequency of natural disasters and	<ul style="list-style-type: none"> • Increased occurrence of drought and overall change in precipitation patterns • Flash floods especially in river basins • Coastal areas affected by sea water intrusion, flooding and severe erosion
Sensitivity	Livelihood options and strategies	<ul style="list-style-type: none"> • People sick with malaria, HIV/AIDS • Farmers and families depending on rain-fed agriculture and subsistence farmers • People with limited access to resources for migrants, widows, disabled people with higher level of poverty and food insecurity • Exploitation of migrants in urban areas • Population living in urban slums
Adaptive capacity	Lack of capital (social, physical, financial, human, and natural)	<ul style="list-style-type: none"> • Decreasing well-functioning community networks • Limited access to low-rate loans • Limited access to services such as health care and sanitation • Lack of irrigation systems and limited water storage • Limited access to knowledge and technologies to deal with changing exposure

folks, people in flood-prone areas including the coastal belt; and migrants mostly living in slums of greater Accra. Finally, participants also identified groups considered vulnerable because of their social situation, regardless of impacts of changing climate, including widows, handicapped people, women who do not own land, and people living in places with weak social networks and conflict-prone zones especially in the Northern regions.

4.1.2 Current and future impacts of changing climate and climatic variability

In general, climate impacts in Ghana will differ from the northern Savannah zone to the coastal areas in the south. The Northern Savannah zone is expected to be mostly affected by increased occurrence of drought. Most of the coastal regions are susceptible to tidal flooding and sea erosion. Despite overall reduction in water availability, due to less rain and increasing temperatures, increasing variability in rainfall patterns may cause flooding in some river basins. Similar types of events have already been experienced; for example the participants reported the following observed impacts and consequences on their livelihoods:

- Changing rainfall patterns resulting in lower rainfall during the growing season has affected agriculture and farming to the extent that farmers have witnessed large reductions in crop yields, reduced incomes, and overall negative impacts on food security and livelihoods
- In the transition zone, farmers prefer to plant crops resistant to high temperatures and low rainfall like cassava and cashew. In addition, those in the transition zone are planting crops which have short gestation, (i.e. tomatoes can be harvested within three months; Dogbe and Ahiable, 2009b)
- The impact of water scarcity is cyclical, which often leads to digging shallow wells, which are still insufficient to overcome major droughts. Droughts often lead to loss of production, disease and migration
- For coastal communities, saltwater intrusion and inundation has resulted in the significant loss of housing and farms mostly through erosion. Economic activities in the region are being badly affected by these changes.
- Reduction in fish harvests which has resulted in the unsustainable practice of fishing immature fish,

thereby continuing to reduce mature fish populations in the area.

Based on the provided information about future climate projections and observed trends, the following key impacts were identified: **reduced water availability and drought, soil degradation, wild fires, floods, coastal erosion and the increased occurrence of diseases** (Table 4.2). These impacts have significant implications on key sectors including agriculture, forestry and water resources that lead to direct impacts on human well-being, food security, drinking water availability and migration.

Major climate change impacts identified in Ghana included **reduced water availability, drought and soil degradation** with secondary impacts on overall soil fertility, as well as crop and livestock loss. According to the participants, these impacts are felt predominantly by subsistence farmers planting mostly cassava and plantain, as well as cash crop farmers growing cocoa and coffee. For those farmers practicing monoculture of one particular cash crop, (which seems to be the current trend), production levels and profits are in jeopardy due to climate variability and a high degree of uncertainty. These impacts were also regarded as the most significant because of the direct linkages to revenues, jobs and food security. Participants also emphasized that when impacts such as drought occur regularly, farmers are discouraged from engaging in further production, and many choose to migrate. Similarly, Dogbe and Ahiable (2009b) indicated that reduced soil fertility and unreliable weather patterns have led to land abandonment by most farmers in the Transition Zone (for Buoyem, a farming community in Brong Ahafo).

In general, migration emerged as a cross-cutting issue affecting all agro-ecological zones, with significant consequences for the coastal and the transition zones. The issues listed in this context included increasing concentration of populations in slums potentially causing further vulnerabilities, increasing incidences of diseases, unemployment, limited availability and access to basic services, increased pressure on infrastructure, and finally, loss of labor in the out-migration areas. As reported by participants, the impacts on the labor market also include the exploitation of cheap labor in the cities, and often reliant on child labor in areas affected by out-migration.

TABLE 4.2 KEY IMPACTS AND THEIR CONSEQUENCES

<i>Key impacts</i>	<i>Consequences of these impacts</i>
Reduced water availability and droughts	Fluctuation in cereal and root crops (cassava, plantain and cash crops: cocoa and coffee) leading to less revenues, less food for storage, malnutrition, food insecurity and migration Migration—increased population in slums, pressure on infrastructure, social services, loss of labor in the out-migration areas
Soil degradation	Loss of land for crop cultivation and reduction of soil fertility and crop yields
Wild fires	Forest degradation, loss of biodiversity, loss of property, GHG emissions; could be worsened by, or caused by, charcoal burners, high biomass, dry construction
Flooding	Settlements and farm land and crop production is affected subsequently Reduced access to markets—no way of getting the products to market, loss of revenues, farmers are discouraged subsequently, increased poverty
Coastal erosion	Salinization, land degradation, loss of settlements and agricultural land for production; impacts on coastal areas with higher population densities
Occurrence of diseases	Spread of diseases such as cholera, malaria, guinea worm, diarrhea leading to loss of man-hours, stress on health facilities and economy as whole; Livestock diseases and pests
Changes in fish availability	Reduced fish catch, changes in fish species, undermining of livelihoods of fisherme

Extreme temperatures and droughts coupled with the seasonal floods in urban and peri-urban areas indicated in the projected climate change scenarios may cause significant impacts in highly populated areas. The impacts are often enhanced by lack of proper infrastructure, which leads to **increasing incidence of vector diseases**, especially malaria, which affects the productivity of people in the suburbs of Accra (also confirmed in Dogbe and Ahiable, 2009b). In the rest of the country, flooding could lead to loss of infrastructure such as roads, irrigation systems and human settlements. Floods could also have negative impacts on crop production and livestock causing negative impacts on food security. However, workshop participants emphasized that most of the negative impacts on food security are due to infrastructure destruction including roads that provide access to markets.

4.1.3 Identifying Adaptation Options

Communities are already experiencing changes in water patterns that required adjustments in their practices. As identified in the report from the local consultants study, the most significant impacts and changes in crop production and community well-being were attained through the following activities (Dogbe and Ahiable, 2009b):

- Expanding farms sizes, instead of intensifying agriculture, however this creates further needs for labor and machinery

- Increasing use of fertilizers to respond to declining growing conditions and soil fertility
- Planting high-temperature and drought resistant crops such as cassava and cashew and plants with short gestation periods like tomatoes
- Planting along the river banks and streams for irrigation purposes (common only among vegetable farmers)
- Adapt planting dates, either delaying or early-planting of crops. This affects revenues since harvesting may not be done at the right time where the demand for the produce is high
- Phasing of cultivation, for example, planting only on half of the land and delay planting the other half to spread the risk of early or late rains.
- Practice early morning farming where the community goes to work in the fields very early in the morning to work and come home before the intense mid-day heat to avoid the health impacts of the scorching sun

To address the major impacts on water availability, erosion and agricultural production, participants emphasized **infrastructure development, changes in governance and training and capacity-building**. Participants suggested that rainwater conservation and building dams would improve water availability for irrigation. They also stressed that smaller scale dams should be supported, but this should be accompanied by effective environmental impact assessment. Further, negative

consequences of severe climate impacts on food production could be reduced by building grain silos and small agro-processing facilities for conserving food surplus, income generation and for helping in maintaining food security. Participants also suggested changes in planted species, by increasing the use of drought-resistant and early maturing crops as well as changes in practices by promoting sustainable agriculture and organic farming to limit further soil depletion. Some changes in planted crops have already been used by farmers.

Actions are also needed to **improve capacities of farmers** and their families to engage in market activities to sell their products, as well as to improve entrepreneurial skills that will generate off-farm income. This will lead to increasing levels of self-employment especially in food processing, thereby increasing household income. There is also a need to develop extension services for information dissemination and skill development on issues such as water harvesting, suitability of planted species, post-harvest techniques, loan and microcredit information etc. Special attention needs to be spent on skill development initiatives in areas of high in-migration to help create alternative livelihoods. Improved capacities and livelihood opportunities especially in limiting 'slash and burn agriculture,' could be also effective in wildfire management.

To prevent flooding, infrastructure development was identified as a priority, including **building flood-proof roads, increasing capacity of drainage systems**, using flood-resistant materials in construction, building flood gates and dykes to control water levels and to protect from sea and fresh water. The protection from sea level rise should also be linked with natural options such as protecting and planting mangroves, instead of only focusing on hard, physical interventions such as dykes.

To further address flooding and other severe weather events, participants suggested **improvements to early warning systems**. This included investing in technology to equip meteorological service agencies, supporting health and agricultural extension services to help translate projections into forecasts of disease outbreaks and recommended cropping patterns, and finally, identifying proper communication channels that will reach remote areas using community radios and local languages.

Overall, participants suggested that these adaptation measures would include relatively high cost investments such as flood gates, dykes, flood-resistant roads, improving basic social services, but that several soft investments were required in food production, processing and storage, as well as training in alternative skill sets. Significant improvements in governance including decentralization, increased participation, sustainable resource management and secured land tenure were listed as preconditions to increase the adaptive capacity of communities and adaptation actions.

4.1.4 Developing Adaptation Pathways and their relevance to vulnerable people

Once adaptation options were identified an *adaptation pathway* was developed as a robust sequence of adaptation actions to be taken over time at a national, regional or local level. The proposed pathway should respond to the current and future impacts of a changing climate, simultaneously paying attention to the overall development needs and priorities of the country (Table 4.3). Specifically, in **the short-term period**, groups identified actions that address current climate variability and the associated negative impacts such as reduced water availability, losses and fluctuation in crop production, and limited public health and social support services. This included water harvesting, sustainable agricultural practices and post-harvest practices. As outlined in the previous section, these measures should be supported by microcredit schemes to help farmers and SMEs obtain resources for production, storage and preservation of products (facilities, methods and processing) and by agricultural extension services to appropriately inform farmers about sustainable practices.

To make the suggested adaptation measures for water harvesting, agricultural practices and post-harvest management most accessible to vulnerable people, the participants specified the following considerations:

- promoting roof-top, run-off rain-water storage for agriculture
- creating shared water storage facilities within the community, especially in dry areas
- targeting small-scale farmers and fishers (in the Transition and Coastal zones) for organic farming and backyard gardening programs

TABLE 4.3 KEY ELEMENTS OF THE ADAPTATION PATHWAY FOR GHANA

<i>Types of actions</i>	<i>Short-term 2010–2015</i>	<i>Medium-term 2015–2030</i>	<i>Long-term 2030–2050</i>
Mostly infrastructure and changes in practice	<ul style="list-style-type: none"> • Rain-water harvesting • Post Harvest management • Aquaculture 	<ul style="list-style-type: none"> • Rainwater harvesting (run-off capture) and building dams • Building dams for irrigation (small scale community management dams) • Improve drainage • Resettlement of displaced people 	<ul style="list-style-type: none"> • Sea-defense along the coastline • Flood proof roads and railways • Developing crops and livestock that are pest and drought resistant, early yielding and culturally acceptable
Mostly services, governance, training and capacity development	<ul style="list-style-type: none"> • Wildfire control • Development of sustainable agricultural practices • Culturally sensitive education • Health services and supporting social nets • Secure land-tenure 	<ul style="list-style-type: none"> • Governance and regulation enforcement • Sustainable water management • Climate forecast and early warning systems • Services for resettled displaced people 	<ul style="list-style-type: none"> • Promote Integrated Water Resource Management • Sustainable land-use management • Social policies—safety nets for communities and immigrants, managing social tensions and conflicts • Vocational training and entrepreneurial skill training

- supporting post-harvest activities including cottage processing and sun-drying
- creating food banks
- adopting improved indigenous and dry land farming practices
- improving extension services for small-scale and subsistence farmers

The participants also identified improvements in basic health services and supporting social safety nets. These services should be targeted especially toward children and pregnant women, and should include improved access to sanitation and personal hygiene education. Preconditions for changes in agricultural practices require securing land tenure, and promoting democratic control of land including gender balance in access to power and resources.

Over **medium-term horizons**, the focus was both on engaging in investments in infrastructure as well as in capacity and training activities mostly focused on water resources. According to the participants, this should include rainwater harvesting and building infrastructure such as dams for irrigation, flood protection and improving drainage systems. As suggested, these measures should occur at the smaller and medium-scale and at the community level, for example by:

- protecting streams and planting along the rivers;
- supporting community-based water management;
- small – scale community dams on local streams;

- addressing inappropriate water management especially in vulnerable areas and areas with potential high migration; and
- using both natural and built structures in coastal protection.

The identified changes should be followed by improvement in governance of water resources by moving towards sustainable and integrated management of water resources, which was identified in all workshops. This includes overall improvements in regulation enforcement, increasing capacity of personnel, and incentive/payment options for environmental services. This would require decentralization of the government authority, strengthening of civil society, engaging traditional authorities in planning and building on existing platforms for community engagement.

Recommended **long-term priorities (to 2050)** included infrastructure development that could address future climate impacts including roads and railways, sea-defense along the coastline and cleaning riverbeds and water ways. As suggested by participants investments in roads should also consider:

- timing of construction especially that the roads are constructed before rainy season;
- ensuring routine maintenance; and
- reviewing overall road design criteria including materials and drainage, road sizes, protection of road shoulders.

Strong emphasis on education and long-term changes in natural resource governance, especially in water resource management, were suggested. Over the long-term, more investment in R&D of culturally acceptable climate and pest resilient crop and livestock varieties, as well as early-maturing varieties is required. This would need to be linked to changes in the educational system, creating support programs for higher education, integrating climate change into the formal curriculum and educating affected communities on the impacts of climate change.

The issues of developing early warning systems and forecasts to guide agricultural production have growing importance over time. In some areas such the Transition and the Northern Savannah zones, there is a strong emphasis on early warning systems, even in the short-term horizons, to inform agricultural producers about potential changes and give warning and advice before major disasters such as floods and droughts. Countrywide effectiveness would require additional support to meteorological offices, improved rural extension units and exploring diverse dissemination channels such as community radio, cell phone networking, or public meetings held by extension agencies and/or village officials to reach the target audience.

Over all the time horizons from short to long-term participants expected that the migration and displacement of people would require significant attention and investments. There needs to be growing effort to support and improve social safety nets including health services that would specifically service migrants and migrant areas.

4.2 RESULTS FROM MOZAMBIQUE

4.2.1 Understanding Current Challenges and Vulnerabilities

Understanding both the historic and current issues and challenges that people are facing is important for identifying vulnerable groups. In terms of social issues, the identified challenges included poor access to water and social services, high rates of absolute poverty, irregular school attendance, especially for women, and high rates of HIV/AIDS and the consequential reductions in the labor force. The overall development challenges that

vulnerable groups face include poor road networks, limited access to markets, limited knowledge and other capacities for processing of agricultural products, high unemployment rates, deforestation, illegal fishing, and desertification. In addition, a lack of institutional capacity in the area of conservation and resource management was also identified. Major vulnerable groups were identified by the participants included: low literacy/uneducated, orphan, or child-headed households, rain-fed agriculturalists, polygamist families, people with disabilities, households living along river basins and families with a high number of dependents.

4.2.2 Current and Future Impacts of Changing Climate and Climatic Variability

Some of the most significant impacts identified across vulnerable livelihood groups in Mozambique included the impacts on agriculture (soil fertility, drought and desertification), forestry (increased occurrence of wild-fires), and floods and related damage (Table 4.4).

