

Recent Progress in Applying Participatory Scenario Development in Climate Change Adaptation in Developing Countries

Part II

Livia Bizikova, Laszlo Pinter and Francesco N. Tubiello

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Head Office

161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org

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Prepared by:
Livia Bizikova, Laszlo Pinter and Francesco N. Tubiello

International Institute for Sustainable Development (IISD), 75 Albert street, Ottawa, ON K1P 5E7 Canada
E-mail: lbizikova@iisd.ca

Department of Environmental Sciences and Policy, Central European University, 1051 Budapest, Nador u. 9, Hungary
Tel: +36-1-327-3000, ext. 2017, Fax: +36-1-327-3031, Email: lpinter@iisd.ca

Summary

Climate change adaptation strategies need to be multifaceted—in particular, they require stronger linkages with socioeconomic priorities. This paper evaluates the value of scenario approaches in linking development priorities of countries to adaptation planning, synthesizing lessons learned through workshops held in three developing countries (Ghana, Honduras and Tajikistan). The results from these case studies indicate that scenario approaches provide specific benefits for adaptation planning, including capacity-building and awareness-raising. They thus complement those approaches linked to the use of climate change impacts and vulnerability assessments. To ensure effective integration of scenarios development into adaptation planning, the results show that it is crucial to use additional qualitative and quantitative approaches to refine stakeholder information on i) climate change impacts on relevant sectors, such as agriculture and water; ii) socioeconomic trends and available capacities; and iii) relevant adaptation actions and their effectiveness at the national and sub-national levels. The paper concludes by identifying further efforts needed to strengthen the argument for linking the broader socioeconomic context to better identify regional and national trends in developing countries.

Keywords: scenario approach, adaptation planning, stakeholder participation, development

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Introduction

Climate change adaptation planners are increasingly recognizing the multifaceted nature of the challenges they face, from capacity-building and institutional changes to infrastructure development and ecosystem-based measures (Birkmann, 2011; Naess, Bang, Eriksen, & Veatne, 2008; World Bank, 2009). Creating adaptation planning processes that both provide a broad diagnosis of the development choices available and identify a range of responses requires integrating not only expected changes in climate, but also expected socioeconomic trends and environmental conditions at various scales (van Aalst, Cannon, & Burton, 2008; Brown, 2012; Organisation for Economic Co-operation and Development [OECD], 2006).

The use of scenario approaches may help to identify key linkages between trends, policies and actions in the area of socioeconomic and climate change impacts (van Aalst et al., 2008; Tschakert & Dietrich, 2010; Tompkins et al. 2008; Carlsen, Dreborg, & Wikman-Svahn, 2012). Use of scenario approaches in adaptation research and policy development is indeed increasing. The World Bank used scenario analysis to identify the consequences of climate change and the related needs of vulnerable populations (World Bank, 2010); the United Nations Development Programme (UNDP) is considering using scenarios to inform climate-resilient development strategies (Flynn, 2011); and the Intergovernmental Panel on Climate Change (IPCC) is developing a new scenario framework integrating climate change impacts, adaptation and vulnerability of communities (van Vuuren et al., 2012).

Current scenario efforts focusing on adaptation planning have been applied in developed countries for national and sub-national applications, including Canada, Finland, the Netherlands, Spain, Sweden and the United Kingdom, (Carter, Jylhä, Perrels, Fronzek, & Kankaanpää, 2005; Shaw, Sheppard, & Burch, 2009; Langsdale, Beall, Carmichael, Cohen, Forster, & Neale, 2009; Tschakert & Dietrich, 2010, Carlsen et al., 2012; Kok, Biggs, & Zurek, 2007). In this context, scenario approaches centre on stakeholder engagement using downscaled global scenarios (e.g., Special Report on Emissions Scenarios [SRES]) and climate change projections to the local scale, to discuss climate change impacts and adaptations under diverse socioeconomic development paths. In developed countries, these contributions have provided valuable insights, given the considerable availability of modeling tools and data capacity, access to resources and opportunities for collaboration between researchers and stakeholder groups. In developing countries, by contrast, and despite long traditions of practices on adapting to climate variability that could be emplaced, these conditions are often missing. And yet developing countries are being increasingly engaged, and understandably so, in adaptation projects with international agencies and funds such as the UNDP,¹ World Bank,² Global Environmental Fund (GEF),³ and often possess unique experiences about past adaptation and coping practices (Gero M'ehoux, & Dominey-Howes, 2011; Rao, Oyoo, & Ndegwa, 2012; Ruijs, de Bel, Kononen, Linderhof, & Polman, 2011).

¹ UNDP promotes pro-poor and pro-growth adaptation that encourages climate-resilient economic development and sustainable livelihoods in the face of climate change. http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/strategic_themes/climate_change/focus_areas/adapting_to_climatechange/

² The World Bank is helping developing countries and their people find ways to adapt to the changes that have begun. <http://climatechange.worldbank.org/overview/climate-change-adaptation>.

³ As the financial mechanism of the UNFCCC, the GEF is the first entity to finance concrete adaptation actions on the ground, through three independent, distinct, yet complementary trust funds: The Least Developed Countries Fund (LDCF), The Special Climate Change Fund (SCCF), The Strategic Priority on Adaptation (SPA), under the GEF Trust Fund. <http://www.thegef.org/gef/adaptation>.

We focus on developing and demonstrating the value of flexible scenario approaches in adaptation planning for use in developing countries, by synthesizing lessons learned in Ghana, Tajikistan and Honduras. Specifically, we provide insights and discuss challenges related to the goals and potential roles of scenario approaches in adaptation planning at the national level, including the process of integrating diverse qualitative, quantitative and participatory approaches to develop credible scenarios.

