

Strategies for reducing vulnerability and building resilience to environmental and natural disasters in developing countries

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1. Introduction

Climate change is today's biggest threat to development and disproportionately affects poor and vulnerable people. The Intergovernmental Panel on Climate Change (2015) predicts that by 2100, climate change is expected to increase the number of poor people in both developed and developing countries, jeopardizing sustainable development. Numerous reasons exist as to why poverty still exists but one major reason is the increasing number of environmental and natural disasters people will face. The frequency and intensity of natural disasters associated with climate change disproportionately reduces the ability of the poor compared to the non-poor to cope with disasters because they are more vulnerable to climate shocks, they lack finance and alternative livelihoods, have limited social safety nets and access to technologies to help them adapt to climate change. Climate shocks and stresses keep or bring households into poverty because the poor are overexposed to impacts of climate change, which can cause loss of assets and production, increase in vector borne diseases, and food price shocks (World Bank 2016, 2017). Climate change will continue to threaten human well-being and undermine progress towards reducing poverty unless it is well integrated into development agendas.

The United Nations recognizes the threat that climate change imposes and has included Target 1.5 under Sustainable Development Goal (SDG) 1 to "end poverty in all its forms everywhere." Target 1.5 states that by 2030, the world must "build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate related extreme events and other economic, social, and environmental shocks and disasters" (UN 2016c). Additionally, Goal 13 focuses purely on climate change calling on "urgent action to combat climate change and its impacts." Target 13.1 states that we must "strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries."

Countries around the world are already beginning to incorporate issues of vulnerability, adaptation and resilience into their nationally determined contributions towards climate change. Prior to the landmark Paris Agreement, signed in April 2016 by 175 Member States, over 70 per cent of parties to the UN Framework Convention on Climate Change included an adaptation component in their plans for climate action (UN 2016b). This suggests that more and more countries are serious about moving their country's development trajectory to development that is climate informed, which places climate change at the center to reduce vulnerability, address poverty, and build resilience.

This paper aims to highlight strategies that adaptation planners can use to help people adapt to climate change by reducing vulnerability and building resilience, and hence, help meet Targets 1.5 and 13.1. Adaptation calls for human-driven adjustment to economic, social, and environmental systems in response to climate impacts. By implementing adaptation options, vulnerability, which is the degree of susceptibility to an adverse effect of climate change, can be reduced (Adger 2006). Reducing

vulnerability by implementing adaptation options leads to building resilience. Resilience is the ability of a system to absorb climate induced shocks or disturbances while either retaining the same basic structure and ways of functioning or bouncing back better. The central element required to building resilience is boosting adaptive capacity of people or the ability to adjust to a climate stimuli (ODI 2010).

The strategies described in section 2 are based on adaptation practices that have been applied in various contexts, and have proven to be successful in reducing vulnerability, building resilience, and addressing poverty. Applying the strategies in this paper by integrating them into climate change and development projects and programs can help to protect lives and livelihoods. It should be noted, however, that this paper does not offer or advocate for any specific adaptation solutions or options because options are context specific. Instead, this paper focuses on five strategies that can be considered as building blocks before implementing any specific adaptation option.

The five strategies include conducting a vulnerability assessment; incorporating uncertainty into resilience planning; engaging socially marginalized groups in decision making; monitoring, evaluating, and learning; and scaling adaptation options. To illustrate how these strategies have been applied around the world, this paper provides examples that describe how the strategies have been applied and have helped to reduce vulnerability and build resilience. The paper concludes in Section 3 with recommendations on applying the strategies to reduce vulnerability and build resilience so that poverty can be tackled within the context of 2030 Agenda for Sustainable Development.