In terms of **impacts on soil fertility and desertification**, participants identified potential consequences as loss of, or reduced agricultural and livestock production, fluctuation in production and reduced water availability. These impacts were thought to have the most significant impacts on subsistence farmers and farmers in the rain-fed areas and were regarded as the most significant because of the direct linkages to nutrition and poverty levels. These impacts were given the highest priority. They further outlined these consequences by emphasizing that they could lead to food insecurity, localized hunger and low diversification of diet with negative impacts on children, cereal scarcity and overall food shortages. They also emphasized that these negative trends could be magnified by indirect impacts such as price fluctuation and often significant increase in food prices especially in the affected areas. Furthermore, in the areas of recurring droughts, it was determined that the negative impacts could undermine coping capacities of households by limiting their availability to either plant or harvest enough food to provide a surplus for storage. Families that do not have surplus food for three months, or the equivalent money, are at significantly reduced capacity to recover from and adapt to adverse climate-related incidents.

TABLE 4.4 KEY IMPACTS AND ASSOCIATED CONSEQUENCES OF CLIMATE CHANGE IN MOZAMBIQUE

<i>Key Impact</i>	<i>Consequences of these impacts</i>
Water availability	Low crop and livestock productivity; hunger and malnutrition; population migration; salinization; and increase in disease
Migration	Increased pressures on the natural resource base (forestry & fisheries); increased unemployment and social conflict; increase in number of abandoned settlements; and increase in disease
Desertification and soil degradation (including loss of soil fertility)	Increased pressure on fisheries (alternative livelihood); loss of vegetation; and food insecurity
Flood	Soil erosion; flood damage (to infrastructure, settlements, and assets); poverty; disease; malnutrition; and improved nutrient cycle for fisheries
Wildfire	Loss of vegetation; soil degradation; low crop yield; reduced availability of firewood; food insecurity; hunger; malnutrition; and low quality of shelter
Coastal erosion and salt water intrusion	Increased fish harvesting, overexploitation and extinction of some species; and increased family expenses and insecurity from fishing - reduced income from fisheries and food insecurity

Further consequences of climate change in Mozambique include reduced water availability, desertification and unsustainable use of forests- often leading to a reduction of pasture land, loss of pastures, **forest and wildfires** and deforestation. These impacts have negative consequences for many vulnerable groups especially charcoal, wood, and wild food collectors, whose livelihoods directly depend on the forest resources. Participants recognized that most of these impacts are also worsened by current challenges of forest management including illegal timber harvesting, weak law enforcement and weak enforcement of the licenses for timber. Many of the activities, together with climatic impacts, contribute to the increased occurrence of wildfires damaging both human settlements and ecosystems.

Flooding was identified as one of the most significant impacts of a changing climate, inasmuch as it has many direct consequences on all segments of the population, but especially vulnerable groups. The impacts identified included loss of infrastructure such as roads, irrigation systems and human settlements. Participants indicated that this could also result in resettlement which often leads to a decline in well-being including living in camps, limited access to basic services, and limited long-term employment. Floods could also result in reduced crop production and livestock causing negative impacts on food security as has been outlined above. However, participants emphasized that most of the negative impacts on food security will likely be due to infrastructure damage, including roads that could provide access to

markets. Finally, participants mentioned that controlled floods in areas where the communities are prepared for these events could also help improve nutrient cycling and crop production, creating benefits for the community.

For areas around the coast, **coastal flooding and salt water intrusion** would create serious consequences for the local livelihoods especially in the context of the fisheries, but also for agricultural production. According to the participants, this could lead to pressure on resources by overharvesting current resources to maintain the level of catches, revenues and food security. Most of the fishermen have limited skills and limited access to other sources of income to potentially cover the reduced revenues from fishing; this will need to be considered when adaptation options are identified.

Many of the above-mentioned impacts could also **impact urban and peri-urban population**. Although not specifically discussed in the workshops, some groups emphasized that negative impacts on agriculture, forestry and infrastructure could also lead to increases in unemployment. As people in these areas do not have their own production systems and/or other means of food security, the end result may be mass migration into urban areas. Similarly, impacts on agricultural production, livestock and settlements can also lead to migration. In most of the groups, the issue of migration was mentioned, but it was prioritized as an issue of medium or low significance that should be monitored as it may lead to further vulnerability not directly related to

climate change impacts, such as diseases, unemployment and limited access to basic services.

4.2.3 Identifying Adaptation Options

Communities are already experiencing changes in weather patterns that require adjustments in their practices. As identified in both workshop phases, the most significant changes in practices to address impacts were changes in crop production. Some examples of adaptation options currently applied by communities include:

- small-scale rainwater harvesting done by households and communities;
- early warning systems;
- construction of small silos for storage at community level;
- management and control of wild fires through community sensitization;
- risk management committees that are established to help control forest fires;
- using malaria nets for fishing; and
- changes in cropping strategies including both practices, size of the cultivated land and planted crops.

To address the major impacts on agricultural production, participants emphasized a need to move towards more sustainable agricultural practices that promote soil conservation and the reduced application of artificial fertilizers. Participants also suggested crop diversification and the promotion of climate-resilient species. To improve water availability, participants suggested rainwater conservation and also building dams to ensure improved water availability for irrigation.

Building grain silos for conservation of food surplus was identified by participants as a key measure for helping to improve food security. Participants recognized that this would also require developing local markets and increasing access to markets to create opportunities for selling some of the surplus. They suggested specific measures including reactivating a network of rural commerce support for creating market programs, simplified licensing procedures for small and medium businesses, and price monitoring to avoid inflated food prices during times of shortages. Building the skills of farmers in marketing and increased vocational training opportunities was also identified to help improve

entrepreneurship and levels of self-employment. It was noted that this is especially important in the food processing sector. This will help to diversify household livelihood options and potentially increase household incomes. To promote some of these potential business activities, accessibility of micro-credit and lower interest loans would need to be made available. Finally, improvement in social services and health care should be considered to address emergencies related to the impacts of climate change.

To address impacts related to the forestry sector, participants emphasized that overall changes in forest management practices are needed. Specific actions should focus on research on forestry and techniques for planting; developing forest extension services; reforestation of deforested areas (including mandatory reforestation by timber companies); mapping of forest areas and areas at risk, especially to wild fires; promotion of sustainable use of forests; overall conservation of the environment; enrichment planting, zoning and related management planning practices; and community reforestation initiatives.

Special attention should be given to address the increasing risk of wild fires when developing adaptation responses in forestry. This should include enforcement of the existing forestry laws and regulations; establishment of steering committees for fire management; mapping vulnerable areas; adopting measures to rehabilitate ecosystems; fire control measures such as reduction of burnt areas; forest protection; and protection measures for farming areas and housing. Participants also emphasized the importance of education and awareness-raising about environmental issues related to wild fire protection, especially at the community level. Communities also should be introduced to participatory forest and resource management through the promotion of community management projects.

To address flooding and other severe weather-events, participants suggested improvements in early warning systems. This should include increased focus of risk management committees (with appropriate geographic coverage), sensitization and awareness of communities including farmers and finding relevant ways of communicating meteorological information within the country and across regions. To address

actual impacts, suggestions included promoting cyclone resistant buildings to minimize or avoid destruction of infrastructure (houses), building flood gates to reduce flood damage, improved drainage to ensure improvement of irrigation system and flood resistant roads to ensure access to markets and enhance food security.

Overall, participants agreed that the measures presented necessitate both relatively high costs in investments such as flood gates, irrigation systems, road, improving basic social services, as well as significant work with communities to increase their capacities in food production, processing and marketing along with increasing engagement in community resource management, risk mapping and use of early warning systems. All these would require significant improvements in governance including decentralization, increased stakeholder consultation, a strategy for combating corruption and overall democratization of decision-making. It would also require working with communities to increase their interest, engagement and participation in local and regional planning and community activities for adaptation to climate change.

Participants also identified that an **immediate consequence of climate change on fish availability** may be overfishing, where fishers attempt to maintain previous levels of fish catches despite reduced availability. To

address the consequences, participants suggested the improvement of storage facilities and processing, (in order to give a greater return for a lesser catch) and to introduce alternative skills and entrepreneurial training to enable fishers to acquire either improved capabilities in aquaculture or other sources of income, so that they are less dependent on fisheries.

4.2.4 Developing Adaptation Pathways and their relevance to vulnerable people

Following the identification of key adaptation interventions, participants prioritized the adaptation options to identify interventions over the short-, medium-, and long-term (Table 4.5).

For the **short-term priorities**, the participants identified actions that address the current climate variability and negative impacts such as wildfire and reduced crop production. This included promoting improved agricultural practices, drought-resistant crops and other improved crop varieties. Similar smaller-scale activities that could provide benefits for vulnerable people and also improve resource conservation were suggested for other sectors, including more effective fishing nets, revitalizing the rural and trade network, provision of low interests-loans, and simplification of licensing procedures for small and medium enterprises. To address the

TABLE 4.5 PROPOSED ADAPTATION PATHWAYS (PER SECTOR) FOR MOZAMBIQUE

	<i>Short-term 2009–2015</i>	<i>Medium-term 2015–2030</i>	<i>Long-term 2030–2050</i>
Mostly infrastructure and changes in practice	<ul style="list-style-type: none"> • Construction of dykes for water retention (small scale) • Conservation agriculture including planting crops resistant to drought 	<ul style="list-style-type: none"> • Construction of flood gates and dams in areas vulnerable to floods • Building silos; improved family/ community storage facilities 	<ul style="list-style-type: none"> • Reforestation, forest management and (environmental) education particularly in forest concession areas (commercial forestry) • Reforestation so the areas destroyed by forest harvesting and wildfires are reduced • Construction of infrastructure with can withstand climate disasters especially related to trade in agriculture
Mostly services, governance, training and capacity development	<ul style="list-style-type: none"> • Simplification of licensing procedures for small and medium enterprises • Improved fishing nets & improved fish management to promote sustainable use of resources • Rehabilitation of rural commerce and trade networks; • Wildfire management and changes in standards 	<ul style="list-style-type: none"> • Water harvesting techniques (i.e. water storage tanks for consumption and irrigation) • Alternative income generating activities Building infrastructure for processing and conservation of fish (increase yield and increase quality of product) • Post-harvest processing 	<ul style="list-style-type: none"> • Education for skills development to influence in behavior and attitude to enforce seasonal fishing restrictions; use improved fishing nets • Education so that people can learn to live with drought

wildfire risks and other severe climate impacts, the capacity of risk management committees must increase and changes in rules and norms for trade in wood products must occur to reduce the pressure on natural forests.

For **medium-term priorities**, participants identified investments in infrastructure coupled with capacity building and training activities for people and communities. Some examples of this coupling included building infrastructure for processing and conservation of fish, silos and post-harvest processing, water harvesting and construction of flood gates and dams in areas vulnerable to floods. It was considered important that the infrastructure-related activities be directly linked to capacity development and training activities. For example, the post-harvesting and processing facilities need to be linked to training in creating small businesses and other income generating activities. These linkages may be established by developing short-term activities necessary to affect change and opportunities for small business by providing loans, networks and vocational training. It was noted that water harvesting is already a government priority, but this needs to happen at both large and smaller scales, and should become an increased focus in government planning.

Long-term priorities included infrastructure development such as roads, dykes and dams. Participants also focused on education and capacity development to enable people to respond effectively to impacts of climate change. Another priority included continuing improvement of natural resource governance to promote sustainable resource management, especially in the forestry and fisheries sectors.

4.3 RESULTS FROM BANGLADESH

4.3.1 Understanding Current Challenges and Vulnerabilities

Bangladesh faces a number of serious development challenges alongside its vulnerability to disaster and natural hazards. These include high population growth, lack of employment opportunities, climatic hazards, lack of sustainable resource management, gender inequity and food insecurity, inadequate access to health care

facilities and primary education, and governance and accountability issues. Key characteristics of vulnerability in the country are presented in Table 4.6.

4.3.2 Current and future impacts of changing climate and climatic variability

Historically, Bangladesh has experienced a significant degree of extreme climatic events. According to the participants, the main **climatic hazards** which are currently being experienced in Bangladesh, and which can be expected to be exacerbated under future scenarios of climate change, include **cyclones, floods, and drought**, with subsequent impacts of peoples' livelihoods. Cyclones are characteristic of the coastal region, drought events are more common in the northwest, and flooding and related impacts has resulted in significant losses and damages within the northeast, coastal, and urban centers.

Major impacts of floods and droughts identified included crop losses due to inundation and loss of agricultural lands, increase in pest infestation and occurrence of vector-borne diseases, reduced potable water availability, and increasing pressures on already fragile natural resources (i.e. sand mining, fishing, groundwater, wetlands, etc). All groups highlighted the effects of mass migration and the increasing number of climate refugees as a major concern for adaptation planning.

Impacts of cyclones in the coastal region include salinity intrusion, drainage congestion and water logging, as well as erosion. Second and third order impacts which followed included migration, disease outbreak, loss of biodiversity and increased poverty.

Similarly, **flooding hazards** during the monsoon season can often lead to increased sediment loads and erosion which in turn can damage crop, livestock, and household assets, resulting in increased food insecurity and reduced household capital. For **drought** events in the northwest of the country, participants noted first order impacts including reduced agricultural production and groundwater availability, with second and third order impacts of food insecurity, unemployment and health implications. Negative impacts on agricultural production could furthermore promote unsustainable land-use practices such as turning wetland to agricultural lands, extending agricultural areas to

natural areas and could potentially increase conflict over common property.

While some impacts would serve to exacerbate the identified vulnerabilities (i.e. **higher rates of landlessness** under future scenarios of climate change), these impacts could cause **increased disease outbreaks** in conjunction with surface water pollution and poor health facilities.

In **identifying some of the social impacts of climate change** in Bangladesh, participants noted that climate change and extreme climatic events are giving rise to a number of changes in local custom and culture. For example, participants from the coastal areas of Bangladesh noted a changing dress code for women wearing the kameeze in place of the sari in order to minimize the amount of loose material. Also in the coastal area, participants noted increasing criminal activities post-disaster as vulnerable groups were forced to sell off their remaining assets to those more wealthy in turn for income. In other villages, people are no longer getting married because the wedding season

traditionally coincides with the rainy season. The declining number of village weddings has resulted in the loss of social capital and altered dependence on familial safety nets.

Other consequences of climate change on the social fabric of Bangladesh include increased corruption amongst local authorities. Participants noted that the distribution of post-disaster relief supplies is used as an opportunity for local elites to secure votes from community members. In addition, one of the well documented risks of climate change is the **loss of indigenous knowledge**. In the northeast of Bangladesh, the harvesting of '*chaila*' grass is a 300 year-old technique used to protect houses and crops from '*afal*', (cyclones and wave action). Participants noted that since the Tanguar Haor in Sunamganj district was designated an Ecologically Critical Area by the Government of Bangladesh in 1999, local communities have been prohibited from collecting the '*chaila*' grass, which in turn has resulted in greater destruction and loss of household assets in the surrounding communities.