Section 2 provides an overview of the relevance of scenario methods in climate change adaptation. Section 3 assesses the integration of different approaches for use in developing countries. We conclude by summarizing key challenges and potential of scenario planning for adaptation.

Scenario Methods in Climate Change Adaptation

Scenario planning is emerging in the social sciences as a methodology particularly well-suited to taking a long-term view while harmonizing diverse goals in the socioeconomic and environmental realm (Raskin, Gallopín, Gutman, Hammond, & Swart, 1998). We define a *scenario* as a story about the future that can be told in both words and numbers, offering a plausible and internally consistent explanation of how events might unfold over time (Raskin et al. 2002). The literature distinguishes two types of scenarios: *explorative*, showing what could happen, and *normative* or *backcasting*, showing how a solution to a particular problem might look like (Carlsson-Kanyama, Dreborg, Moll, & Padovan, 2008). The outcomes of the scenario planning can be used for multiple purposes, ultimately providing better policy or decision support and stimulating engagement in the process of change (Jaeger, Kasemir, Stoll-Kleemann, Schibli, & Dahinden, 2000; Carlsson-Kanyama et al., 2008).

A number of authors have recently emphasized the importance of using scenarios in adaptation planning (Carlsen et al., 2012; Tschakert & Dietrich, 2010). Shaw et al. (2008) and Langsdale et al. (2009) in Canada, Carlsen et al. (2012) in Sweden, and Tompkins et al. (2008) in the United Kingdom applied normative scenario approaches with stakeholder participation together with downscaled climate change impacts to identify relevant adaptation strategies. These scenarios included assumptions about population change, economic development and projected climate change impacts on local communities. Working with these trends, stakeholders discussed potential pathways for relevant key sectors and identified adaptation options under varying assumptions. Similarly, Langsdale et al. (2010) combined climate change projections with projected population trends, agricultural activities and conservation needs to identify adaptation options in the water sector, using an integrated model developed through stakeholder collaboration. Shaw et al. (2008) also developed a series of visualizations of the future including different climate impacts and possible adaptation options.

The reports on scenario approaches in adaptation planning emphasize methodological challenges related to ensuring effective participation of stakeholders, linking qualitative and quantitative information when developing scenarios, and assuring their relevance for adaptation planning and overall decision-making. Rooted in the earlier practices of group model building (e.g., Vennix, 1996), scenario development is seen as a powerful tool to engage stakeholders (Kasemir, Jaeger, & Jager, 2003). Such processes are now often referred to as participatory scenario development (PSD) (Kok et al., 2007; Bizikova, Nijnik, & Kluvankova-Oravska, 2012; Shaw et al., 2009). Participatory scenario development includes structured group processes where non-experts play an active role by articulating their knowledge, values and preferences when creating scenarios (Kok et al., 2007). In the recent application of scenarios in adaptation, a series of workshops was often used to regularly consult stakeholders on scenario elements and potential adaptations (e.g., up to two workshops in Shaw et al., 2009) and Carlsen et al. 2012). Langsdale et al. (2009) used four workshops to identify scenario drivers, define the components of integrated models, develop and evaluate scenarios, and identify adaptation options. Experience from these applications shows that scenarios can be developed without much technical skills—they can be easily understood by scientists, policy-makers and lay people alike, as also noted by van Asselt and Rijkens-Klomp (2002).

Stakeholder participation often results in qualitative scenarios which, combined with quantitative, model-based analyses, can shed light on the relationship among critical scenarios elements, identify inconsistencies and help provide evidence-based outcomes (Bohunovsky Omann, & Jäger, 2011; Robinson, Carmichael, Tansey, & VanWynsberghe, 2006). Potential linkages between the qualitative and quantitative domains include using quantitative data to provide

information on what is possible with regards to important drivers, such as facts and trends about technology options (Carlsen et al., 2012 in Sweden), land-use change (in British Columbia by Shaw et al. 2008) and other environmental variables; using integrated models to generate quantitative scenarios through discussion with stakeholders (Langsdale et al., 2009); and translating qualitative scenarios developed by stakeholders into quantitative models and then reviewing these with the stakeholders (for example Volkery, Ribeiro, Henrichs, & Hoogeveen, 2008). However, while interest is increasing in connecting quantitative information to participatory scenario processes, the linking should be done with caution, as inconsistencies may often arise between the quantitative and qualitative domains (Volkery et al., 2008).

Carlsen et al. (2012) distinguished three major roles for scenarios in adaptation planning: i) identifying future socioeconomic challenges; ii) identifying socioeconomic changes important to deal with climate change impacts; and iii) identifying appropriate adaptation options. From these three broad categories, recent applications have mostly focused on socioeconomic challenges, such as growing population, urbanization and demand for food (Shaw et al., 2009; Langsdale et al., 2009; Tompkins et al., 2008), changes in tourism (Carlsen et al., 2012) and identifying appropriate adaptation strategies in the context of future scenarios. These applications did not outline specific linkages between the scenarios outcomes and adaptation strategy development. Rather, the importance of using scenarios as learning tools for stakeholders was emphasized, to improve understanding of linkages between climate change and other sectors and priorities (van Aalst et al., 2008; Shaw et al., 2008; Tompkins et al., 2008; Tschakert and Dietrich, 2010). Specifically, scenarios were indeed mostly seen as learning and capacity-building tools for stakeholders, including decision-makers to improve their understanding of consequences of climate change at the local level, to help identify potential policy choices in the future (Tompkins et al., 2008; Shaw et al., 2008) and to identify robust adaptation choices relevant under diverse socio-economic and climatic scenarios (Carlsen et al., 2012; Langsdale et al., 2009).