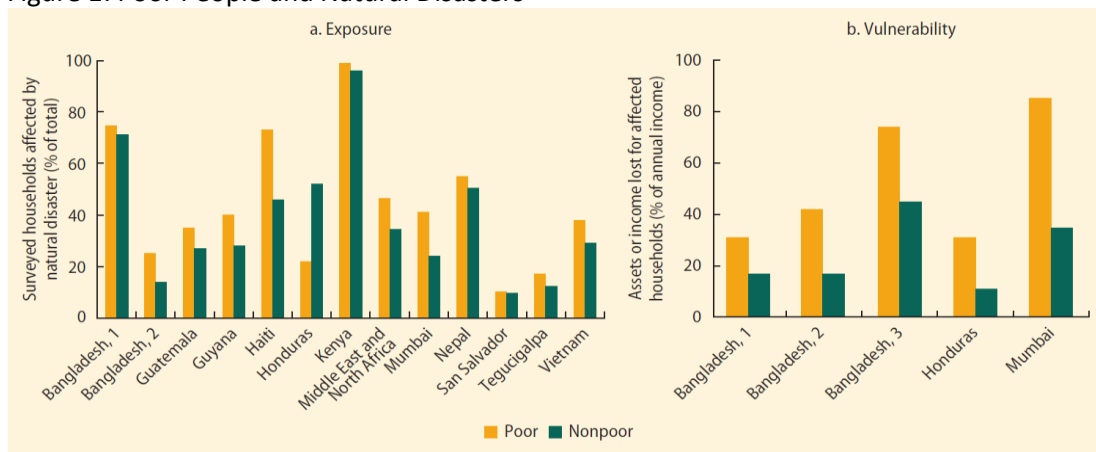
2. Strategies to Reduce Vulnerability, Address Poverty, and Build Resilience

This section highlights strategies that have been tried and tested in various contexts that can help reduce vulnerability and build resilience. They have been derived from climate change adaptation literature and are referred to as “good” adaptation practices. This section also provides examples to illustrate how these strategies have been applied to demonstrate how poor people have reduced their vulnerability and build resilience.

(a) Strategy 1: Conduct Vulnerability Assessments to Develop Resilience Plans

The poor are highly vulnerable to impacts of natural disasters. The Intergovernmental Panel on Climate Change defines vulnerability as “the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change” (McCarthy et al. 2001). Vulnerability is comprised of three components: degree to which a system experiences environmental and socio-political stress (exposure), degree to which a system is modified by the stress (sensitivity), and the ability of a system to evolve to accommodate environmental hazards or policy change (adaptive capacity) (Adger 2006). Figure 1 below shows that the poor are much more exposed and vulnerable to natural disasters.

Figure 1: Poor People and Natural Disasters



Source: World Bank 2016

To reduce vulnerability, it is important to first understand what vulnerabilities exist by conducting a vulnerability assessment. Often, in practice a vulnerability assessment primarily focusses on exposure and sensitivity of biophysical systems. Comprehensive vulnerability assessments, however, go beyond measuring biophysical exposure to climate change impacts. They include assessment of climate risks; social, economic, and ecosystem vulnerability; assessment of people’s capacity to cope with and plan for natural disasters; and institutional mapping that identifies organizations who can help manage climate risks (CARE 2016). They specifically incorporate socioeconomic vulnerabilities of people and identify those who are resource poor so that they can be targeted to build their adaptive capacity. Therefore, vulnerability assessments include economic research on how climate impacts poverty and wealth, and gender analysis to assess the adaptive capacity of men and women.