TABLE 4.6 KEY DRIVERS OF VULNERABILITY TO CLIMATE CHANGE IN BANGLADESH

	<i>Vulnerability driver</i>	<i>Example of vulnerability</i>
Exposure	Nature and frequency of natural disasters	Sea-level surge (tidal and storm), salinity intrusion Flooding (including flash floods) Drainage congestion and water logging Erosion (coastal and river) Siltation and sedimentation Surface water pollution Earthquake prone areas Drought-prone
Sensitivity	Livelihood options and strategies	Livelihood hazard Mobility hazard, especially for women High rates of unemployment (particularly of youth) School drop-out and reduction in school enrolment levels
Adaptive capacity	Lack of capital (social, physical, financial, human, and natural)	Migration of local people (changing social networks) Reduced social security after disasters (i.e. food, health, sanitation) Unplanned relief activities reducing natural coping patterns Social insecurity Lack of timely administrative support Decreasing recreational places (i.e. playgrounds) Poor health facilities High rates of homeless/landless High incidence of poverty Lack of power of female upazilla members Land conflicts

4.3.3 Identifying Adaptation Options

Key adaptation options for Bangladesh were identified as follows:

- Disaster mitigation and preparedness
- Economic diversification and training in alternative livelihoods
- Improved agriculture and natural resource management
- Improved access to information and services

Disaster mitigation and preparedness are a key focus for overall development in Bangladesh. In light of projected climate change and increasing uncertainty in predicting extreme climate events, participants indicated the need for ongoing intensified efforts in this area, including more **cyclone shelters** in the coastal areas. Participants proposed various upgrades to the current model of constructing and/or renovating cyclone shelters which included the use of **solar energy, raised live-stock carrying facilities**, and using a **gender-sensitive design** which would separate the sanitation facilities of the men and the women. Participants also noted that currently, cyclone shelters are located at too great a distance from one another, resulting in human fatalities in transit to the nearest cyclone shelter. Fatalities are mostly women and children injured in the high winds and loose debris, or unable to reach a cyclone shelter in time before it fills to capacity. As a result, participants suggested **smaller, more frequent cyclone shelters**, with sufficient capacity, basic resources (i.e. clean water) and services (i.e. for pregnant women, elderly) available to house all citizens in the local area. Participants also advocated for **stronger embankments, higher polder heights**, and **more accurate warning systems** to minimize false alarms and give communities adequate notice of a pending weather event.⁵

In addition to the physical, technological, and infra-structural advances suggested in the area of disaster mitigation and preparedness, participants also noted a number of regulatory and cultural interventions which require equal consideration in adaptation planning. For example, current building law allows construction on lowland, flood-prone areas. Building codes are often not enforced and the result is unsafe living conditions for millions in Bangladeshis. As a result, participants

recommended better **monitoring and enforcement of building codes and improved planning practices** which prohibit development in protected areas, and ensure environmental impact assessments (EIAs) are properly carried out.

With much of the rural populations' livelihoods derived from the agriculture sector, and a projected decline in national agricultural output, **economic diversification and alternative livelihood options** will provide a critical means by which communities can adapt to a changing climate. Livelihood diversification within a system reduces sensitivity of people within the system by reducing stress on the natural environment that results from less diverse livelihood activities. In the char areas of Sylhet, participants indicated a shift from agricultural laboring to fisheries laboring, indicative perhaps of the higher sensitivity associated with an agricultural system in comparison to a fisheries system. Participants targeted the need for more vocational institutions to provide training in alternative livelihood strategies. In addition, participants commented that a priority focus on improving rural economic opportunities would help to address the current, unsustainable rate of rural-urban migration.

To address the major impacts of cyclones, drought and flood on food security in Bangladesh, participants emphasized the need for **improved agriculture and natural resource management**. One of the greatest challenges to agriculture in Bangladesh is the lack of disaster-resilient crop varieties. This includes the need for salinity-tolerant varieties in the coastal areas, and short-duration varieties (or early maturing) in the northeast. In order to ensure year-round food security throughout the country, participants noted the need for improved irrigation technologies, as well as the provision of government subsidies for agricultural inputs including seed and fertilizer.

⁵ Participants of the northeast group noted that many communities did not respond to the early warning which had been provided in advance of Cyclone Sidr in November 2007. They noted that a false alarm had been issued only one month prior and as a result, many households chose to ignore the subsequent warning, despite its urgency. Also, participants from the coastal group noted that in 1991, two false signals in the Chittagong district of southeastern Bangladesh had preceded in the months before Cyclone Gorky. As a result, a number of fishermen continued to go out the day of the cyclone, which killed approximately 138,000 people.

In addition to investments in disaster planning, economic diversification and agriculture, participants also commented on the strong need for **improved access to information and services**. In particular, participants expressed their support for changing the primary school calendar to match that of the high school calendar (where exams take place outside the monsoons and vacation corresponds with the monsoons) to improve overall school attendance. Participants also noted the need for boats to transport students to and from school (particularly women who are more at risk when crossing flooded areas), as well as the need for more mobile health care facilities to maintain the health of the local communities. In urban areas, participants recommended the need for surface water treatment plants to improve freshwater availability and overall health of the population.

4.3.4 Developing Adaptation Pathways and their relevance to vulnerable people

Following the identification of key adaptation interventions, participants prioritized interventions over the short-, medium-, and long-term (Table 4.7).

In the **short-term**, groups prioritized a number of adaptation options at the national scale which spanned each of the four key areas for adaptation investment. In the area of disaster mitigation and preparedness, participants prioritized the **construction of new, and rehabilitation of existing, flood embankments, increased polder heights**, and the **construction of improved cyclone shelters** with solar panels, raised platforms for

livestock and gender-sensitive facilities. Participants also noted the need for **afforestation activities** to reduce the ongoing effects of erosion and increased sedimentation in riverbeds. Improved agriculture and natural resource management was the focus in the northwest of the country, with priority interventions including **improved crop varieties** and **fish sanctuaries**.

In the urban areas of Bangladesh, special consideration was drawn to the provision of basic services in the face of climate change, as participants agreed that **government subsidies for safe housing, food, health and education**, were required, in addition to improved access and availability of clean drinking water through the **purification of surface water resources**.

In the **medium term**, priority disaster management interventions included **improved river flow management** and the construction of protective walls to protect both residential and other land. **Improved information and services** are also essential in the medium-term, particularly in the form of improved early warning systems, education and awareness, and the **monitoring and enforcement of building codes and construction laws** in urban areas. Priorities in the agriculture sector included **improved irrigation systems** and access to other, more **modern, agricultural technologies**.

The **longer-term priorities** in general were those that participants identified as significant adaptation efforts, but those that could be postponed until more urgent interventions (short and medium-term) were underway. Long-term interventions included **river and canal**

TABLE 4.7 NATIONAL ADAPTATION PATHWAYS FOR BANGLADESH

	<i>Short-term</i>	<i>Medium-term</i>	<i>Long-term</i>
Mostly infrastructure and changes in practice	<ul style="list-style-type: none"> • Construction and rehabilitation of flood embankments • Increase of polder heights • More cyclone shelters (gender-friendly, livestock, solar panels) • Afforestation • Purification of surface water (improved access and availability of clean drinking water) 	<ul style="list-style-type: none"> • Improved river flow management • Construction of protective walls • Improved irrigation systems • Access to other, more modern, agricultural technologies 	<ul style="list-style-type: none"> • Dredging (rivers and canals)
Mostly services, governance, training and capacity development	<ul style="list-style-type: none"> • Short duration crop varieties • Conserve fish sanctuaries • Subsidized social schemes (food, education, health) • Government-subsidized housing facilities 	<ul style="list-style-type: none"> • Improved early warning systems • Improved early warning systems • Education and awareness • Monitoring and enforcement of building codes and construction laws 	<ul style="list-style-type: none"> • Improved policies in Haor region

dredging as well as special attention to the **policy environment** of the Haor regions of the northeast.

In summary, it is interesting to note that although economic diversification and training in alternative livelihood options was considered at length throughout group discussions, it was not prioritized as an adaptation investment over the short, medium, or long-term.

4.4 SIMILARITIES AND DIFFERENCES BETWEEN PSD WORKSHOP PROCESSES AND RESULTS

Most of the development challenges are similar across the studied countries including low quality of basic services contributing to increased incidence of diseases and poverty, fast pace of natural resources depletion especially forestry and water, increasing migration and uncoordinated urbanization. These challenges significantly contribute to increasing sensitivities and lowering capacities available to respond to challenges including climate and weather-related events. In terms of current challenges, capacities and sensitivities to exposures including climate change and variability there are many similarities between the three countries.

In terms of exposure, all countries are experiencing increased negative impacts associated with weather-related events such as floods, droughts, cyclones. Impacts of these events are often worsened by unsustainable human actions and practices such as deforestation, increased erosion, unsustainable water resource management and destroying natural coastal protection leading to sea water intrusion and coastal erosion.

Sensitivity in the studied countries generally refers to overall level of social development including health, high levels of poverty, food insecurity and limited availability of basic services. In Ghana and Mozambique, the major existing challenges are malaria and HIV/AIDS; while diarrhea is common in all countries. Households that are practicing rain-fed agriculture, households with limited food storage and high incidence of poverty are also vulnerable to weather-related exposures. Sensitive groups across the countries include widows with children, child-headed households and handicapped people. Gender disparities also contribute to sensitivity by limiting access of women to resources including land.

Participants from the studied countries were concerned about limited adaptive capacities available for people to deal with future exposures. In general, the capacities are low and major challenges include limited access to resources that could help in responding to threats at the community levels such as functioning community networks, limited access to low-rate loans and micro-credit, limited access to training and technologies to reduce dependence on natural resources and land tenure issues. It is also important to note the reduced capacity in communities that are repeatedly faced with disasters and how post-disaster relief efforts contribute to rebuilding capacity and increasing sensitivities including food insecurity, health and sanitation services.

Most of the countries have already encountered major impacts of weather-related disasters including cyclones and floods in Mozambique, drought, cyclical water scarcity and floods in river basins in Ghana and sea-level rise (tidal and storms), flash floods, heavy rainfall and salinity intrusion in Bangladesh. When addressing consequences of potential impacts of projected climate change and adaptation actions, participants built on their knowledge and experiences with past extreme-weather events and variability and on their aspirations for future development in their countries. In all three countries some adaptation measures are already being implemented, generally as autonomous actions at the household or community levels. These actions mostly include changes in agricultural practices (i.e. timing, planted species and water harvesting) in all studied countries.

In terms of differences, in Mozambique the current adaptation actions include creating fire risk management committees, in Bangladesh varying levels of disaster preparedness has been implemented for many years, and in Ghana farmers are using more drought-tolerant crops. Participants identified a number of currently used unsustainable or ineffective adaptation practices including fishing younger (immature) fish to maintain the catch size in Mozambique; expanding farmed area to maintain yields in Ghana; and, in Bangladesh, the large distances between cyclone shelters that result in numerous human fatalities.

Finally, immediate adaptation priorities were focused on addressing impacts of changing climate on food security including water harvesting, improvement in farming

practices and post harvest management in all countries. These actions include skill development, training and community-based activities; while infrastructure development including dykes, roads and flood gates are mostly focused over medium and long-term horizons in Mozambique and Ghana. In Bangladesh, the major short-term focus includes disaster preparedness including flood embankments, cyclone shelters and housing facilities. In all the studied countries, most of the important warming systems were medium-term priorities. A long-term priority for all the studied countries was a need to improve governance in order to move toward more sustainable resource management, including forest and water resources, was identified. In line with their development priorities, all countries recognize the importance of improving social services (i.e., health, food, education) over different time horizons (i.e., short-term in Bangladesh and long-term in Ghana due their high costs as indicated by workshop participants).

4.5 KEY SECTORAL THEMES EMERGING

In all three countries, the focus of identified adaptation responses are on agriculture and water resource management, fisheries, forestry (especially wildfire management), flooding, emergency preparedness and investments into basic services such as education, health care and sanitation. Major common themes across these sectors in all studied countries are presented in Table 4.8.

Adaptation options identified in these themes are relevant for all countries and the major differences are in the scale and emphasis on how the options should be implemented, on what scale and what types of capacity-building options are needed to support these actions.

For example, practices such as erosion control by encouraging contour farming and water storing, building grain silos, crop diversification, improved post harvest technologies and promoting sustainable agriculture are relevant for all countries; however in Ghana and Mozambique further emphasis is on training and skill-development in post-harvest management, while in Bangladesh the focus is on crop-diversification and planting resilient crops (disaster and salinity).

Similarly, in all countries emergency preparedness is among the priority actions, but only in Bangladesh is it identified as a stand-alone initiative. In Ghana and

TABLE 4.8 OVERVIEW OF ADAPTATION ACTIONS IN AGRICULTURE AND WATER RESOURCE MANAGEMENT IN THE STUDIED COUNTRIES

<i>Key Sectors</i>	<i>Sectoral adaptation options listed in all studied countries</i>
Agriculture and water resources	<ul style="list-style-type: none"> • Erosion control by encouraging contour farming and water storing • Building grain silos • Crop diversification • Improved post harvest technologies • Prompting sustainable agriculture, organic farming and appropriate technology to reduce degradation • Drought-resistant and early mature crops • Alternative skill training to promote self-employment and economic diversification • Building dams and irrigation systems
Wild fires	<ul style="list-style-type: none"> • Wildfire control—creating fire belts • Forest management: reduction of desertification, sustainable use of forests, conservation of environment and enrichment planting, zoning/management planning, community based reforestation • Promoting sustainability of forest harvesting activities (firewood harvesting)—to improve availability and diversity of forest species • Improved institutional control of wildfires • Improved physical fire control measures
Flooding	<ul style="list-style-type: none"> • Flood-proof roads—increase capacity of drainage systems to absorb increased volumes of water, flood-resistant materials used in road construction • Flood gates—control water levels • Building dykes embankments and sea defense walls • Improved drainage
Emergency preparedness	<ul style="list-style-type: none"> • Early warning systems—equipping meteorological service with modern technology • Building shelters and post-disaster relief preparedness
Fisheries	<ul style="list-style-type: none"> • Improved fishing nets • Storage facilities and basic processing • Education and skill training in aquaculture and processing • Alternative skill to reduce dependence on fisheries
Basic services	<ul style="list-style-type: none"> • Improved education, more community hospitals and mobile health-care facilities, surface water treatment • Improved sanitation, proper drainage system, adequate health supplies, emergency-response teams

Mozambique, these options are part of the measures to improve agricultural production, diseases monitoring, forest and water management, where emergency preparedness is a part of extension services.

All countries identified improving basic services to increase quality of the health-care, education, potable

water and sanitation as part of the necessary adaptation actions. Participants from Bangladesh also stressed the need to maintain basic services in post-disasters relief situation. These actions should also be designed with a gender perspective.

4.6 CROSS-SECTORAL EMPHASES

Most of the adaptation actions identified by the participants from all the studied countries are cutting across sectors. For example, improvement in fishing technologies needs to be linked with training and skill-development measures to help in catch processing, implemented principles of sustainable fisheries management and exploring opportunities for alternative income generation for fishers. Examples of relationships could easily be identified between key sectors including water resources management, agriculture and emergency preparedness and basic services in the studied countries. Linkages between climate change response and addressing key development challenges such as food security, land-use management and basic services are interwoven in all three countries. These measures should also be linked to disaster preparedness programs and account for future climatic and social challenges.

Other major cross-cutting social challenges including migrations from rural to urban areas, are not yet serious, but participants expect them to have significant impacts in the future. Migration was identified as a cross-cutting issue across regions, sectors and countries. Participants from all countries expected that the migration and displacement of people would require significant attention and investments in the future as well as better planning and governance both in areas of out and in migration. A growing effort is necessary to support and improve social safety nets including health services that would specifically service migrants and in-migrating areas. Increasing rates of migration often leads to overexploitation of people in urban areas, lack of basic services and increasing number of people living in slums. It was reported by participants in all the three countries that migration also weakens social networks and community ties.

To address the growing challenges from migration would however require further actions to integrate migrants, including employment and training

opportunities.⁶ In all three countries the majority of the rural populations' livelihoods are derived from the agriculture sector. Therefore increased opportunities for economic diversification and alternative livelihood options will provide a critical means by which communities can adapt to a changing climate. As a result, participants targeted the need for more vocational institutions to provide training in alternative livelihood strategies.

4.7 IDENTIFICATION OF TOPICS ADDRESSED BRIEFLY OR NOT ARISING IN WORKSHOPS

Not all the issues raised during the discussions about vulnerability, impacts of climate change and adaptation options were listed as national or regional adaptation priorities in the adaptation pathways, perhaps due to the range of affiliations and priorities of workshop participants. Many issues were discussed briefly during small group sessions, but they did not make it to the group plenary sessions. One issue that was probably not sufficiently explored by the groups was the challenges of protecting biodiversity and ecosystems in the countries in the context of changing climate change and development pressures. Many of the participants identified the role of ecosystems services and biodiversity in providing livelihoods in agriculture, fisheries and also for charcoal burners, firewood and wild food collectors. They also suggested that people whose livelihoods almost exclusively depend on ecosystems services are very vulnerable to impacts of changing climate. Despite this recognition, most of the recommended adaptation options did not include measures to protect biodiversity and ecosystem services. In Mozambique, during the discussion about forest renewal strategies, participants suggested a need to consider biodiversity and ecosystems' health and impacts of climate change and reforestation measures.