Current practice in adaptation planning in developing countries is mostly focused on vulnerability and risk assessments, without extensive integration of scenario approaches (e.g., Fussler, 2007; Schröter, Polsky, & Patt 2005). These assessments are centred on current risks and vulnerabilities and then examine potential future vulnerabilities based on projected climate change impacts, often without looking at concomitant and important future socioeconomic and environmental trends (Schröter et al., 2005; Figure 1). By contrast, in community-based risk assessments, van Asselt et al. (2008) and Tschakert and Dietrich (2010) stressed the importance of extending current practice by not only identifying future trends in climate, but also socioeconomic trends such as migration and deforestation rates, which are also affected by climate change and must also be taken into account when designing future risk reduction strategies. These authors suggest that information on many important contextual factors can be provided by community members, who need to participate in integrated vulnerability and risks assessments. Finally, in developing countries, where challenges such as poverty, food, water and energy insecurity, or inadequate access to education and healthcare are fundamental to future well-being, the relationship between climate change adaptation and development needs to be much more closely connected. Therefore, especially in developing countries, climate change adaptation planning and actions must take into account measures to address socioeconomic and environmental challenges (Eriksen & O'Brien, 2007; Brown, 2011).

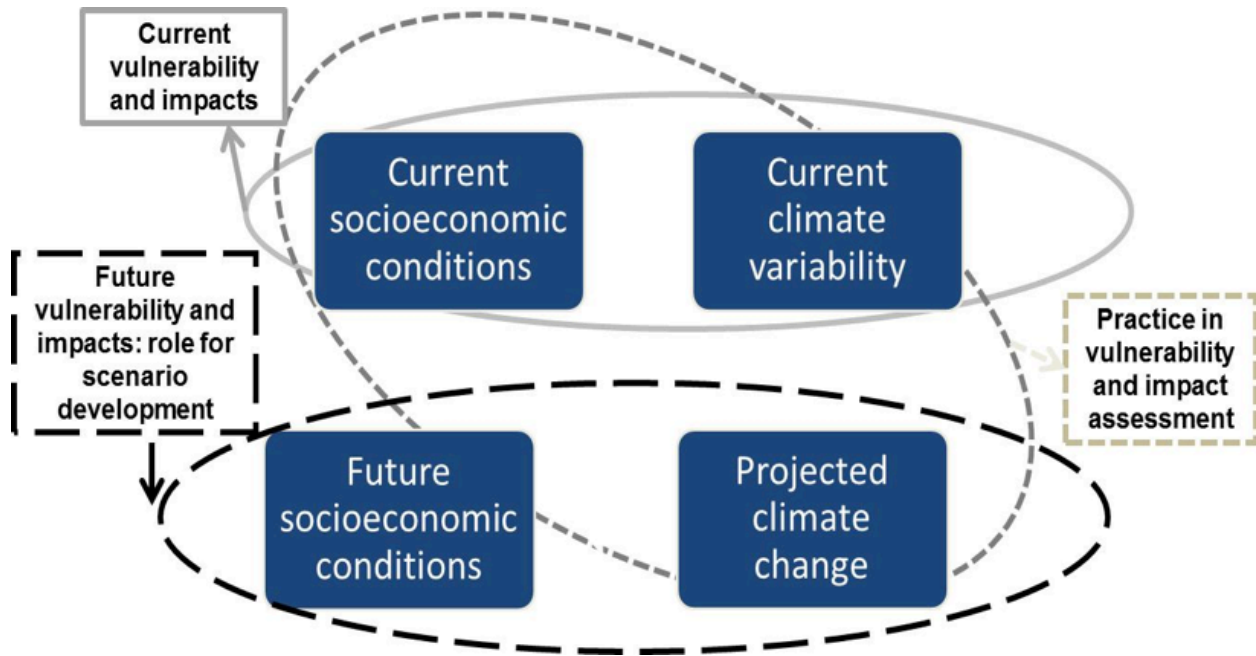


FIGURE 1. OVERVIEW OF KEY APPROACHES LINKING CLIMATE CHANGE IMPACTS AND SOCIOECONOMIC TRENDS

Scenario Development in Climate Change Adaptation Planning in Developing Countries: The cases of Ghana, Honduras and Tajikistan

Case studies are necessary to better understand how to design scenario approaches for adaptation planning in developing countries. In this section we examine recent experience, based on qualitative evidence and practitioner knowledge, with the use of scenario approaches in adaptation planning in Ghana (Yaro, 2010; World Bank, 2010), Honduras (UNDP BCPR, 2012; IISD, 2011b; Medeiros & McCandless, 2011; Rivera Sosa, 2011) and Tajikistan (Legro, 2012; Bizikova, 2012).

TABLE 1. OVERVIEW OF KEY GOALS, INPUT INFORMATION AND APPLIED QUANTITATIVE AND QUALITATIVE METHODS WITHIN THE SCENARIO DEVELOPMENT IN THE THREE CASE STUDIES