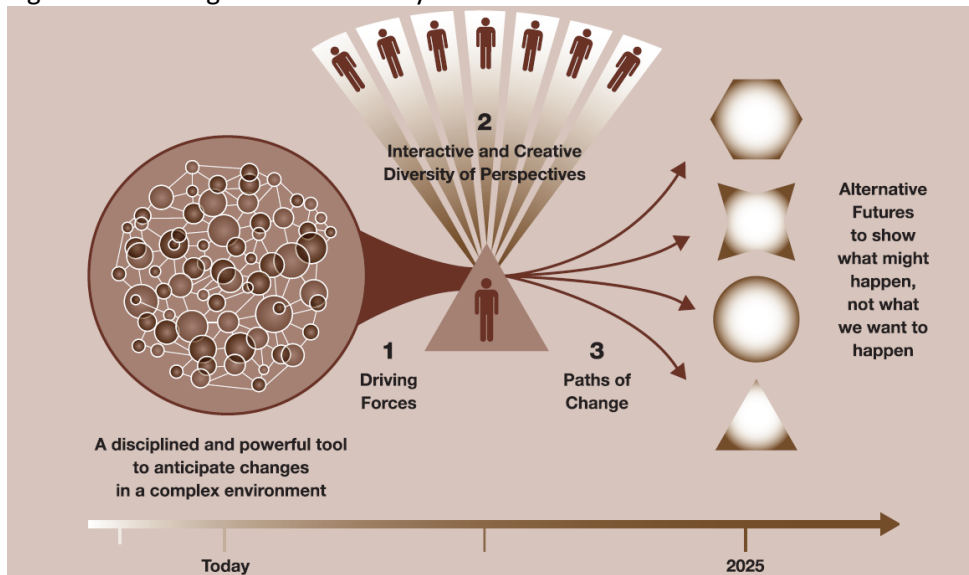
For vulnerability assessments to be effective in reducing vulnerability, they need have credible scientific information, and be salient to local level adaptation planners and beneficiaries of adaptation interventions to be effective (Chaudhury et al. 2014). For instance, pastoralists in Northern Kenya face drought quite often. To help pastoralists reduce their vulnerability and build their resilience, the International Institute for Environment and Development (IIED 2013) acted as a knowledge broker, working jointly with scientists conducting the vulnerability assessment to inform local climate planning to help pastoralists adapt to climate change. IIED also worked with NGOs in Northern Kenya to ensure that scientists were incorporating views of vulnerable pastoralists. Scientists collaborated with local level planners to apply different methods to collect information for the vulnerability assessment ranging from community resource mapping, focus group discussions, and forecast workshops. Downscaled climate projections were also integrated into the assessment. IIED and its NGO partners helped scientists and pastoralists to work together to identify who is socially and economically vulnerable and adaptive capacity measures needed by using scientific information and incorporating local understanding of who is vulnerable. The vulnerability assessment conducted was highly effective since it allowed for consensus between pastoralists and government officials as to where funds should be allocated to implement adaptation options to reduce vulnerability. The assessment is also included in the Kenyan National Adaptation Plan and County Livestock Strategy, and is being used to streamline scaling-up adaptation activities in neighbouring counties. These achievements have been highlighted in Kenya’s National Climate Change Strategy.

(b) Strategy 2: Incorporate uncertainty in resilience planning

When planning for adaptation, weather information is crucial. For instance, it is important for a farmer to know when the rain will arrive, which will determine when crops are planted and harvested. Weather information is provided within a short timescale, that predicts what could happen within the next five days. It is also offered in the form of long-term forecasts, which can suggest what may happen in a months' time or within a particular season. Both short- and long-term weather information are critical for planning how to reduce vulnerability and plan for adaptation (WRI 2015). However, weather forecasts become more and more uncertain in the future because it becomes less clear how much rain will fall and how high the temperatures will be in a long-term horizon – so it is essential that planners learn to incorporate uncertainty into their decision making.

Incorporating uncertainty into decision making means planning for different scenarios, which are defined as plausible futures, since it is unclear which scenario will actually take place. This offers decision makers the ability to be flexible since planning with different scenarios in place enable planners to think about a variety of options and when they could be implemented over time should a scenario actually become real (Sterrett 2011). Planning through an uncertainty lens also allows for more anticipatory measures to be in place, rather than reactive when it may be too late to implement an adaptation option. Scenario planning in adaptation is gaining ground. This requires visualizing potential climate impacts and vulnerability decades ahead to identify adaptation goals from short- to a long-term time frames, and anticipate plausible futures (Chaudhury et al. 2012). Figure 2 below shows several stages in scenario development (IFRCRCS 2016). First is the identification of the 'driving forces' through tools that help anticipate changes, such as changes in weather patterns. Second, experts from government, non-governmental organizations, private sector, and research institutes communicate with each other to visualize plausible future and pathways. In stage 3, this leads to developing different scenarios or alternative futures, which could show how the weather may be different in 2025.