The strongest focus of agricultural issues pertained to planting practices in the context of climate change and variability. However, other inputs for changing practices including market prices were only briefly considered. In Ghana, participants noted that the impacts of weather variability are causing fluctuations in cereal and root

⁶ Activities to reduce migration by targeted action in areas where people are migrating from were also mentioned by the participants.

crops (cassava, plantain) including cash crops (cocoa and coffee) leading to fewer revenues, less food for storage, malnutrition, food insecurity and migration. However, it is not clear how the planted species need to change in the future because of climate change while paying attention to changes in the markets. Impacts on livestock and adaptive practices were also only briefly addressed.

During the workshop, participants mentioned the role of social networks, community ties and traditional practices in maintaining adaptive capacity in the countries. Some of the participants provided examples of changing customs because of changing weather patterns (wearing traditional dresses in major storms is nearly impossible), deteriorating social networks because of migration and suggesting traditional food storage methods and returning back to traditional recipes to cook more nutritious meals. Further exploration of such practices would be beneficial perhaps during focus groups sessions that allow in-depth understating of such issues.

4.8 RELATIVE PREVALENCE OF “HARD” VERSUS “SOFT” ADAPTATION OPTIONS

In general, soft measures focused on skills and capacity development, training and governance. Hard measures focused on building infrastructure and adopting new technologies. In Ghana and Mozambique, most of the short-term options are based on community-level actions including small-scale dams and silos supported by extension services, capacity-building and skill

development training. In these two countries, hard measures such as building flood gates, flood-resistant roads, dams and infrastructure for processing (fish, vegetables and other agricultural products) are mostly listed over medium and long time horizons. Compared to Ghana and Mozambique, the focus on hard adaptation options is slightly stronger over the short-term horizon in Bangladesh. For example, short-term measures include flood embankments, increasing of polder heights, building cyclone shelters, promoting purification of surface water and improving access and availability of clean drinking water.

When analyzing the hard and soft adaptation options in diverse sectors, we can observe diverse levels of these measures. For example, in agriculture, the focus is slightly more toward soft options including changes in resource governance, microfinance schemes, low-interests loans, alternative skills training focusing on youth and migrants as well, agricultural extension services, small scale water harvesting, food storage and alternative agricultural practices to reduce erosion and run-off.

These measures, however, depend on hard adaptation options such as introducing technologies and building facilities for processing agricultural outputs, promoting technologies for sustainable agriculture, building grain silos and dams. For example, in Mozambique, the participants emphasized the importance of building flood-resistant roads to ensure market access even during heavy rains and flooding, so local price fluctuations and shortages are minimized (Table 4.9).

TABLE 4.9 EXAMPLES OF COMPLEMENTARITIES BETWEEN HARD AND SOFT ADAPTATION MEASURES IN AGRICULTURE AND WATER RESOURCES MANAGEMENT IN THE THREE COUNTRIES

<i>Infrastructure and changes in practices</i>	<i>Governance, training and capacity development</i>
<ul style="list-style-type: none"> • Building grain silos • Improved post harvest technologies such as setting up small-scale agro processing industries to utilize farm products • Promoting sustainable agriculture, organic farming and appropriate technology to reduce degradation • Drought-resistant and early mature crops—better utilization of water, diversified production • Building dams • Building flood-resistant roads to ensure market access 	<ul style="list-style-type: none"> • Erosion control by encouraging contour farming and water storing • Sustainable water management • Farmers' education—water harvesting and contour farming • Training centers and microfinance and to get skills for off-farming season activities • Vocational training—especially for youth, in places with high in-migration; and creation of markets and training in other sector skills including hairdressing, sewing, carpentry • Alternative skill training to promote self-employment and economic diversification • Developing agricultural extension services and passing the actions through district assemblies, to intensify education in water harvesting • Funding and more research on potential changes in planted crops • Sensitization to eat more legumes and promoting traditional recipes • Education 'sensitization about using livestock and nutritional complement rather than social capital • Improved market-support, marketing skills (especially in Mozambique)

In other sectors, there are different levels of balance between soft and hard measures (Table 4.10). In the case of flooding, the focus is on hard measures that should be supported by social services to address the needs of affected populations and displaced victims. Early warning systems require investments into technologies and monitoring stations, but also investments into effective communication strategies and capacity-development to effectively utilize these technologies.

In the health sectors the focus is on building additional health facilities, community and mobile hospitals and increasing supplies, but also ensuring clean water and sanitation to limit the occurrence of diseases. According to the participants, these hard measures should be accompanied by soft measures such as educating people about personal hygiene and disease prevention.

4.9 DISCUSSIONS ON PHYSICAL AND SOCIAL VULNERABILITY

In all three countries, the workshop participants recognized the need to improve the situation of the most vulnerable, who are already significantly affected by current challenges and exposures. Such groups includes traditional fishers, households with low income, without animals, with less than 3 months of food storage and farmers practicing rain-fed agriculture, charcoal and

wood collectors, wild food collectors and families practicing subsistence agriculture. Most of these livelihood types are highly sensitive to changes in climatic patterns and natural resources. As reported by the participants, many of these people could become even more vulnerable through repeated exposures as their coping capacities are further undermined. For example, people with limited food storage may cope with one drought, but reoccurring droughts may result in all of their reserves being depleted. Major strategies to improve the situation of these vulnerable groups include adoption of alternative activities (e.g. crafts, trades, processing), dissemination of new techniques for management (fish, agriculture, forestry), production diversification, community water harvesting, food processing and food storage, and creating extension services or farmers unions to maintain on-going support. Hard measures such as construction of water collecting and facilities including wells, dams and water conservation systems were also identified as priorities to address physical vulnerabilities.

Vulnerable groups in these countries also include groups such as women and widows as single head of households with low purchasing power and no land ownership, children as head of households, dependent households and orphans, elders and handicapped people taking care of orphans. These groups are highly vulnerable regardless

TABLE 4.10 EXAMPLES OF HARD AND SOFT ADAPTATION MEASURES IN AGRICULTURE AND WATER RESOURCES MANAGEMENT IN THE THREE COUNTRIES

<i>Areas of key impacts</i>	<i>Infrastructure and changes in practices</i>	<i>Governance, training and capacity development</i>
Wild fires	<ul style="list-style-type: none"> • Wildfire control—creating fire belts • Reforestation 	<ul style="list-style-type: none"> • Enforcement of laws, creating public education, development of tools and mechanisms to facilitate farming and prevent slash and burn
Flooding	<ul style="list-style-type: none"> • Flood-proof roads—increase capacity of drainage systems to absorb increased volumes of water, flood-resistant materials used in road construction • Flood gates—control water levels • Building dykes embankments and sea defense walls 	<ul style="list-style-type: none"> • Social services—providing houses flood displaced victims, social services
Occurrence of diseases	<ul style="list-style-type: none"> • Health facilities—improved sanitation, proper drainage system, • More community and mobile hospitals, adequate health supplies, emergency response teams 	<ul style="list-style-type: none"> • Health education on personal hygiene
Emergency preparedness and forecasts	<ul style="list-style-type: none"> • Early warning system—equipping meteorological service with modern technology • Early warning systems and forecasting—Ghana meteorological agency, health extension agency 	<ul style="list-style-type: none"> • Development of communication mechanisms and agencies

of climate variability and weather-patterns. For members of these groups, the participants suggested improvement in basic services and vocational training. These measures include access to free basic health services, assistance from social programs, introduction of substitute family models, integration of adopted family modality, access to technical and professional schools and promoting self-employment through micro-credit systems. Participants in Mozambique emphasized that these actions need to be pursued collectively with government, NGOs and civil society.

4.10 SEQUENCING, LEVERAGING AND TRADEOFFS AMONG ADAPTATION OPTIONS

Overall knowledge in communities regarding possible impacts of climate change is increasing; they have significant experience with current climate variability and with the effectiveness of applied adaptation measures to enable them to advise on potential future adaptations. It is however, important to move beyond only identifying discrete adaptation options to planning for adaptation in

context of other development needs, institutional capacities and preferences of diverse stakeholders.

In terms of future adaptation priorities and pathways, we can distinguish between overall changes in governance in the sectors such as forestry, land-use, water and fisheries towards sustainability, and specific measures to improve adaptive capacities and reduce sensitivities to exposures including climate change that include infrastructure development, changing practices and capacity building. **Short term priorities** include hard measures such as community-based rainwater harvesting and post-harvest facilities in Ghana, construction of community-level dykes for water retention and alternative crops in Mozambique, and building flood embankments, increasing polder heights, surface water purification and afforestation in Bangladesh. In Ghana improving health services is also seen as a priority short-term action. These measures should be supplemented by capacity development and training activities including the introduction of sustainable agricultural practices, improving health services, social safety nets, and wildfire control in Ghana; improved finishing and agricultural processes,

TABLE 4.11 CONNECTING ADAPTATION RESPONSES FOCUSED ON WATER MANAGEMENT, AGRICULTURE AND SOCIAL SECURITY IN THE STUDIED COUNTRIES

<i>Sectors</i>	<i>Current actions</i>	<i>Short-term</i>	<i>Medium and long -term</i>
Water resource management	<ul style="list-style-type: none"> Local water harvesting from community sources in all countries Programs of water harvesting are already a priority in Ghana 	<ul style="list-style-type: none"> Increasing the extent of current programs on water harvesting Accelerate small-scale water harvesting programs (household community) especially major drought-prone agricultural areas 	<ul style="list-style-type: none"> Rainwater harvesting (run-off capture) and building dams
Agriculture	<ul style="list-style-type: none"> Changes in planted crops and planting times in Ghana and Bangladesh 	<ul style="list-style-type: none"> Post Harvest management (Silos, food banks, training to learn ways processing) in Mozambique Access to microcredit in all countries Land-tenure security in Ghana Access to land for women in all countries 	<ul style="list-style-type: none"> Building dams for irrigation (small scale community management dams) More R&D to new crops resistant to potential impacts of climate change in all countries Improvements in resource governance and mainstreaming climate change in into agriculture and other sectoral policies in all countries
Emergency preparedness	<ul style="list-style-type: none"> Shelters are available in Bangladesh 	<ul style="list-style-type: none"> Better reflect on peoples situation including gender issues and migration when building shelters 	<ul style="list-style-type: none"> Crosscutting emergency preparedness strategy implementation
Social challenges	<ul style="list-style-type: none"> Low level of social security in selected areas in all countries Migration to urban areas in all countries 	<ul style="list-style-type: none"> Including migrants in the social nets in all countries Services for resettled displaced people in all countries Alternative skill training for migrants in all countries 	<ul style="list-style-type: none"> Social safety nets and food banks to elevate significant impacts on food production in all countries

support for post-harvest management, access to micro-credit and wildfire management in Mozambique; and creating subsidized social schemes, government-subsided housing and fish conservation in Bangladesh.

Over medium and long time horizons there is an increased focus on hard measures including building dams, improving drainage in Ghana, construction of flood gates and roads in Mozambique and building flood-protection walls, cleaning river beds and introducing new agricultural technologies in Bangladesh. Furthermore, important elements of future pathways are changes in land, water, and natural resource management and governance. This includes sustainable land-use management (forestry, mining and agriculture), secure tenure, and democratic control of land including gender balance in access to power and resources. Strengthening democratic governance and access to resources supported with capacity building and training activities are recognized as key elements for increasing capacities in responding to both climate and development challenges. Finally, moving towards sustainable and integrated resources management and improving social policies and protections are the key suggested actions for all countries. Social policies include improvement of affordable houses, health care, access to clean water, sanitation and access to relevant education. In Bangladesh, social protection issues, such as housing is recognized as an immediate priority. Over longer time horizons, all countries included measures to improve social protections and safety nets. The relationship between diversity of sectoral measures is presented in Table 4.11.

In addressing the needs of vulnerable groups, participants noted a number of additional considerations for the design of a pro-poor adaptation pathway. In particular, a number of suggestions proposed the need for more post-harvest safety nets, including improved access to trade of surplus harvest, as well as access to processing and storage facilities. In order to facilitate access to processing and storage facilities, as well as other physical, social, and economic capitals, micro-credit mechanisms, offered at low, manageable interest rates, can also facilitate a pro-poor approach towards adaptation. Improved access to micro-credit, trade, and small-system technologies (biogas, micro hydro energy, etc) along with improvements in agriculture must be supported through an expansive rural extension service,

offering awareness-raising and training in soil and water conservation, agro-forestry, financial and marketing issues and renewable energy technologies.

With respect to the trade-offs inherent in the proposed adaptation pathway, it was noted where interventions compromised the basic needs of poor and vulnerable groups. For example, where adaptation activities include intensive reforestation practices, the availability and accessibility of pasture for the poor and/or landless is reduced. Similarly, where infrastructure interventions such as dams and dykes are proposed, the risk of resettlement and changes to the local ecosystem must be considered, particularly where vulnerable groups are dependent on the local environment for livelihood security. In order to sufficiently acknowledge the impact of some of these trade-offs on vulnerable groups, it is important to explore those interventions which best enable a pro-poor adaptation pathway.

4.11 POLICY AND INSTITUTIONS: STRENGTHENING ADAPTIVE CAPACITY

In all the countries, the participants emphasized that changes in governance, improving policies and institutions that develop, implement and monitor policies and regulation are needed to ensure long-term improvements in adaptive capacities.

In summary, despite the cross-cutting nature of the adaptation pathway, there emerged a number of further refinements which helped to strengthen the proposed pathway. Amongst these refinements emerged a theme of improved governance at the national scale, supporting processes of decentralization and capacity building of local institutions, resulting in a more stable and attractive arena for investment (overseas and domestic), as well as a platform from which to begin mainstreaming climate issues into national sectoral policies as well as local level development plans. Complementing improved governance and decentralization was the desire to improve international cooperation and apply lessons learned from other countries related to adaptation, including technology and knowledge transfer. It is also necessary to try to involve traditional decision-making structures to generate ownership and better enforcement of the implemented policies and actions.

Furthermore, administration of adaptation and development measures in countries needs to be improved by reducing corruption, simplifying licensing procedures and revising out-dated codes and standards (i.e. building codes and EIA standards). Participants also emphasized the need to ensure proper law enforcement as this was identified as the most effective way of improving fire management and sustainable resource management. For many current policies, monitoring and enforcement may need to be approached in a

different way if change is to be affected. For example, in Ghana, participants emphasized that the new policies should try to provide options and incentives for changes and not only restrict activities; they should also have realistic, built-in monitoring mechanisms. This is particularly important in the context of climate change that will require adaptive policies with built in flexibility to accommodate changes as new information about impacts and their consequences become available.

5. KEY METHODOLOGICAL ADVANCES

5.1 COMMENTS ON KEY METHODOLOGICAL ADVANCES

There is a growing amount of information available on sectoral adaptations based on the projections of future climate change. We also have increasing information on local adaptations and their effectiveness. PSD approaches are well established in building on this information by identifying strategic directions and long-term objectives in companies, cities, regions and at different levels of governments. In the context of climate change, PSD builds on the experiences of the involved participants, so they do not perceive climate change and needed responses as something outside of their expertise. However, there are only limited examples of applying this approach to climate change issues. The PSD approaches may also be used to guide and complement model based approaches including projections of climate change, economic assessments of adaptation costs and qualitative approaches, such as focus groups and interviews.

Applied PSD workshop design allows participants to integrate their own experiences on climate variability and weather-related events with projections of future climate change. We consider this to be highly relevant, because of the high uncertainty and large spatial scale of projections of climate change, and limited information of potential future changes in climatic variables that participants could easily relate to such as droughts,

floods and extreme weather events. Furthermore, in developing countries, there is limited information available on the potential consequences of future climate change on resources such as agricultural production, fish population, occurrence of diseases or deterioration of infrastructure. By focusing on observed impacts of climate variability and lessons learned from responding to them, participants are able to think more effectively about what future projections could mean to their regions and countries and to identify the most appropriate adaptation responses.