CASE STUDY	GOALS FOR THE SCENARIO PROCESS	INPUT INFORMATION	QUANTITATIVE METHODS	QUALITATIVE METHODS
Ghana	<ul style="list-style-type: none"> To help anticipate and understand the consequences of climate change in the context of desired and plausible socioeconomic scenarios (Yaro, 2010). To provide context for stakeholders to identify and prioritize relevant adaptation options over time (Yaro, 2010). To validate and complement analysis and estimates provided by the sectorial economic analyses assessing the costs of adaptation (World Bank Group, 2010). 	Population projections and economic growth indicators; urbanization rate.	Climate change projections on key climatic variables (temperature, precipitation, hydrological changes and changes in growing seasons) and impacts on crops, flooding and impacts of infrastructure.	Surveys on vulnerability and adaptation, coping strategies in vulnerable areas "hotspots."
Honduras	<ul style="list-style-type: none"> To identify goals and priorities for sustainable crop production in the context of climate variability and change. To prioritize possible climate risk management options (infrastructure, ecosystems-based, technology, capacity). To discuss the feasibility of those options (possible consequences and trade-offs) and identify policies, programs and plans and intervention are needed (IISD, 2012; Riviera-Sosa, 2011). 	Population projections and economic growth indicators; urbanization rate.	Climate change projections on key climatic variables (temperature, precipitation, hydrological changes and changes in growing seasons) and impacts on crops, flooding and impacts of infrastructure.	Surveys on vulnerability and adaptation, coping strategies in vulnerable areas "hotspots."
Tajikistan	<ul style="list-style-type: none"> To assist in capacity-building on climate change and adaptation needs. To validate the priority areas in the Strategic Program for Climate Resilience in Tajikistan (SPCR) to ensure that the identified priorities are in line with the capacities of the communities. To complement the SPCR with activities that are considered crucial from the stakeholders' perspective to increase capacities to adapt and in the context of other development priorities (Bizikova, 2012). 	Population projections, agricultural supply and demand; life expectancy and poverty levels.	Climate change projections on basic climatic variables such as temperature and precipitation and impacts on glaciers.	Review of institutional capacities on adaptation to climate change. Series of interviews to review current adaptation projects including key capacities and gaps.

All three cases reviewed followed a similar framework, presented in Bizikova, Boardley, & Mead (2010) and Bizikova et al. (2012) and built on earlier applications involving diverse issues such as land-use planning, urban development and emission reduction (Robinson et al., 2006; Kok et al., 2007; Volkery et al., 2008). The normative approach was used, including a process by which qualitative scenarios were developed based on participants' understanding of their socioeconomic and environmental systems, including but not limited to climate variability and climate change. The scenarios were developed in workshops that combined small groups and plenary sessions, and were guided by expert facilitators. Secondary quantitative data was used to describe current and future development trends, climate change projections and experiences with adaptations to inform participants as they were constructing future scenarios and identifying adaptation needs. Details of the processes, including the goals of the scenario development, input information and methods used, are presented in Table 1. The key characteristics of the scenarios used in the three case studies are presented in Table 2.

The first case study was conducted in Ghana from 2009 to 2010 and combined national, regional and local assessments. Climate change projections for Ghana indicate warming in all regions and an intensification of cyclical patterns of high rainfall and drought (World Bank, 2010). The purpose of the scenario exercise was to help anticipate and understand the consequences of these changes in the context of desired and plausible socioeconomic scenarios and to provide context in which stakeholders could identify and prioritize relevant adaptation options (Yaro, 2010).

In the case of Ghana, diverse methods were used to support scenario development, including household interviews and focus groups involving over 100 participants, as well as quantitative climate change projections, including impacts on hydrology, water resources and key crops (Yaro, 2010; World Bank, 2010). Two national and two regional scenario development workshops were conducted, with 20 to 40 participants in each of the workshops, including representatives of the national and regional governments, community members, chiefs, farmers, academics, experts in resource management, local and international organizations (Yaro, 2010).

To identify adaptation options, scenarios were used to explore both hard (e.g., technology and infrastructure) and soft (e.g., awareness raising, capacity development, governance and policy) adaptation. The options identified were used to validate previous analyses, prepared with other methods, especially estimates from economic sector analyses that assessed the costs of adaptation (World Bank, 2010).

In the case of Honduras, the focus was on identifying adaptations to current and future climate variability, predominantly climate change risks. Communities in the country are highly vulnerable to climate impacts, especially in the agricultural sector, which is the major source of livelihoods (IISD, 2012). The specific focus was on identifying how sustainable crop production could assist in responding to climate variability and change, prioritizing possible adaptation options, looking at consequences and trade-offs, and identifying which policies, programs and interventions were needed for implementation (IISD, 2011b). A diverse set of methods was used to support participatory scenario development, including an assessment of climate change impacts on key crops using the Decision Support System for Agro-technology Transfer (DSSAT) model and local consultations in 20 communities across the country on specific current and potential future local adaptation options using CRiSTAL (IISD, 2011a and 2011b; Medeiros & McCandless, 2011). The DSSAT model focused on key crops, such as maize and beans, for 14 municipalities across Honduras, using information on land-use type, soil temperature and water availability, planting practices such as row spacing and planting depth, and climate projections (Medeiros & McCandless, 2011). Scenarios were developed at a national workshop that brought together climate projections with the results of crop modeling and local consultations. The workshop involved approximately 60 stakeholders, including sector experts at the regional and national levels, farmers, academics, resource managers and decision-makers.

The third example focuses on Tajikistan, one of the most vulnerable countries in Central Asia. The country faces many development challenges dating back to the centrally planned Soviet system, compounded by additional challenges that arose during the transition process (UNDP, 2009). Tajikistan has a relatively high sensitivity to climate change, coupled with low adaptive capacity compared with other countries in the region (World Bank, 2009). Tajikistan is one of 11 countries and regions selected for funding through the Pilot Program for Climate Resilience⁴ under the Strategic Program for Climate Resilience (SPCR, 2011).

In Tajikistan, scenarios were used to assist in awareness raising and capacity-building for climate change impacts and adaptation and to identify priorities, development trends and gaps of key stakeholders in adaptive capacity, propose recommendations and, therefore, complement the priority components identified in the Strategic Programme for Climate Resilience (SPCR). The scenario approach was supported by an institutional assessment of current legislation, programs and capacities to implement adaptation measures, including a series of approximately 50 interviews with stakeholders representing government and non-governmental agencies, experts and managers (Legro, 2012; Bizikova, 2012). In total, five scenario workshops took place, from September through November 2011, with a total of 124 participants. About two-thirds of the participants represented local, regional or national government, academics or other research staff affiliated with a university or institute, and managers or experts, often focused on water, land management or agriculture. The rest of the participants were farmers, producers, or representatives of business, non-governmental or other civil society organizations.