Responses to climate change need to be relevant to the people who are affected by them currently, but it is also desirable that the measures are linked to other development priorities and to assist countries and regions to make development decisions that increase adaptive capacities. Presently, many studies have focused on identifying adaptation options by imposing future climate model outputs on current situations. During the workshops, participants were engaged in visioning exercises at the early stages of the PSD process, which help them to think about climate change and impacts in the context of other development challenges that regions and countries are facing and also to prioritize those adaptation options that are in the line with future development pathways. This created opportunities to review the created future development pathway and determine whether it is robust enough to withstand impacts of climate change. In some cases responses to climate change are already integrated into existing strategies, because many of the regions are already experiencing impacts of climate change-related events. For example, water harvesting in Ghana, flood protection in

Mozambique and emergency preparedness in Bangladesh. However, the identified development decisions need to be accelerated to respond to increasing vulnerabilities. Many development decisions identified by the participants were highly relevant for addressing climate change impacts, including promoting sustainable resource management, which was both part of the development pathway and adaptation pathway.

The applied PSD approach offers opportunities to look at cross-sectoral linkages between adaptation options and in this way identify options that offer multiple benefits and options that need to be implemented in other sectors to harness the benefits of the adaptation actions. An example of this includes the linkages between post-harvest processing, road network development and skill training to create alternative sources of income, as identified earlier in this report.

Major challenges of the applied PSD approach include challenges with designing a workshop with diverse participants. Many key experts in the countries are over-committed and already participate in many workshops and conferences; therefore, they may not be willing to participate. Gathering diverse groups of participants could also create substantial costs for travel and accommodation for participants living away from major cities. In this project, the local country teams ensured that local PSD workshops were also held so not only views of participants living in the major cities were collected.

5.2 COMPARISON WITH PSD EXERCISES CONDUCTED ELSEWHERE

Currently, we have information available about the relationship between development decisions related to GHG mitigation actions and how changes in development decisions can provide positive or negative contributions to climate change. In this project, we tried to apply the PSD approach to help identify impacts of climate change and adaptation responses in the context of other development challenges.

In the PSD approach used in this project, we addressed climate change impacts and adaptation options in the context of current and future development challenges, in short, 1.5-day workshops. Similar scenario exercises focusing only on development pathways without climate

change go through a process of identifying key scenario elements, key uncertainties, creating scenarios and then identifying policies and measures that are needed to achieve the scenarios. Such processes were used to develop the scenarios in the GEO-4 process (www.unep.org/geo). In our previous work on future scenario development in the context of climate change in the Lake Balaton region (Hungary), we applied similar steps as in this project, but divided into 5 half-day sessions (Bizikova et al., 2009). SRES scenarios were downscaled to help participants envision future development pathways then they develop their own future development pathway.

Other examples of PSD include a PSD process in British Columbia, Canada focused on development scenarios of local futures under different IPCC scenarios (Shaw et al., 2009). In this context, the research team, in consultation with local stakeholders, developed future socio-economic scenarios based on the IPCC SRES scenarios and then assessed the estimated climate change impacts related to the each scenario and visualized possible adaptation options. This study illustrates that addressing climate change in a participatory way, with credible but easily accessible visuals, and at a scale that people can identify with, may be critical in building capacity for climate change action (Shaw et al., 2009).

Another recent project has focused on illuminating potential futures of hydro electricity in the province of Manitoba (Canada; Swanson and Rothman, 2009), where the research team developed a set of three scenarios by using a series of half day workshops. They worked with three different projections of climate change including conservative estimates and models projecting significant impacts for the area. The research team facilitated a number of half day workshops to identify current development challenges, major uncertainties in future trends and key elements of the development scenarios combined with different projections of climate change. After assessing the robustness of the scenarios, adaptation options were identified to improve the performance of the corporate decisions under different climate change projections in each scenario.

In contrast to these approaches, we focused on identified development priorities that mattered to stakeholders, partly because our primary concern was to identify

relevant responses to climate change and to create adaptation pathways instead of developing future scenarios themselves.

5.3 SCOPE FOR INTEGRATION WITH OTHER RESEARCH ELEMENTS

In the previous chapters, we outlined some of the results of the PSD approaches. However, to make the outcomes more relevant it is beneficial to link the PSD approach with other methodological approaches. The ultimate focus is on how we can link quantitative information about current trends and climate projections with qualitative scenarios of realistic yet plausible development pathways and then transforming them into policies and measures on the ground. However, integration between different methods, disciplines and between different stakeholders is a challenging process. Increased attention needs to be given to maintaining the dialogue between researchers and community groups on the challenges and uncertainties of climate change projections and encouraging information sharing that can be used to advance adaptation and development despite existing uncertainties. For the integration with other methodological approaches we can distinguish to major challenges including:

- Integration across diverse knowledge domains (scientific, traditional, and local knowledge) is necessary to address the differences among scientists in various disciplines and between scientists and stakeholders, including decision makers and the community.
- Integration across diverse purposes (producing high-level scientific outcomes, providing inputs or validating model approaches and being relevant for policy making, management and guiding donor programs) is needed to address the differences between objectives and outcomes required by involved stakeholder groups including donors and their institutions, and outcomes relevant for resource managers and policy makers.

To enhance this process, it is necessary to review the accessible inputs, desirable outputs and products, and the planned process structure when the actual framework is being developed. Furthermore, it would be useful to review current data sets and projections of climate change to assess their suitability to reflect on

socio-economic impacts and environmental conditions, and their usefulness for local, regional or national adaptation work.

Practically, PSD is an effective approach to identify key areas of the impacts of climate change and adaptation options that are relevant for the stakeholders. PSD could be conducted at the early stages of a project to identify key areas for the modeling approaches that are relevant for the stakeholders. Stakeholders could also provide information about types of needed infrastructure, their spatial allocations, their experiences with climate change-related impacts and related costs, and planned initiatives to address climate change issues. They could also provide information about accessible data that might be included in the models. This would help to ensure that the modeling outcomes provide more realistic information for the decision-makers. Based on our experience, this also gives opportunities for the research team and the modelers to introduce key uncertainties and limitations to the stakeholders and build their confidence that they are focusing on ‘the right things’.

During the project development, PSD approach could be effectively combined with focus groups and interviews to aid with estimating current experiences with adaptations. From PSD we could then gather information on applied adaptation options, and further our understanding of how adaptation options are linked to sensitivities, coping capacities and livelihoods of local stakeholders, focus groups and interviews could provide such in-depth understating.

Through combining PSD with GIS and other spatially-explicit approaches, we could get better insights on how changes in vulnerability, impacts and adaptation options are manifested over regions and countries. This is very important for mapping risk and capacities, because not all of these characteristics can be supported by data sets usable by GIS. Combining maps based on available GIS information and participants’ insights during a structured dialogue, we can get better understanding what the issues are even with limited data. GIS maps can be used as dialogue starters rather than final products.

At the final stages of the project, stakeholders could help in validating the results, in assessing their potential incorporation with other on-going initiatives and

identifying potential directions for future work. However, it is generally not recommended to involve only stakeholders in these later stages of the projects, because the time and resources available for modification in the results are often minimal. So the stakeholders consequently may feel that their inputs are not taken on board in the project outcomes.

When integrating PSD approaches with other methods, it is important to keep in mind the key goals of the project so there is a balance between reasonable levels of

participation, qualitative methods, collecting data and applying models so that we produce relevant outcomes. This often requires involving diverse groups of stakeholders in different stages of the projects so we minimize the pressure on the time and busy schedules of stakeholders, while still benefiting from the inputs. This also requires collaboration and regular communications between different research groups working with the different methods so they are aware of the results and potential constraints or changes in the results compared to the initial consensus.

6. CONCLUSIONS AND RECOMMENDATION

6.1 SUMMARY OF FINDINGS

The identified development challenges are similar across the studied countries. These include low quality of basic services contributing to increased incidence of diseases and poverty, depleted natural resources especially forest and water, increased migration and uncoordinated and growing urbanization.

Sensitivity in the studied countries generally refers to the overall level of social development, high levels of poverty, food insecurity and limited availability of basic services. In countries such as Ghana and Mozambique, the major challenges are malaria and HIV/AIDS; while diarrhea is common in all countries. Households that are practicing rain-fed agriculture, households with limited food storage and high incidence of poverty are also vulnerable to weather-related exposures. In terms of exposure, all countries are experiencing increasing impacts of weather-related events such as floods, droughts, cyclones). Impacts of these events are often worsened by unsustainable human actions and practices such as deforestation, increased erosion, unsustainable water resource management and destroying natural coastal protection leading to sea water intrusion and coastal erosion. Based on these existing constraints, participants from the studied countries were concerned about limited adaptive capacities available to people to deal with future exposures.

Most of the countries have already encountered major impacts in weather-related disasters including cyclones and floods in Mozambique, drought, cyclical water scarcity and floods in river basins in Ghana and finally sea-level rise (tidal and storms), flash floods and heavy rainfall and salinity intrusion in Bangladesh. Based on the future climate projections and observed trends, the following key impacts were identified: reduced water availability and drought, soil degradation, wild fires, floods, coastal erosion and the increased occurrence of diseases. When addressing consequences of potential impacts of projected climate change and adaptation actions, participants built on their knowledge and experiences with past extreme-weather events and variability and on their aspirations for future development in their countries. In all the studied countries, some adaptation measures were already being implemented as autonomous actions, especially at the household or community levels as autonomous actions. Many of these practices were identified by participants as being unsustainable or ineffective, including fishing younger (immature) fish to keep the catch sizes in Mozambique; expanding farm sizes in Ghana; and the large distances between cyclone shelters resulting in human fatalities in Bangladesh.

Based on identified consequences of climate change, development challenges and priorities for adaptation actions, some key actions were identified by participants in all three countries:

1. Some of the planned development priorities and actions need to be accelerated and supported through additional investment in training and skill development, as they also increase capacity for

- adaptation (i.e., improving basic health care services in areas prone to diseases such as malaria and diarrhea, which may be exacerbated by climate change; and promoting agricultural product processing and off-farm income generation).
2. Some of the on-going development programs and actions dealing with current impacts need to be intensified and applied to other regions that will be facing impacts in the future (i.e., alternative crops and rainwater collection, are often a small-scale initiative, however these should be expanded by supporting equipment in areas where reduced rainfall and other impacts are expected.)
 3. Review and modification of current resource governance rules and policies and their enforcement to reflect the need to build adaptive capacity (i.e. water, forest and fisheries management including conservation and sustainable management)
 4. Identify and integrate climate change adaptation measures into current development and investment planning, along with the associated capacity development to support these measures (up-grading current dyke heights, building flood-resistant roads, early warning systems and emergency shelters)

All measures, whether development or adaptation-driven should involve traditional decision-making authorities, decentralized structures and consider traditional practices and communities' social networks in their design and implementation.

Moving forward with the actions listed above requires expanding capacities and resources in local and national institutions, so decision-makers can effectively design, implement and monitor the actions. Gender considerations and participation of women in this process is essential for effective design and implementation of climate change adaptation responses due to the disproportionate effects of climate change on women and the primary role played by women in many of the affected sectors such as water, agriculture and healthcare.

In terms of specific adaptation actions, key sectors that will be affected by climate change include agriculture, forestry and water resources, which result in direct impacts on human well-being, food security, drinking water availability and migration. Adaptation measures identified by participants included relatively high-cost

investments such as flood gates, dykes, flood-resistant roads, improving basic social services, and a number of soft investments related to food production, processing and storage, as well as training in alternative skill sets. Significant improvements in governance including decentralization, increased participation, sustainable resource management and secured land tenure were listed as needed preconditions to increase the adaptive capacity of communities.

When analyzing the hard and soft adaptation options in diverse sectors, we can observe diverse levels of these measures. In agriculture, the focus is slightly more towards soft options including changes in resource governance, microfinance schemes, low-interest loans, alternative skills training focusing on youth and migrants, agricultural extension services, small scale water harvesting, food storage and alternative agricultural practices to reduce erosion and run-off. These measures, however, depend on hard adaptation options such as introducing technologies and building facilities for processing agricultural outputs, promoting technologies for sustainable agriculture and building grain silos and dams. In other sectors there are different levels of balance between soft and hard measures. In the case of flooding, the focus is on hard measures that should be supported by social services to address the needs of affected populations and displaced victims. Early warning systems require investments into technologies and monitoring stations, but also investments into effective communication strategies and capacity-development to effectively utilize these technologies. In the health sector the focus is on building additional health facilities, community and mobile hospitals and increasing supplies, but also ensuring clean water and sanitation to limit the occurrence of diseases. According to the participants, these hard measures should be accompanied by soft measures such as educating people about personal hygiene and disease prevention. Overall, most of the adaptation measures will require additional capacity development to introduce new skills and develop existing strengths so that people in local and national institutions are able to design, implement and monitor the required actions.

Future adaptation priorities and pathways, can be split into overall changes in governance in sectors such as forestry, land-use, water and fisheries; and specific

measures to improve adaptive capacities and reduce sensitivities to exposures, including climate change. These measures include infrastructure development, changing practices and capacity building. Short term measures include hard measures such as community-based rainwater harvesting and post-harvest facilities in Ghana, construction of community level dykes for water retention; alternative crops in Mozambique; and building flood embankments, increasing polder heights, surface water purification and afforestation in Bangladesh. These measures are supplemented by capacity- development and training activities

Over medium and long term horizons there is an increased focus on hard measures including building dams, improving drainage in Ghana, construction of flood gates and roads in Mozambique and building flood-protection walls, cleaning river beds and introducing new technologies to agriculture in Bangladesh. Furthermore, important elements of future pathways are changes in land, water, and natural resource management and governance.

In addressing the needs of vulnerable groups, participants noted a number of additional considerations for the design of pro-poor adaptation actions. In particular, a number of suggestions proposed the need for more targeted emergency preparedness and post-disaster relief, basic service accessibility, post-harvest safety nets and access to processing and storage facilities. It is also necessary to consider changes in the available capacities in communities that are repeatedly faced with disasters and how post-disaster relief efforts can contribute to rebuilding capacity, and addressing increasing sensitivities including food insecurity, health and sanitation services.

6.2 CONGRUENCE WITH NATIONAL PLANS INCLUDING NAPAS

NAPAs were available for two of the study countries, Bangladesh and Mozambique. In general, the NAPAs in these countries are focused only on short-term targets up to next two years and long-term targets up to five years. However many of the suggested actions in the NAPAs including changes in agricultural practices, water management, urban infrastructure development are probably unlikely to be completed in such a short time horizons. In this project, we tried to identify

adaptation options that are relevant immediately (i.e., short-term actions), but also adaptations that are relevant over medium and long-term horizons. An overview of identified major priorities over short-term horizons in the study countries is listed in 6.1.

In general, the results of the projects are in the line with the suggested activities in the countries' NAPAs. In Bangladesh, the NAPA identifies actions focused on infrastructure such as coastal afforestation, providing drinking water to coastal communities, construction of flood shelters, enhancing resilience of urban infrastructure and industries, exploring options for insurance and other emergency preparedness and promoting changes in coastal fisheries and planted agricultural crops to reflect the increased salinity. In terms of measures focused on capacity-building, training and skills development, the NAPA includes capacity building for integrating and mainstreaming climate change in planning, policies and programs, inclusion of climate change issues in the schools' curriculum, development of eco-specific adaptive knowledge and promotion of research on drought and floods (NAPA Bangladesh, 2005). In our workshops, outcomes focused on infrastructure development also included emergency preparedness, afforestation and providing clean water. The workshops provided more details about each measure including types of shelters and gender-aspects. Participants also emphasized that more attention is needed on coastal protection besides afforestation; the additional measures included construction and rehabilitation of flood embankments and increasing polder heights. Finally, during the workshop specific measures to improve the situation of vulnerable people were identified such as subsidized social schemes (food, education, health) and government-subsidized housing facilities. These measures are more related to development action but are also of significant benefit in increasing adaptive capacity to climate change.

In Mozambique, the NAPA outlines priorities such as strengthening early warning systems including seasonal forecasts and locally-relevant warning information and dissemination; strengthening capacities of agricultural producers to cope with climate change by promoting associations of farmers; small-scale irrigation systems; financing schemes for small businesses; reduction of climate change impacts in the coastal zones; and

changing management in water resources to effectively respond to floods and droughts (NAPA Mozambique, 2007). The workshop outcomes provided similar priorities to those outlined in the NAPA; however, they provided more elaboration on the types of activities and the synergies between them and other sectoral priorities and their applicability to address the needs of vulnerable groups. The actions listed in the adaptation pathways also included increasing focus on changes in resource governance and infrastructure development.

Overall, the suggested adaptation actions and pathways are consistent with the actions outlined in NAPAs for Mozambique and Bangladesh, though the results provide a more realistic pathway for several reasons. Because they are building on synergies with other development needs and sectors, the actions are spread out over longer time horizons so the feasibility that they can be implemented is higher and they also pay significant attention to capacity-development, and changes in governance that are necessary to maintain the results of adaptation actions.

6.3 PSD DESIGN CONSIDERATIONS AND KEY ELEMENTS OF PSD WORKSHOP FOR CLIMATE ADAPTATION

We can summarize the objectives of the PSD workshop as “to explore existing and alternative adaptation options which are relevant for the different livelihoods and

correspond to the current and future development challenges that the different regions and vulnerable groups may be facing based on the knowledge and experiences of a variety of stakeholders”. The PSD workshops also aimed to help identify integrated and robust adaptation pathways which (i) prioritize adaptation measures and desired investments and (ii) recognize synergies and trade-offs between these investments. These workshops also offered an opportunity to explore the types of sectoral and institutional measures that would be required to facilitate the integration of adaptation actions into local projects and practices. Based on the lessons learned from the phase I and II PSD workshops, the key elements are summarized below. A Capacity Development Manual, presenting step-by-step details of workshop design, planning and facilitation is submitted alongside this report.

Developing future scenarios: Ideally, after the opening session, the workshop would begin with a Future Visioning activity that allows participants to envision a desired yet realistic future for their area/community. This helps to provide context for the rest of the workshop focused on identifying impacts of climate change and adaptation options. This session should also include discussion about current development challenges, However, if there are time constraints (i.e. if the workshop must fit into a 1-day delivery) or if the workshop is at a scale where such visioning would be too broad to be tractable (e.g. national workshop) the alternative is to

TABLE 6.1 OVERVIEW OF SHORT-TERM MEASURES IN ALL THREE COUNTRIES

Types of actions	Ghana	Mozambique	Bangladesh
Mostly infrastructure and changes in practice	<ul style="list-style-type: none"> • Rain-water harvesting • Post Harvest management • Aquaculture 	<ul style="list-style-type: none"> • Construction of dykes for water retention (small scale) • Conservation agriculture including planting crops resistant to drought 	<ul style="list-style-type: none"> • Construction and rehabilitation of flood embankments • Increase of polder heights • More cyclone shelters (gender-friendly, livestock, solar panels) • Afforestation • Purification of surface water (access and availability) • Short duration crop varieties
Mostly services, governance, training and capacity development	<ul style="list-style-type: none"> • Wildfire control • Development of sustainable agricultural practices • Culturally sensitive education • Health services and supporting social nets • Secure land-tenure 	<ul style="list-style-type: none"> • Simplification of licensing procedures for small and medium enterprises • Improved fishing nets & improved fish management to promote sustainable use of resources • Rehabilitation of rural commerce and trade networks • Wildfire management and changes in standards 	<ul style="list-style-type: none"> • Conserve fish sanctuaries • Subsidized social schemes (food, education, health) • Government-subsidized housing facilities

include a presentation of the future vision based on key strategic planning documents (NAPA's, PRSPs) and other future oriented development plans as prepared by the country, region, or community.

Impacts and adaptation options: Based on comments received from national-level participants throughout Phase I and Phase II, participants noted the need to discern direct and indirect impacts of climate change. This would mean identifying first primary impacts of climate change linked to projections such as impacts of changing precipitations patterns on for example agriculture and then elaborating further on additional impacts such as food insecurity, practice fluctuations etc. Similar approaches can be applied for identification of adaptation options when participants identify direct responses such as building a dyke or alternative skill development programs and then identifying other measures that are needed to make the adaptation options effective. Once the climate change projections are translated to locally-relevant impacts, participants will be better able to characterize which groups are most vulnerable to the impacts of climate change, and which adaptation options might best address the needs of those vulnerable groups.

Adaptation pathways: In Phases I and II, participants were asked to prioritize adaptation options in the short-, medium-, and long-term. However, based on comments received, it was agreed that participants might not have the background, expertise, or the information necessary to address the appropriate (and realistic) time horizons. Given the target audience of the proposed PSD workshop (vulnerable groups and representatives of, or people knowledgeable about, vulnerable groups), participants will however, have a strong idea as to which interventions are more *urgent* based on those which they feel might have the greatest direct benefit to these groups. As a result, we recommend developing the adaptation pathway based on urgency of the needed adaptation measures. By taking this focus, participants will have a better understanding of what is expected from the activity and be better able to undertake the activity, resulting in stronger, more robust outputs for review by the larger workshop group.

Integrating adaptation pathways using 4 leading questions: Once groups have completed the

prioritization of adaptation options based on the urgency of needed actions, the top 5 most urgent adaptation options from each group would be posted at the front of the workshop room for all to review. The result is a preliminary matrix of pathways for initial adaptation investment. In order to assess the internal cohesion of the adaptations in the matrix towards an integrated pathway that will best meet the needs of those most vulnerable to climate change, participants are asked to reflect on four key questions. The first question focuses on what might be missing from the collective pathways in the matrix when viewed together, in particular from the perspective of vulnerable groups. The second question focuses on the preconditions necessary to implement the adaptations in the matrix. The third and fourth questions focus on the synergies and trade-offs most apparent among the proposed pathways and encourage participants to think about how investment options might best be clustered and/or streamlined (synergies), and which options might need to be weighted against others (trade-offs). Having participants evaluate the proposed pathway for gaps, preconditions, synergies and trade-offs will help guide wise investment decisions for robust and consistent adaptation pathways that target the needs of vulnerable groups.

Combining group work, with plenary sessions and presentations: Design of the PSD workshops during Phase I and II managed to incorporate a diversity of approaches to engage and maintain the interests of the workshop participants. This included inviting country team members and researchers to introduce available future socio-economic scenarios and projections of climate change. Future visions, impacts of climate change and adaptations were developed by participants in small group sessions. Finally, outcomes of the small group sessions were brought together in plenary sessions to comment on groups' outcomes and to discuss cross-cutting issues. Combining small groups' sessions and plenary discussions worked well in giving opportunities to participants to present their ideas in the small groups and also the participants benefited from getting feedback from their colleagues.

Ensuring the right audience: Given that the focus of the PSD workshop is to determine preference for adaptation investment amongst vulnerable groups, it is

imperative that the targeted list of participants represent the needs and priorities of vulnerable groups. This representation will vary according to scale of workshop (local, regional and/or national), but in general, should include vulnerable groups as well as representatives of, or people knowledgeable about, vulnerable groups. Ensuring the right participants are present at a PSD workshop as dictated by the desired scale, is critical to successfully meeting the objectives of the PSD workshops.

Impact and adaptation cards with photos as visual cues:

As a design consideration for the impact and adaptation cards, it is important to use photos taken *in the country*, either from previous field work or other reliable sources. Despite participants' assumed and/or inherent knowledge of the impacts of environmental change, and associated adaptation interventions, it is useful to present participants with visual reminders that are culturally and geographically appropriate. The intention is to move beyond the four walls of the workshop venue and draw in the stories and pictures of those most vulnerable to climate change. Photographs that are selected strategically based on realistic future scenarios of varying frequency, intensity and duration will increase participants' ability to relate to the visualized impacts and/or adaptation options.

6.4 RECOMMENDATIONS FOR PRO-POOR ADAPTATION IN WORKSHOP COUNTRIES

In addressing the needs of vulnerable groups, several additional considerations for the design of the adaptation pathway were noted. In particular, a number of suggestions proposed the need for more support for basic services and safety nets, emergency preparedness and post-disaster relief, post-harvest management, including processing and storage facilities. It is very important to understand the sensitivities that poor communities are facing, such as lack of food, deteriorated social networks, lack of basic services, housing and employment. Many of these challenges will be increased by climate change impacts, but only focusing on responding to climate change won't create significant improvements in the situation of poor people. When focusing on specific measures that could address the needs of poor people the key adaptation priorities identified can be summed-up as follows:

Effective early warning systems and disaster preparedness are necessary to address current exposure, and will likely have growing importance over time. This measure includes building more small shelters in close proximity to each other so the communities and families are not separated. It is also necessary to consider changes in the available capacities in communities that are repeatedly faced with disasters and how post-disaster relief efforts contribute to rebuilding capacity and addressing sensitivities including food insecurity, health and sanitation services.

1. **Improving post-harvest services and water storage/water harvesting** are crucial options for maintaining the livelihoods of the people in rural areas, consequently helping to reduce outmigration. This includes a set of diverse measures starting in the short-term with supporting and building on the on-going activities.
2. Options such as **social protection, social services and safety nets** were identified as ways to improve the situation of vulnerable groups. These actions were identified as high-cost options exceeding resources currently available. Participants envisioned gradual investments into social and health services and safety nets with stronger emphasis over longer time horizons by adding migrants and potentially displaced people to the systems over time
3. **Improved governance of water and land** over the medium and long-term was identified as a necessary precondition for effective management of investments including infrastructure, dams, dykes and also for the success of community-based activities. Changes in resource governance were also considered to be a high-cost option.
4. **Strengthened civil society, using decentralized structures, engaging traditional authorities in planning**, and using existing platforms for community engagement were identified as crucial for addressing a number of issues. These included improving security of land tenure, regulation enforcement, increasing capacity and awareness of personnel implementing policies and carrying out monitoring, providing alternatives and reward systems for people, rather than only restricting resource use.
5. Special attention needs to be given to **measures focused on urban and peri-urban areas** that are

often affected by migration and increasing concentration of people that are poor and vulnerable, as they don't have their own production systems and livestock. Social services, and skill training are especially relevant for these areas, but efforts should also be made to improve adaptation in rural areas, in order to give an alternative to migration.

6.5 RECOMMENDATIONS ON INTEGRATING PSD APPROACHES WITH OTHER RESEARCH TOOLS

PSD is a useful tool that builds on the involvement of stakeholders to explore the future in a creative and policy-relevant way. PSD is very useful when we are dealing with issues that incorporate high levels of uncertainty to determine how different groups of stakeholders view the range of possible responses including policy and management options available to them, and what public policy, or investment support is needed to facilitate effective future actions. However, to make the outcomes more relevant it is beneficial to link the PSD approach with other methodological approaches.

The ultimate focus is on how to link quantitative information about current trends and climate projections with qualitative scenarios of development pathways, local and regional impacts of climate change and adaptation actions. When focusing on integration we can distinguish between integration across diverse knowledge domains (scientific, traditional, and local knowledge) and integration across diverse purposes (producing high-level scientific outcomes, providing inputs or validating model approaches and being relevant for policy making, management and guiding donor programs). To enhance this process, it is usually beneficial to review the accessible inputs, desirable outputs and products, and the planned process structure when the actual framework is being developed.

Being clear on the goals and objectives of the project helps us find a balance between reasonable levels of participation, qualitative methods, collecting data and applying models so that we produce relevant outcomes. This often requires involving diverse groups of stakeholders in different stages of the projects so we minimize the pressure on their busy schedules while still benefiting from the needed inputs. This also requires

collaboration and regular communications between different research groups working with the different methods so they are aware of potential changes in outputs compared to initial consensus.

Practical examples of combining the PSD with other approaches at different stage of the project cycle are listed below:

1. PSD is an effective approach to identify consequences of climate change and adaptation options that are relevant for the stakeholders. PSD can be conducted at the early stages of a project to identify key areas for the modeling approaches that are relevant for the stakeholders. Stakeholders could also provide information about types of needed infrastructure, their spatial allocations, and their experience related to climate change damage and adaptation measures and the associated costs.
2. During the project development, PSD approach could be effectively combined with focus groups and interviews to better understand the effectiveness of adaptation options and their linkages to sensitivities, coping capacities and livelihoods
3. Combining PSD with GIS and other spatially-explicit approaches, will give better insights on how changes in vulnerability, impacts and adaptation options are manifested over regions and countries. This is very important for mapping risk and capacities, because not all of these characteristics can be supported by GIS data sets.
4. At the final stages of the project, stakeholders could help in validating the results, in assessing their potential incorporation with other on-going initiatives and identifying potential directions for future work.

6.6 RECOMMENDATIONS ON USE OF PSD APPROACHES IN DONOR AND NATIONAL PLANNING CONTEXTS

PSD approach is well suited to explore different pathways and to reconcile different perspectives when addressing challenging issues including climate change impacts, adaptations and vulnerability. The approach also offers flexibility in designing PSD processes so we are able to gather information that is relevant for planning and decision-making.

Based on the lessons learned from the series of workshops in Phase I and II and our previous work, we would suggest the PSD approach useful for following key areas:

- Developing regional and local development and adaptation pathways to help identifying how national and donor priorities are linked with other sectoral priorities and situations at the local and regional level and guide prioritizing of investment planning.
- Identifying sectoral impacts of climate change and necessary adaptation responses across diverse sectors, so actions that can create multiple benefits are identified as priorities. For example actions linking areas such as agriculture, water resource management, emergency preparedness and basic services.
- Exploring hard and soft adaptation options in different areas and over time so the actions conducted by governments and/or by donors are complementary in building adaptive capacities.
- Creating scenarios on linkages between adaptation measures, vulnerability reduction and development priorities of the countries to make the investments by donors better integrated and therefore increase their effectiveness and relevance.
- Customizing best practices and lessons learned from other countries so that they reflect on the situation of the country/region including its institutions and available capacities.

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APPENDICES

APPENDIX 1. LIST OF VISUALIZATIONS DEVELOPED

The following list represents all of the visualizations developed specifically for workshops in Ghana, Mozambique, Bangladesh and Ethiopia. Some visualizations from other sources, such as maps, data and graphs etc. were used informally and in presentations, but these are not included here. A complete set of visualizations developed for the project is submitted on a CD along with this report.