⁴ The Pilot Program for Climate Resilience, approved in November 2008, was the first program under the Strategic Climate Fund. The program aims to ensure climate resilience is integrated into development planning, budgeting and investments in participating countries (SPCR, 2011).

TABLE 2. OVERVIEW OF THE CHARACTERISTICS OF THE SCENARIOS IN THE THREE CASE STUDIES

CASEY STUDY COUNTRY	TIME FRAME	KEY SECTORS	MODES OF PARTICIPATIONS	NUMBER AND TYPES OF SCENARIOS
Ghana	2050 with focus on short-term (up to 2015) and medium-term actions (2015-2030)	Agriculture Pastoralism Forestry Water Resource governance Migration	Two national and two regional workshops; approx. 120 participants total	Two national scenarios Two regional scenarios
Honduras	2040 with focus on short-term actions (up to 2015 and 2015-2020)	Agriculture (subsistence and cash crop farming) Water Health Resource governance	National and regional workshops; approx. 80 participants total	Four national scenarios Two regional scenarios
Tajikistan	2040 with focus on short-term (up to 2015) and medium-term actions (2015-2020)	Agriculture (subsistence and cash crop farming) Water Energy and infrastructure Education Health Migration	Four regional and one national workshops; approx. 124 participants	Two national scenarios Four regional scenarios

Results and Discussion

Roles of Participatory Scenario Development in Adaptation Planning

The three cases represent examples of scenario development at the national scale, with different roles and focus of the approach towards adaptation planning. Overall, scenario development played two different roles: i) capacity building/awareness raising, and ii) validation and completion of actions within ongoing donor-driven initiatives.

The literature recognizes the importance of awareness raising and capacity building towards increasing adaptation capacity, because they improve stakeholders knowledge and allow for experience sharing (Gero et al., 2011; Ruijs, et al., 2011). The capacity to adapt requires learning and the ability to make sense of information by using a combination of sources and knowledge (Walker, Gunderson, Kinzig, Folke, Carpenter, & Schultz, 2006; Pelling, High, Dearing, & Smith, 2007). Stakeholders worked with targeted information, such as climate change impacts on relevant crops in Honduras, examples of local coping and adaptation strategies to different impacts of climate variability in Ghana, and examples of successful pilot projects to reduce impacts of climate variability in Tajikistan. Awareness raising was implemented by providing targeted and collected information that was not previously available to stakeholders, and especially decision-makers, on climate change impacts on specific crops, climate projections and examples of local adaptations and capacities.

From this point of view, the process of participatory scenario development is an end in itself (as suggested by Stirling, 2006), helping to raise awareness and building capacity through the active integration of diverse information on development challenges and projected climate change impacts. Similar to van Aalst et al. (2008), stakeholders in each case valued the scenario approach that allowed them to create explicit linkages between climate change and development scenarios, visions and goals, as they were concerned as much about impacts of climate change and adaptation as they were about other socioeconomic and environmental changes. (For example, besides climate change, concerns included; in Honduras, new planting practices such as agroforestry, linkages between the access to irrigation technologies and food security; land tenure structure, market access and infrastructure for improving situation of poor and vulnerable groups in Ghana; and energy sources, migration and agricultural production in Tajikistan.

Beyond capacity building, participatory scenario development had other specific goals in all three cases. These included validating and complementing climate change impact assessments and future adaptation actions that had been outlined in other relevant programs and strategies. For example, scenario development was used to assess the relevance of adaptation options included in the estimation of adaptation costs by a computable general equilibrium model (CGEM) in Ghana (World Bank, 2010) and of the priority areas for increasing climate resilience in the Strategic Program for Climate Resilience in Tajikistan (SPCR, 2011). In both cases, scenario development provided a context for examining the relevance of current and future adaptation needs as related to socioeconomic priorities and goals identified by the stakeholders. We also used scenarios to identify additional options, to complement other strategies and plans, such as the national communications, SPCR in Tajikistan, and those included in economic modeling and assessment in Ghana (World Bank, 2010). Additional adaptation included changes in resource governance, capacity-building, and policies and programs such as protecting natural buffers and learning new sustainable land-management practices. Additional general development measures, such as improvement of social safety nets, access to health care and infrastructure for energy and water were taken to increase the effectiveness of more adaptation specific initiatives.

Using Qualitative and Quantitative Methods to Provide Inputs for Scenario Development

Overall, scenarios are seen as flexible tools that can incorporate information from a variety of fields (see Van Asselt & Rijkens-Klomp 2002). In the previous studies applying participatory scenario development (for example Jaeger et al., 2002; Bohunovsky et al., 2011; Kok et al., 2007; Shaw et al., 2009), scenarios were seen as qualitative storylines that were valuable for inspiring people to think beyond business-as-usual approaches to climate change and adaptation. However, backing up storylines with quantitative data helps anchor scenarios in evidence and both widens their scientific foundation and increases their value for policy-making (Bohunovsky et al., 2011; Volkery et al., 2008; Kowalski, Stagl, Madlener, & Omann, 2009).

In the case studies we focused on four areas of input information directly relevant for adaptation planning (for example Schröter et al., 2005; Smit & Wandel, 2008). These areas broadly included future socioeconomic trends, climate variability and projected climate change (Figure 2). Specifically, information gathering included reviews of current planning and strategic documents, quantitative information obtained from global scenarios and quantitative modeling, and qualitative information on local challenges to adaptation. Furthermore, decision-makers and stakeholders involved in the case studies saw this information gathering as an opportunity to develop/gather additional quantitative and qualitative information relevant for the country.

In scenario development it is important to account for current and future trends, including those relevant for planning documents. We found that building on existing planning documents in the scenario process could increase decision-makers' interest in participating in the process. To facilitate this, during the case studies we reviewed relevant development strategies such as Tajikistan's Poverty Reduction Strategy, National Development Strategy for 2015 and National Action Plan (NAP) for Climate Change Mitigation (The Government of Tajikistan, 2003, 2009 and 2010). We also gathered information about sector priorities and planned major investments over the short and medium terms (up to 10 years) especially at the national level. However, we found that those long-term socioeconomic and environmental trends necessary to account for longer-term climate change impacts and adaptation planning were not sufficiently captured, requiring analysis and downscaling of global scenario projections.

At the global scale, scenarios on future development trends are available from the International Panel on Climate Change's Special Report on Emissions Scenarios (Nakićenović et al. 2000), UNEP's Global Environmental Outlook (GEO; UNEP, 2007 and 2012), FAO (Conforti (ed.), 2011) and others. Each global scenario gives rise to different regional and national implications regarding such things as population growth, demand for resources, and land-use change. Because of limited information available on quantitative future trends specific to the three countries, with the involvement of stakeholders we chose trends from global and regional scenarios relevant to national issues, such as trends in population, life expectancy, agriculture, urbanization and resource demands. We then used this information as boundary conditions to improve stakeholders' understating of the potential scale of the change at the country level, with uncertainties. These trends were used to examine the developed scenarios by creating a series of 'what if' questions such as what if the population, urbanization or water use would be at the level presented by the already published national and regional scenarios. This helped to ground the scenarios in evidence to avoid what Carlsen et al. (2012) call "myopic traps" or creating scenarios based only on the stakeholders' inputs and knowledge.

Building on the information gathered on socioeconomic trends, we found that it was important to provide additional information on climate change to stakeholders to help with scenario planning. Stakeholders strongly emphasized the importance of information on climate change, especially projections for relevant sectors and examples of current and potential future adaptation, their effectiveness, and relevance for different social groups such as vulnerable groups, small-scale farmers and migrants. In all cases, after reviewing the available climate change projections, we worked together with local and international agencies and consultants who were involved in other parts of the projects that the case studies were part of. In Honduras, climate projections were developed by local consultants (IISD, 2012), in Ghana by an international organization that was a project partner, and in Tajikistan by international organizations involved in other relevant projects.

Providing information on climate change impacts was challenging, as information was available only on climatic variables such as precipitation and temperature with limited application to water availability, crop production or disease occurrence (similar examples were presented in van Aalst et al., 2008 & Carlsen et al., 2012). This is particularly challenging for stakeholders who are interested in identifying adaptation options based on linking climate change impacts and socioeconomic and environmental development priorities. To address some of these challenges, in Honduras (in collaboration with local organizations and universities) we developed projections of climate change impacts on key crops, including bean and maize, using both information from public databases and data provided by local partners (Medeiros & McCandless, 2010).