Ghana

Workshop structure poster
 Topographic country map
 Four regional topographic maps
 Climate change poster (temperature and precipitation)
 Impact and adaptation cards
 Participant handout

Mozambique

Workshop structure poster – Portuguese
 Topographic country map
 Climate change poster (temperature and precipitation)
 Social indicator maps
 Impact and adaptation cards
 Participant handout

Bangladesh

Workshop structure poster
 Topographic country map
 Four regional topographic maps
 Climate change poster (temperature and precipitation)
 Impact and adaptation cards
 Participant handout

Ethiopia

Workshop structure poster
 Topographic country map
 Climate change poster (temperature and precipitation)
 Social indicator maps
 Impact and adaptation cards
 Participant handout

APPENDIX 2. EXAMPLE OF PARTICIPANT HANDOUT (BANGLADESH)



Participatory Scenario Development (PSD) Workshop

Dhaka, Bangladesh
October 2009



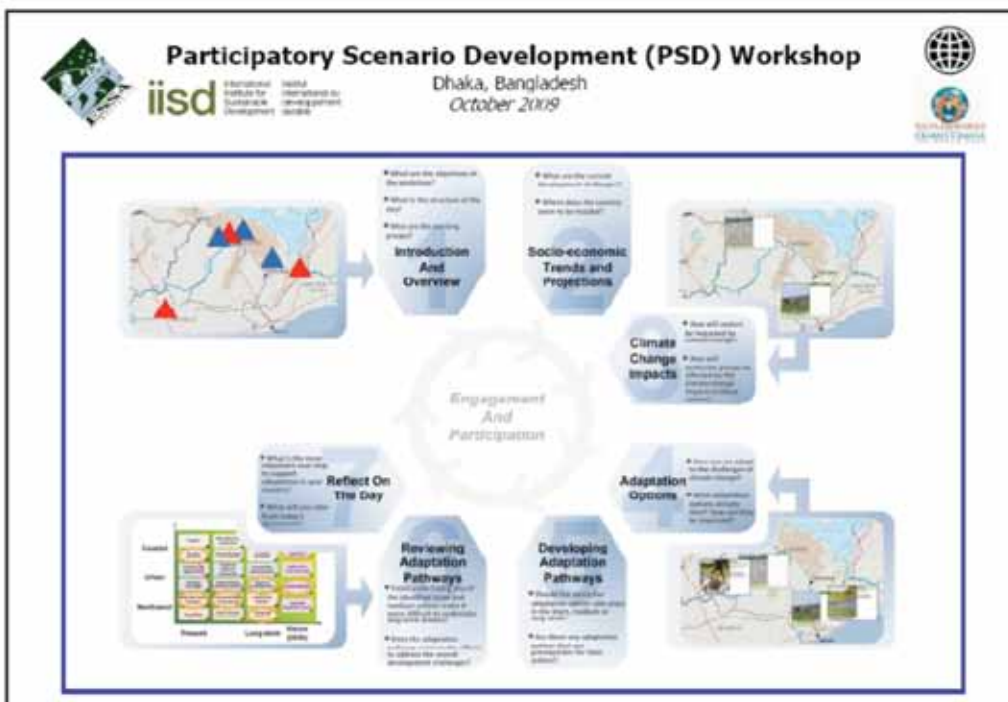
What is the Economics of Adaptation to Climate Change (EACC) study?
 The Environment Department in close collaboration with the Social Development Department of the World Bank is leading a Global Study on the Economics of Adaptation to Climate Change. The overall objective of the EACC study is to help decision makers better understand and assess the risks of climate change, and to better cost, prioritize, sequence, and integrate adaptation strategies into development plans and budgets under conditions of high uncertainty, competing needs, and high potential future costs. The results of the EACC study will be used to inform the international community's efforts to provide access to adequate support for new and additional resources to help developing countries meet adaptation costs. This study focuses on 7 countries: Bangladesh, Bolivia, Ethiopia, Ghana, Samoa, Mozambique and Vietnam.

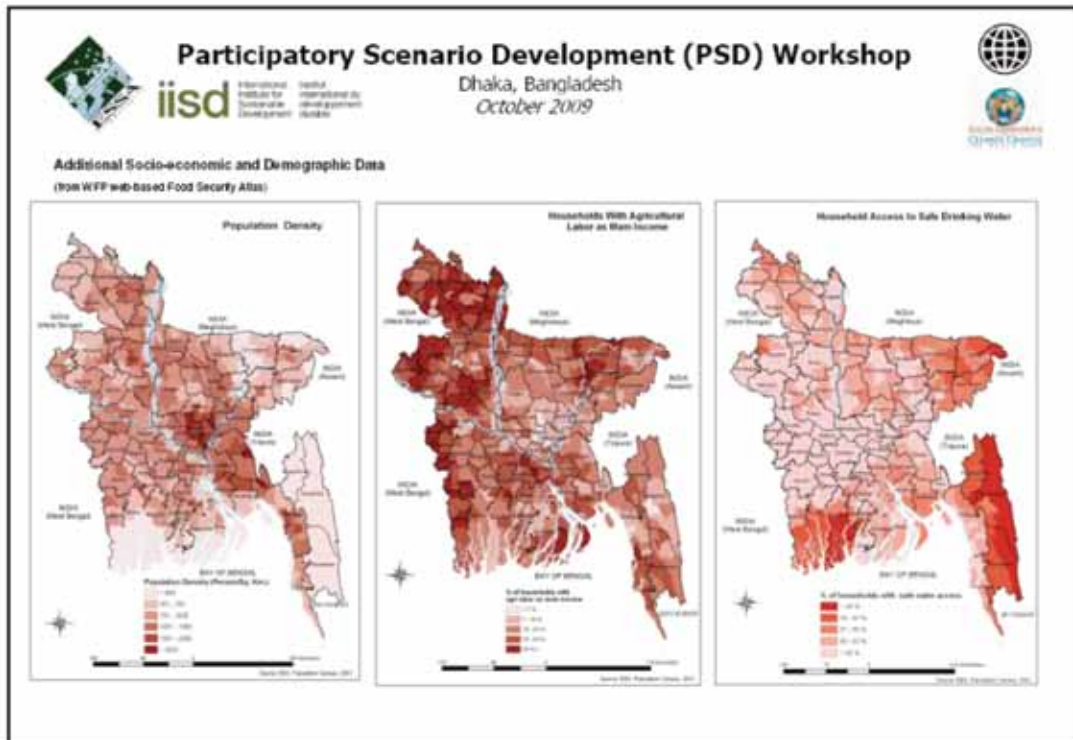
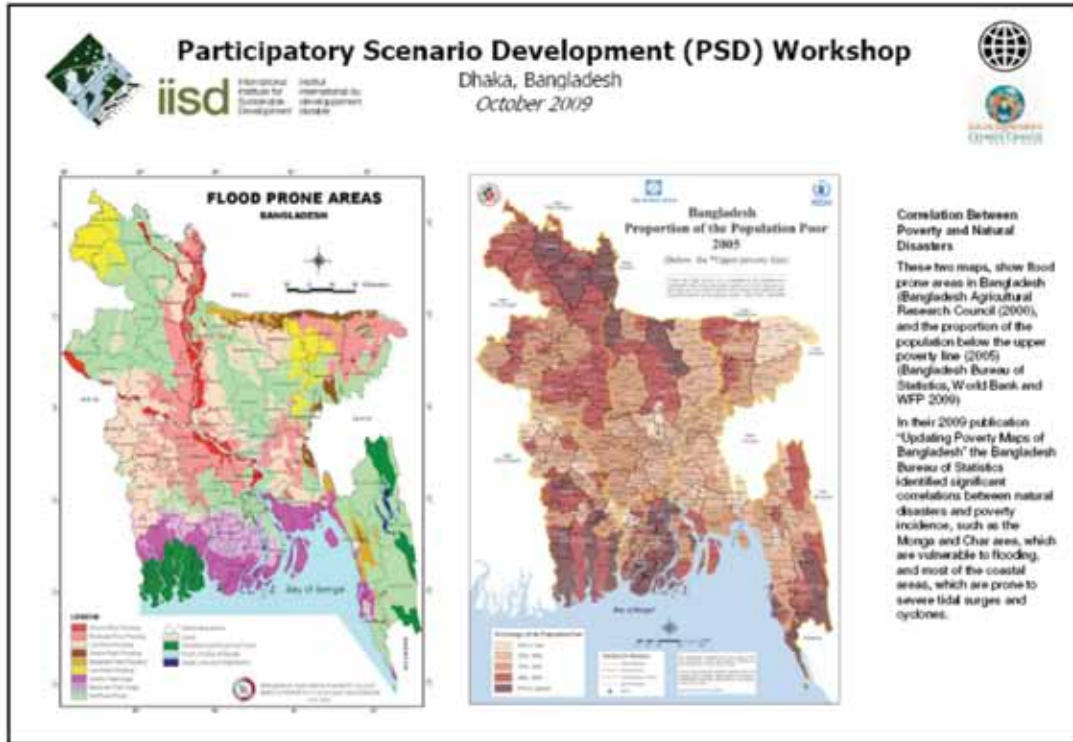
Progress to date: Engaging Experts in Participatory Scenario Development Workshops:
 In June and July, a first phase of Participatory Scenario Development workshops took place in Ghana, Mozambique, Bangladesh and Ethiopia. In these workshops, participants from government as well as the research and non-profit sectors developed desired, yet realistic, adaptation pathways for regional and/or livelihood groups within the country, evaluating both existing and alternative adaptation options in order to prioritize investments in the short-, medium-, and long-term. In Bangladesh, a national workshop and 3 regional workshops took place. During the national workshop in early July, Bangladesh was delineated into four geographic areas (Coastal, Urban, Northwest, and Northeast). For each of these areas, participants identified climate change impacts and potential adaptation options and pathways related to a number of sectors including health, food security, water, social development, governance, coastal issues and poverty. The results of the workshop represent the development priorities of those areas and include consideration of those groups most vulnerable to climate change. The results of the first and second phase workshops will inform the recommendations of the Economics of Adaptation to Climate Change (EACC) study with regards to the most appropriate design and prioritization of national adaptation pathways for Bangladesh.

What is Participatory Scenario Development (PSD)?
 PSD is a process which provides an opportunity for a range of stakeholders, including government officials, local experts, and representatives to explore the future in a rigorous, creative and policy-relevant way. PSD is used in the EACC study to identify the effects of different responses to future development challenges. More specifically it characterizes various adaptation strategies possible for different livelihood groups, given their identified vulnerabilities and assets in prevailing conditions of uncertainty. The PSD approach also enables participants to identify which public policies, programs and interventions are needed to facilitate effective autonomous adaptation.

Workshop Objectives:

1. To develop a vision for meeting key development priorities as defined by national authorities and experts for the short-, medium- and long-term;
2. To identify the impact of climate change on development priorities identified by key stakeholders as well as the challenges that climate change presents for specific livelihood groups, regions and vulnerable groups in Bangladesh;
3. To identify existing and alternative adaptation options which correspond to the desired future vision of various stakeholders;
4. To identify integrated and robust adaptation pathways which (i) prioritize adaptation measures and desired investments in the short-, medium- and long-term and (ii) recognize synergies and trade-offs between these investments.







Participatory Scenario Development (PSD) Workshop

Dhaka, Bangladesh
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What is Vulnerability?

Over the past two decades, the term vulnerability has been used widely throughout the risk management and climate change literature. In relation to climate change, the Intergovernmental Panel on Climate Change (IPCC) has defined vulnerability as the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change, including both climate variability and extremes, (IPCC, 2007). As a result, it is generally accepted that vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. Vulnerability, for the purpose of the EACC study, is defined accordingly with focus on geographic exposure to climate hazards and also to sensitivity and adaptive capacity of households and communities as defined by various socio-economic, livelihood and political factors. Consideration of exposure as well as sensitivity and adaptive capacity is essential for mapping and evaluating alternative, robust adaptation pathways and investment priorities for a specific region or country.

Who is Vulnerable? [1]

Vulnerability is a function of a system's exposure to climate change risks, sensitivity to these risks, and adaptive capacity [2].

Vulnerable populations are exposed to multiple risks including reduced agriculture productivity, risks to crops and threatened systems, increased exposure to disease vectors and extreme weather events. For example, devastating floods of 1987, 1988 and 1989 inundated more than 80% of the country. The 1988 flood caused 1,100 deaths, inundated nearly 100,000 acres, rendered 30 million people homeless and damaged 500,000 homes. The floods caused catastrophic losses to agriculture and livestock production and heavy loss to infrastructure. The total estimated value of losses was US\$ 2.8 billion [3].

Sensitivity results from dependence on the environment for raw foods, fuel, shelter and medicine, lack of access to decision making and justice, (geographic context, a range of interacting issues like housing, financial, socio-economic, cultural and gender status). The 1987 typhoon in Bangladesh illustrates many of these issues. More than 90 percent of the estimated 140,000 deaths were women, their limited mobility, vulnerability and socio status exacerbated their vulnerability to this extreme weather event.

Adaptive capacity refers to the pool of assets (social, physical, financial, natural, human, and cultural) and resources (technological, knowledge and governance) which an individual, household or community may draw upon to build resilience to climate change impacts. One of the keys to increasing adaptive capacity is an integrated and participatory approach that brings together both institutional and community stakeholders. Participants of regional and national participatory scenario development workshops throughout Bangladesh identified a range of risks and vulnerabilities specific to their communities as well as potentially effective adaptation strategies. In doing so, the objective is to help strengthen the adaptive capacity of local, provincial, and national governments to understand and address the impacts of climate change.

The social assessment of the EACC study indicates that vulnerability is not a uniform phenomenon. For example, not all women, farmers and fishing communities are equally vulnerable. Regarding the climate hazards as well as the common livelihoods of different groups, it is evident it is crucial to have a complete understanding of vulnerability and design successful and sustainable interventions. This latter facilitates the work which occurs thereafter about developing a strong, resilient and self-reliant, and exposure is minimized. Just as vulnerable communities are threatened with or cope with climate impacts, a resilient community can anticipate and plan for a sustainable future.

[1] Adaptation from: B. Guo, C. Guo, S. Guo and B. Guo, (2008) Climate Change Adaptation: A Review of the Literature, International Institute for Sustainable Development, Winnipeg, Canada.

[2] The definition of vulnerability is widely provided in the climate change literature and the basic assessment is similar to that of a variety of researchers including the IPCC and various committees of the IPCC working group on climate change impacts, risk, adaptation and vulnerability in Development, Working Group II.




Participatory Scenario Development (PSD) Workshop

Dhaka, Bangladesh
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Region	Key Characteristics	Vulnerabilities	Key hazards	Climatic
Coastal	<ul style="list-style-type: none"> - Slower pace of social and economic development due to - GDP per capita lower than the national average - Rich in natural resources, including shrimp, coastal fisheries, forests, salts, minerals, and natural gas - Regional economy - fishing, agriculture, shrimp farming, salt farming and tourism - Includes the Sundarbans in the southwest (world's largest stretch of mangrove ecosystem) - Chittagong and Khulna districts currently experiencing significant growth & industrialization 	<ul style="list-style-type: none"> - High levels of poverty - High incidence rates of environmental hazards and natural disasters (high incidence of erosion, arsenic contamination, waterlogging, earthquakes, salinity, and pollution) - High population density with limited cultivable land. 	<p>Cyclonic events, storm surge, salinity</p>	
Northwest	<ul style="list-style-type: none"> - Low-lying - Historically more neglected and poor - Lacking industrial development - Agriculture is main source of employment - Western part of region comprises driest area in Bangladesh - Experiences less migration to urban centers compared to migrations from other regions 	<ul style="list-style-type: none"> - High levels of poverty - Frequent natural disasters - Dependent on agriculture as main livelihood 	<p>Flood, drought, river basin erosion, tornadoes, spring and cold waves in winter, desertification</p>	
North-east	<ul style="list-style-type: none"> - Hilly area - Acidic soils make the area suitable for tea plantations - Poor areas - High growth of industries expected as well as urbanization - High remittances - people living abroad 	<ul style="list-style-type: none"> - Lower levels of poverty - Proximity to Himalayas and other river systems - Sedimentation 	<p>Frequent flash floods, winter rain and fog.</p>	
Urban	<ul style="list-style-type: none"> - Includes Dhaka, Chittagong, and Khulna - High population density (population of Dhaka = 12 million and growing by an estimated 4.2% per annum) - Most developed infrastructure of the country - Major centers of trade and commerce - Large numbers of migrant workers - High annual growth in GDP (Dhaka = 7.6%) - High unemployment (Dhaka = 23%) - Almost half of the population live below poverty line 	<ul style="list-style-type: none"> - Very high levels of poverty - Population density and migration - Unplanned development (encroachment of wetlands) - Pollution (air & water) - Traffic congestion - Lack of adequate services - Increase in slum dwellers 	<p>Monsoon flooding, heavy rainfall, cyclones, drainage congestion, waterlogging</p>	

Key Characteristics of the selected four regions of Bangladesh (information from Phase I Workshop)



Participatory Scenario Development (PSD) Workshop

Dhaka, Bangladesh
October 2009





iisd International Institute for Sustainable Development

United Nations Development Programme

United Nations Environment Programme

Next Steps:

Following the completion of Phase II workshops by October 2009, the results of the PSD workshops will be synthesized into a final report for integration into the larger EACC Project. In advance of the United Nations Climate Change Conference (COP15) in Copenhagen in December 2009, the EACC study will be used to inform the international community's efforts to provide access to adequate, predictable and sustainable support to developing countries in helping them to meet the costs of adaptation to climate change. In addition to capturing details on desirable adaptation projects, programs and policies, the design and experience of working with participatory scenario development (PSD) and visioning tools will be documented in a capacity building handbook for use by other interested countries. Updates and available reports on the EACC Project may be monitored and downloaded from the EACC website, at <http://go.worldbank.org/2P5A156000>.