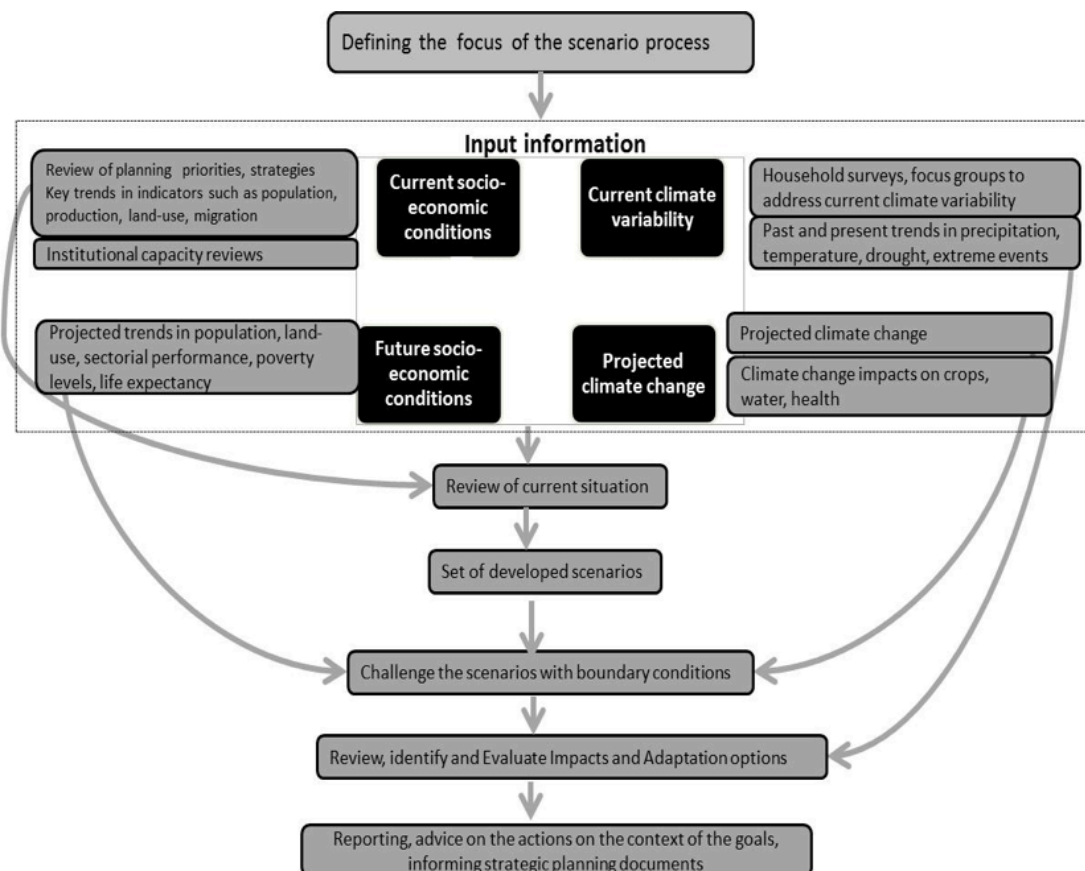


FIGURE 2. KEY STEPS IN THE SCENARIO DEVELOPMENT PROCESS, WITH QUALITATIVE AND QUANTITATIVE INPUTS

In terms of qualitative approaches, no systematically collected data for our countries was available, but we could rely on information from previous studies to identify areas that would work well for qualitative data collection. In each country we collected information on current adaptation practices and capacities to inform the scenario process. This information was used, for example, to identify specific needs and adaptation capacities of people at risk living in vulnerable areas in Ghana and Tajikistan, and specific adaptation needs and capacities in areas of larger- and small-scale agriculture in Honduras. To collect such information, in Honduras we conducted interviews in 20 communities (IISD, 2012), and in Ghana we undertook a series of household surveys and focus groups (Yaro, 2010).

The created inputs, including the information of impacts of climate change, socioeconomic trends, available capacities and adaptations, were brought in at the different stages of the scenario development process (Figure 2). Input information was plugged into the different stages of the scenario workshop, followed by participatory activities to further inform pre-developed scenarios and identified adaptations. Information on current trends, including information covering a number of relevant sectors, was used to bring the participants up to date with respect to recent past and present situations, which not all of them may have been aware of.

Finally, not only the actual information provided is important but it is equally crucial that the input information is presented in an understandable form for the stakeholders. We often asked local experts to introduce the information with specific local examples and additional time was provided in a form of plenary discussions to help participants clarify and work with introduced inputs during the participatory sessions of the scenario planning workshops.

Participation and Collaboration During the Scenario Development Process

Participatory methods are not always used in a structured way; practitioners often prefer a “just do it” approach instead. However, using participation as an element of a research process requires social scientific knowledge and craftsmanship where ad hoc approaches are not sufficient (van Asselt & Rijkens-Klomp, 2002). Scenario processes need to be planned in advance, including decisions about how qualitative information will be generated and used, and how the different stages of the process build on each other. Local stakeholders need to be consulted to provide advice on other local experts, similar to a “snowballing” interview process, to help identify local sites for interviews or surveys. Stakeholders may also point out available climate projections and other local data needed for modeling, and preferred ways of conducting scenario development. Local organizations provided projections for basic climatic variables in Tajikistan, experts from a local university provided vulnerability maps in Honduras, and stakeholders shared experiences with adaptations in Ghana. Key sectors and boundary conditions for the scenarios were identified at the beginning and modified during participatory workshops.

Similar to other scenario methods, scenario workshops that are centered on participation are very interactive. The success of the whole process depends on preparation, the information provided to stakeholders and the actual effectiveness of the workshops’ process implementation. In most cases, we conducted multiple workshops to ensure in-depth understanding of place-specific challenges, especially in hot spots. We conducted four regional workshops in Tajikistan and two local workshops in Ghana that were summarized in national workshops later. Conducting workshops with focus on different scales in a country was important, because stakeholders at different levels have different perspectives, winners and losers may vary, and different sets of issues and opportunities come into focus (Kok et al., 2007). There are also important cross-scale linkages both from the perspective of vulnerability and adaptation. Also, adaptation may require new forms of collaboration between higher-level and local organizations, especially in developing countries, where individual organizations, particularly at the local scale, often have very limited capacity.

To make the scenario process effective, the workshops need to follow the same methodology with skilled facilitators. In most countries, local organizations and consultants have experience in using various participatory methods, such as running local consultations, poverty appraisals and livelihood assessments. In order to prepare local facilitators, a weeklong “training of trainers” event was held to review the workshop methodologies in detail, to train facilitators in the various details of scenario workshop delivery, to discuss possible outcomes, and to review the reporting and documentation of results. During this week, potential facilitators also participated in a mock-up workshop with participants, to help them anticipate and successfully handle a variety of possible situations in a no-risk learning environment.

Challenges in Applying Scenarios During Adaptation Planning

Conducting scenario processes in the three developing countries described required addressing the challenges and weaknesses of the process. Both our experience and the literature (for example van Asselt et al., 2008; Carlsen et al., 2012; Shaw et al., 2009) point to increasing interest in stakeholder involvement in adaptation planning by decision-makers, researchers, farmers and other groups. Groups like these are increasingly consulted under different projects of international agencies, national and local organizations, although their time and capacity to provide input is limited. Therefore, it is important to inform and possibly connect with other organizations working in the same region and, ideally, link the scenarios with other relevant planning processes in the country, such as sectorial planning and policy reviews. In this way, scenarios could feed into strategic documents or other projects and thus minimize the pressure on stakeholders and raise their interest in being involved in the process.

In the three countries described herein, scenarios were developed to address specific thematic needs within the specific project, which could limit their application for other issues with unique technological, policy and economic conditions. To address this limitation, creating scenarios for multiple purposes would be beneficial; this would require a transparent, well-prepared scenario development process involving national, international and other agencies and stakeholders operating in the country and regionally. Such higher-level, more generic scenarios could provide a basis for integrated analysis of climate change mitigation or adaptation issues and other planning processes, instead of creating scenarios under specific adaptation planning initiatives and projects.

Finally, as stated recently in Carlsen et al. (2012), van Aalst et al. (2008) and others, it is still challenging to provide or produce information on climate change in finer spatial resolution and with relevance for key livelihood types, especially for many developing countries. It includes both the ability to access projections with clear indication of uncertainties and to conduct downscaling of key climatic parameters at the finer resolution (e.g. 10 - 50 square kilometres). It is certain that the availability of climate change impacts information has improved during recent years thanks to considerable efforts to provide information on climate change projections, hazards and other impacts, especially on the national scale (e.g., the Climate Change Knowledge Portal (CCKP) developed by the World Bank Group⁵, the Adaptation Learning Mechanism (ALM)⁶ launched by UNDP and online climate data directory by NOAA⁷). However, further information is needed on projected impacts across key sectors that could then be better integrated with socioeconomic scenarios and adaptations practices and gaps.

⁵ <http://sdwebx.worldbank.org/climateportal/index.cfm>

⁶ <http://www.adaptationlearning.net/>

⁷ <http://www.ncdc.noaa.gov/oa/climate/climatedata.html>

Conclusion

In this paper, we discussed the application of scenario approaches to adaptation planning in three developing country case studies. During the process of conducting these case studies a number of lessons learned could be synthesized that could aid in future scenario application in adaptation planning. Scenarios approaches related to adaptation have to date been used mostly for awareness raising and capacity-building in developed countries (for example Shaw et al., 2009; Langsdale et al., 2009; Carlsen et al., 2012). Their value for these purposes was also demonstrated in the three developing countries. Scenario development processes provided context for climate change impacts and adaptations and helped identify adaptation options that are compatible with other pressing developing country priorities such as poverty reduction, access to health care and employment. Furthermore, the case studies have shown that scenarios could have specific roles in adaptation planning by validating and complementing adaptation strategy development, by providing a platform to bring together diverse quantitative and qualitative information and by creating a structured process for stakeholders' interactions.

Scenario development enriching climate change impact assessments and adaptation planning

Planning for adaptation encompasses two important aspects: considering diverse type of actions ranging from infrastructure to institutional change to re-thinking overall development choices and pathways such as allocation of agricultural practices, coastal development and urban planning. Scenario approaches could help frame the discussion about development choices such as future allocation of sectors, size of urban centers, demand for services, poverty reduction strategies etc. and thus provide a context for needed and preferred adaptation options. Furthermore, the scenarios provide indication of types of appropriate (e.g. Carlsen et al., 2012) and preferred adaptations by stakeholders' groups such as needed changes in infrastructure, actions to develop institutions and promote collaboration between agencies, and measures improving ecosystem services to increase protection from climate change impacts. In this context, scenarios could also provide specific contribution to adaptation strategies and initiatives by validating and complementing adaptations included in economic assessments, GIS-based tools and national and regional priorities for funding allocations. In order for scenario processes to provide such contributions it is crucial to:

- Clarify the specific role of the scenario development within the adaptation planning and initiatives at its early stages so the other steps in the strategy/initiative implementation are done in a way that they could be integrated into the scenario development, often involving diverse stakeholders' including public, diverse experts and community members.
- Design a scenario development process that covers different spatial, governance scales so the created scenarios not only account for priorities at the national level implemented by national agencies, but they are able to include regional differences and priorities and decision-making authorities from the local and regional agencies.

Scenario development provides a platform for integration of diverse approaches and information

Scenario development could be seen as an added value to already on-going assessments and research as it could provide a platform to bring together outcomes from diverse methods and approaches. Especially because adaptation has a strong cross-cutting nature (including cross-jurisdictional and cross-sectorial aspects) this would require coordination between different sectorial priorities implemented over space and time. Scenarios could provide a platform where stakeholders could interact to bring together narrowly focused assessments and identify trade-offs, win-win options and gaps. In order to effectively integrate diverse sources of information and approaches within the scenario process, the following key issues would need to be considered:

- Provide details about the characteristics of the scenario process including the areas, sectors, time horizons, considered key trends so the input information and approaches could be adjusted to address these needs e.g., cover the area of the interests, present the outcomes in relation to the involved sectors, assess changes over the same/similar time horizons.
- Identify specific contribution of the inputs and approaches to the process, e.g., provide information on specific agricultural practices and crops, indicate feasible local adaptations according to different livelihoods and illustrate changes in the availability of ecosystem services over time for different sectors.

Scenario development creating a structured process for stakeholders' interactions

One of the key advantages of scenario development is that it could bring together experts from different fields, decision-makers, and the public, including people with indigenous knowledge. However, this also means that the scenario process needs to be crafted in a way that these diverse groups could meaningfully interact and contribute to the process. This include considering customs and traditions in the regions because working together in groups and sharing information between participants may not always be possible, and the used information may not always be easily understandable for all backgrounds. Participation is also time-consuming and therefore choosing timing, locations and format for stakeholder interactions is crucial; specifically:

- Set up a collaborative relationship with a local organization/agency that works in the country to identify best ways of participation, timing of the workshops incl. season, starting and ending times to fit the needs of the specific place.
- Ensure effective collaboration with the local organizations, agencies and other stakeholders.
- Collaborate with a local organization/agency to identify participants from different sectors, fields, expertise; consider stakeholders that have a strong expertise in development, livelihoods beyond just considering experts on climate change and impacts assessments.

Finally, based on the lessons learned from the developing country case studies, further research is needed on strengthening the evidence base for future trends in developing countries both related to climate change and climate change's broader socioeconomic context. While considerable efforts have been made to provide information on climate change projections, hazards and impacts at the national scale, more information is needed on impacts on livelihoods in natural resource-related sectors such as agriculture, fisheries, tourism, extractive industries and over medium-time horizons such as 2030 to 2050. Further information is also needed on linking projections in global socioeconomic scenarios to those at national and regional scales. Thematic projections and trends for demographics, agricultural production, land-use change, urbanization and other trends could help countries explore linkages between future trends in socioeconomic and environmental systems and climate change.

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Head Office

161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4

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