Glossary



Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harms or exploits beneficial opportunities.

Adaptation pathway: an internally consistent and robust sequence of adaptation actions to be taken over a particular time period at a national, regional or local level. It responds to the current and future impacts of a changing climate, paying attention to the overall development context of the specific location.

Climate change: Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Climate variability: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forces (external variability).

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

APPENDIX 3. SAMPLE WORKSHOP AGENDA (FIRST NATIONAL WORKSHOP)

1st July 2009, Dhaka (Bangladesh)	
9:45 – 10:30	Address of Welcome and Introductions Context Setting and Workshop Objectives Overview of the Day and Introducing PSD
10:30 – 11:00	Tea Break
11:00 – 11:20	Review of the Current Situation Presentation and Discussion
11:20 – 12:10	Development a Vision of the Future Group Work
12:10 – 12:30	Report Back from Groups and Plenary Discussion
12:30 – 13:30	Challenge the Vision with Boundary Conditions – Climate and Socioeconomic Three presentations
13: 30 – 14:30	Lunch
14:30 – 15:15	Impacts on the Vision Group Work Review, Identify and Evaluate Adaptation and Coping Options and Develop a Pathway Group Work
15:15 – 16:00	Revise Vision of the Future and Identify Adaptations Pathway Group Work
16:00 – 16:15	Tea
16:15 – 17:00	Report Back from Group and Plenary Discussion Reflect on the Day and Closing

APPENDIX 4. SAMPLE WORKSHOP AGENDA (SECOND NATIONAL WORKSHOP)

26th August 2009, Maputo (Mozambique)	
8:30 – 9:00	Welcome and introductions Aims and objectives of the workshop in the context of the EACC study; Outline and agenda
9:00 – 9:45	Socio-economic trends and projections for Mozambique Presentation and Plenary discussion
9:45 – 10:30	Overview of climate change and impacts Presentation and Plenary discussion
	Introducing activities for the day
10.30 – 10.45	Break
10:45 – 11:30	Assessment of Climate Change Impacts Group Activity
11:30 – 12:15	Identification of Adaptation Options Group Activity
12.15 – 13.15	Lunch
13.15 – 14.15	Concept of Adaptation Pathway Plenary discussion
	Developing Adaptation Pathways Group Activity
14.15 – 15.00	Group Presentations on Adaptation Pathways
15.00 – 15.15	Break
15.15 – 16:00	Reviewing Adaptation Pathway Plenary discussion
16:00 – 16.30	Reflecting on the day

APPENDIX 5. SAMPLE LOCAL WORKSHOP AGENDA

August, 2009, Local PSD workshop in Ghana	
Day 1	
9:00 – 9:30	Welcome and Introductions Objectives of the workshop Program Outline
9:30 – 11:00	Overview of the current development situation Group discussion and Presentation
11:00 – 11:15	Break
11:15 – 13:00	Developing local vision of the future Group work and presentations
13:00 – 14:00	Lunch
14:00 – 15:00	Challenge the vision with boundary conditions – climate and socio-economic Presentations and group work
15:00 – 15:15	Break
15:30 – 16:15	Review, identify and evaluate existing local adaptation strategies/coping options
16:15 – 16:30	Reflect on the day Comments, Suggestions for next day
Day 2	
8:30 – 9:00	Recap of previous day Plenary
9:00 – 10:00	Identify adaptation pathways in the zone Group work
10:00 – 10:15	Break
10.15 – 11:15	Group presentations and plenary discussions
11:15 – 12:00	Evaluation of the Workshop and closing remarks Comments, suggestions and Thanks
12.00	Lunch and departure

APPENDIX 6. EMAIL UPDATE PROVIDED TO ALL GLOBAL TEAMS (AUGUST 2009)

The following text was extracted from an email distributed to all in-country teams informing them of the updates to the Phase II PSD workshop design (based on their comments and feedback regarding the success of Phase I). This email, sent 13th August 2009, preceded any support which was provided to in-country teams in advance of Phase II delivery, and served to advise all teams of the next steps in moving forward from Phase I.

Dear Colleagues,

We are pleased to announce the completion of Phase I of the Participatory Scenario Development (PSD) workshops. A great many thanks to all country teams for helping to design and coordinate these workshops. We have learned a great deal from working with you and we hope that you too have found them useful and informative. Thank you also for your feed back on the Phase 1 workshops. We have tried to include your comments and suggestions in our planning for the next phase.

In preparing for the Phase II national-level workshops, there are a number of key issues which have been summarized for all country teams below. Details about specific in-country requirements will be discussed further during a conference call with individual in-country team members over the coming days (see Item 5 below).

- 1 **Dates for Phase II Workshops** We have received the following dates for each Phase II workshop. Please review the dates below and confirm any changes necessary. Also, please confirm whether a one-day, or a one-and-a-half day workshop is planned:
 1. Mozambique = Wednesday, 26th August, 2009 **(1 day)**
 2. Ghana = Wednesday and Thursday, 2nd and 3rd September, 2009 **(1.5 day)**
 3. Bangladesh = TO BE CONFIRMED (between 28th–30th September, 2009) **(1 day??)**

- 2 **Proposed Participants for Phase II Workshops** Phase I participants for the national workshops included stakeholders from government, research, and non-government. Although similar representation is desirable for Phase II workshops, and some overlap of participants would be useful for continuity between workshops, the majority of Phase II workshop participants should be different than those invited for Phase I workshops. In addition, increased representation from various livelihood groups and those representing the interests of vulnerable groups (i.e. women's groups, agriculture & livestock, forestry and fisheries, etc) would help ensure results are best suited to include 'pro-poor' adaptation pathways. Other suggested participants for consideration might include:
 - Some participants from the Phase I local-level workshops to ensure continuity across local and national level adaptation priorities.
 - Female participants in general, as well as representatives from women's groups or groups working on gender issues in-country.

- 3 **Revised Phase II Workshop Design** Based on the excellent feedback received regarding the design and the results of the Phase I workshops, we have proposed a few revisions to the PSD workshops for the Phase II national-level workshops. Most notably is a modified activity on "Adaptation Pathways" to ensure greater understanding of the relationship between different adaptation options over the short-, medium-, and long-term. Please see the attached for updated agendas. In addition, we are also designing a large poster of the 8-step hexagon model so that participants and facilitators alike may follow along with the progression and objectives of each workshop activity.

- 4 Participants Pack** In response to comments related to the need to have a more detailed and user-friendly information pack for participants, we will be designing and developing a new Participants Pack which will include improved visualizations. Additional content will include background information on the EACC Project, workshop objectives and format (hexagon model), examples of key outputs, maps of projected changes in temperature & precipitation, photos of key livelihood activities, etc. For the purposes of designing this Participants Pack, it is important that each country define which types of visuals they would like to showcase, and which they feel the intended audience will most benefit from. As a result, country teams will be asked for specific maps and photos they would like to include in their Participants Pack. This will be discussed further in the conference call with country teams (see below) so please be prepared with suggestions and ideas.
- 5 Conference Call with Country Teams** In order to address country-specific needs and clarify any outstanding questions, we would like to propose to arrange a conference call with each country team. With dates for Mozambique and Ghana workshops quickly approaching, we would like to ask both the Mozambique and Ghana teams to confirm a date and time with us which is *no later than next Tuesday, August 18th*. For the Bangladesh team, please confirm an appropriate time which falls *no later than Thursday, September 10th, 2009*.
- 6 ESSA/IISD personnel attending workshops** We have tried to ensure some degree of consistency of personnel between Phase 1 and 2, so at least one team member will be present from the previous workshop.
- Proposed personnel are as follows:
- Mozambique**
1. Livia Bizikova (Lead) lbizikova@iisd.ca
 2. Samantha Boardley
- Ghana**
1. Livia Bizikova (Lead) lbizikova@iisd.ca
 2. Samantha Boardley
- Bangladesh**
1. Samantha Boardley (Lead) sboardley@essa.com
 2. to be determined

Many thanks again for all of your efforts to date as we look forward to working with you again throughout the design and completion of Phase II. Please confirm with us the dates and length of your respective Phase II national workshops, as well as a proposed date and time for a conference call, as soon as possible.

Best regards,

Simon Mead

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APPENDIX 7. EXCERPTS FROM COMMENTARY PROVIDED TO SUPPORT PSD WORKSHOPS IN ETHIOPIA

The following text was extracted from various emails to the PSD Facilitation Team in Ethiopia (9th October, 2009), in advance of a national-level PSD workshop. Members from the Ethiopia Facilitation Team attended a 2-day training on PSD in Accra (Ghana) in early-June. However, as improvements were made to the workshop methodology between Phase I (June – July) and Phase II (August – October), the ESSA/IISD Consortium was asked to provide distance support to the Ethiopia team, advising them of the updates and coaching them through the improvements. The ESSA/IISD Consortium and the Ethiopia Facilitation Team worked collaboratively on design and visualization material before the national PSD workshop which took place on the 16th October, 2009.

On the issue of customizing the PSD approach to fit in-country needs...

What is most important is that the objectives of each session are met. The means by which the objectives are met are flexible and subject to the country-context. Feel free to apply any of the ideas below directly, alternatively, use the ideas to formulate activities/discussion questions that you think will best meet the objectives of the day.

Question

Time could be a challenging issue. In [previous workshops] they managed it in 2 days time. The agenda packs in lots of items. In our case, two presentations are also expected. One is from [a livelihoods] study; the other one (optional) is a summary on the three local PSD [workshops]. The latter you suggested [presenting] along with the impacts and adaptation discussions in the form of cards.

Answer

The agenda of a PSD workshop is certainly ambitious given a 1-day workshop. Since your attendance in [a previous workshop], we have tried to refine the workshop design to allow for customization by in-country teams including relevant presentations, key note

speakers, and cultural norms related to break and lunch times, as well as time required to complete group activities. I would suggest you not feel bound by the times indicated on the Facilitator's Agenda used for Bangladesh as this was designed based on consultation with the in-country team.

As for the optional summary of the 3 local PSD workshops, there are a few reasons you might choose to present on this topic, however ultimately this decision will be up to you and your team:

1. Accountability to local workshop participants – depending on how/if next steps were proposed to local workshop participants re: how their input would feed into the larger country-study, a presentation on local level results improves the accountability of the project to its local stakeholders in ensuring their inputs/comments/voices are heard at the national table on the 16th;
2. Accountability to national workshop participants – depending how familiar participants are with the [purpose of your] study, ... participants might be interested to hear an update on progress, or key results, to date.
3. As entry point to highlight the needs of vulnerable groups, and those most vulnerable to climate change—depending on how you have targeted the invited participants for the national level workshop, some participants might be farther removed from working directly with the needs of vulnerable groups. For example, high level officials from environmental line ministries are responsible for programs which meet the broader targets of adaptation within the country. Similarly, others might be more familiar with the physical impacts of climate change (i.e. modelers), rather than the intricacies of the social consequences. By presenting a brief intro to some of the key results from your fieldwork/local PSD workshops, this could help to ensure the focus of the day remains true to workshop objectives and vulnerable groups (assuming your local PSD workshop sites were selected based on the areas relative social vulnerability to CC).
4. To set-up questions for discussion during final plenary in the afternoon—given a summary of key outcomes from local PSD workshops, the facilitator can use some of these key results to generate

discussion around the national level adaptation pathway(s) generated in the morning. For example, once groups have selected their prioritized adaptation interventions and a proposed pathway is designed using the priorities from all groups, one discussion question could be, “how does the proposed pathway address the needs of vulnerable groups?” or “what is missing to ensure these needs are met?”. As a facilitator, if you notice that a key result/message from your local workshops has not been prioritized in the national pathway, this could provide an example by which you can generate discussion, “community X also noted the need for reforestation to help stabilize the soil and reduce erosion in the area, but the pastoralists in community X are concerned about losing grazing land...” In this case, the question to the national level stakeholders would be how to minimize/mitigate this negative trade-off so that we help maintain [all] livelihood [alternatives]?

On the issue of table-groups using smaller maps to identify vulnerable areas...

The [smaller] maps can refer to either national maps or area maps, depending on how you have decided to divide groups for the national level workshop. The important thing is that the maps are only used as a tool to help groups further identify and refine areas of particular vulnerability within the region/country. There was a concern in Bangladesh that by providing groups with the maps, this would bias participants towards only thinking about vulnerability as a function of physical exposure, as opposed to additional considerations of sensitivity and adaptive capacity. As a result, the Bangladesh team chose not to actively use the maps, (although they had them available within the group, no group used them).

On the design of impact cards...

The blank space provided on the cards is meant to allow for any sort of elaboration participants would like to give related to either the nature of the impact, or the expected severity of the impact.

On customizing the agenda to suit cultural norms...

Use your discretion here as to what timing will work best for Ethiopia. In Bangladesh, [a] later lunch

corresponded with prayer time, and also ensured that in the event that some participants left after lunch [as was expected], we would still have some idea of what the regional adaptation priorities were throughout the country. The final agenda for Ethiopia should account for energy levels throughout the day, participants incentive to stay following lunch, desired balance between presentations, group work, group presentations back to plenary, and plenary discussion.

On the Adaptation Pathways Review session and forming new groups for the 4 assigned tasks...

Forming new groups to discuss synergies, trade-offs, preconditions and vulnerable groups allows for more interaction and networking with other workshop participants outside those that have worked through the morning activities together. This session can be conducted in one of two ways:

1. In plenary with strategic moderation – this would mean the lead Facilitator (will this be you?) leads the group through a deeper analysis of the proposed priority interventions over the short-, medium-, and long-term. Using this model, the Facilitator will have to internalize and evaluate how the groups are prioritizing adaptation interventions while they are still presenting. The trick here would be to extract at least one synergy between group priorities, one trade-off, a key result from your local workshops that is missing, and turn such observations into questions for participants (without biasing the discussion with only your own observation!). This can be most certainly a very effective way to critically reflect on the proposed national priorities, however takes some rather experienced and strategic moderation skills.
2. By group discussions – the trick here would be to task groups (different or the same) with one or two manageable questions that will add further depth to the proposed pathway. You can choose to divide groups by key sectors/themes (i.e. agriculture, health, etc), by vulnerable groups (i.e. identify 3-5 vulnerable groups from the list generated earlier in the morning, delegate each group as representatives from a particular vulnerable group (similar to a role playing activity), and ask groups to identify trade-offs, synergies, and pre-conditions

from their perspective of a particularly vulnerable person.

Ultimately, the objective of this session is to get a deeper, fuller, richer, discussion around the proposed adaptation priorities. The means by which this objective can be met is entirely up to the in-country team.

On examples of synergies between adaptation options (from Adaptation Pathways Review session) ...

For example, perhaps one group prioritized ‘improved crop varieties’, while another group prioritized irrigation systems, and another improved rural extension services. One proposed synergy between these interventions might be related to improved food security. If this type of synergy exists across the country, what participants might be proposing is that food security measures are an important investment not only for overall development in Ethiopia, but also for adaptation to climate change (particularly given the increased frequency and intensity of drought which is expected). Alternatively, one might observe that many of the interventions include infrastructural developments (dams, dykes, irrigation systems)—this might be another synergy across groups and therefore a national priority (although I would be tempted to ask a

question about what softer, supporting interventions are also therefore required?).

On the introduction of discussing preconditions (Adaptation Pathways Review session) ...

The idea of identifying pre-conditions emerged as a means to further analyze and refine the interventions that were being prioritized [on the master pathways matrix]. Particularly as many interventions are not new, and rather a matter of up-scaling, or improving availability and/or accessibility to a particular intervention, it is important to identify what types of institutional prerequisites are necessary to facilitate this availability/accessibility.

On the issue of omitting activities related to the enabling environment from Phase II design...

This was seen as too much of a planning exercise rather than a pathway exercise. If this is to be one of the objectives of the workshop (identify pathway(s) *and* appropriate enabling environment) *and* you have the correct participants to be able to identify such things (i.e. actors, institutions), this might be best completed in the final plenary discussion of the day in response to a question on ‘what next?’ or ‘where do we go from here?’.



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