Figure 2: Planning with Uncertainty



Source: IFRCRCS 2016

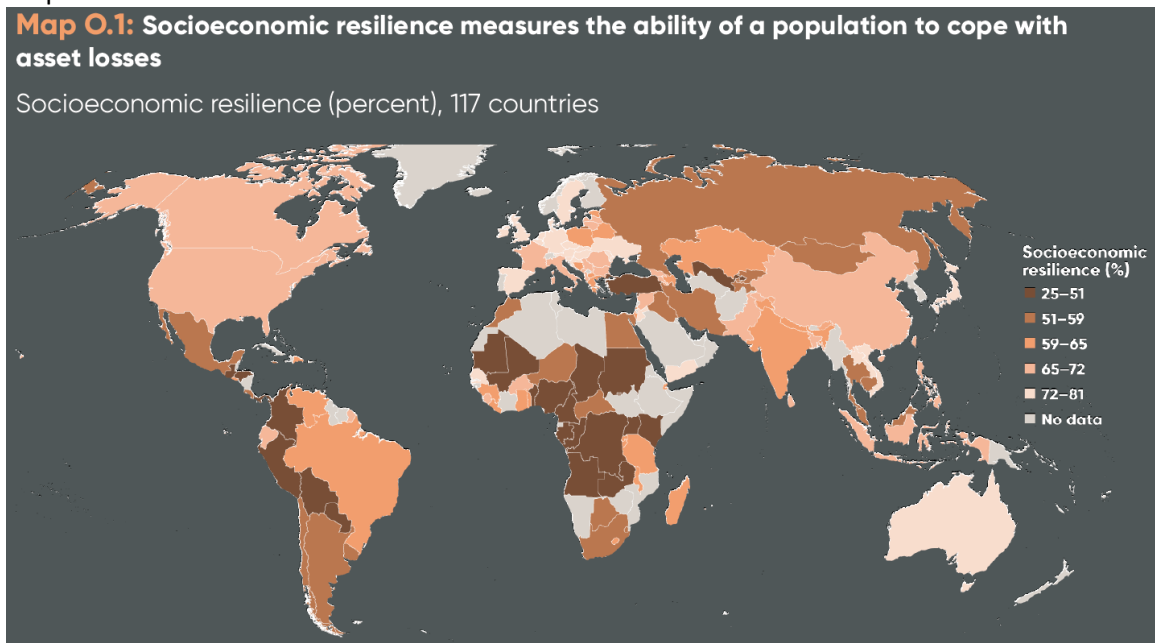
Bangladesh is one of the most vulnerable countries in the world, and is already combatting sea level rise, floods, tropical cyclones, and droughts. To strategize about how to tackle multiple hazards, the

Government of Bangladesh used participatory scenario development process to plan for the short and long term impacts of climate change, taking future uncertainties and current local knowledge into account (CCAFS 2015). Facilitated by the CGIAR Research Program on Climate Change, Agriculture, and Food Security, the Bangladesh Planning Commission, and the International Centre for Climate Change and Development developed scenarios or plausible futures at the national level out to 2050. The scenarios were developed to test the flexibility of the seventh Five Year Plan for the Government of Bangladesh to see if it can withstand future climate and socioeconomic uncertainties. Using downscaled climate data and models, the team came up with four scenarios that ranged from prosperous to disastrous. Once the scenarios were developed, short and long term adaptation interventions were identified to prevent disasters or enhance positive scenarios. The Planning Commission plans to implement the major systemic adaptation interventions identified in the scenario planning workshop into the Five-Year Plan.

(c) Strategy 3: Include poor and socially excluded groups into decision making

Usually, socially excluded groups such as the poor people who are disabled, elderly, women, slum dwellers and indigenous groups have limited participation and influence over resource allocation are more vulnerable to impacts of climate change (UN 2016a). The effects of natural disasters can cause disproportionate harm to vulnerable and socially disadvantaged groups since they are more likely to be affected by injury, illness or death, damage to homes, workplaces and essential infrastructure, by limited or absent public services, and the availability or affordability of water, food and other consumption items. Map 1 below shows a strong correlation between poor countries and socioeconomic resilience. Countries that have higher proportions of poor people who are socially and economically marginalized have lower socioeconomic resilience. SDG Goal 13.b recognizes the need to engage with local communities so that “mechanisms for raising capacity for effective climate change related planning and management in least developed countries and small island states, including focusing on women, youth, local and marginalized communities,” are promoted (UN 2016c).

Map 1: Socioeconomic Resilience



Source: World Bank 2017

Equitable participation by poor and socially excluded local communities helps minimize vulnerability and build resilience (Adger 2006). Participatory engagement with local communities helps to identify their vulnerabilities and prioritize adaptive capacity needs based on local knowledge. Allowing marginalized groups to have a voice strengthens their capacity to gain control over decision making. To engage local communities into plans that reduce vulnerability and eventually lead to resilience, adaptation planners need to support multi-stakeholder engagement where voices and concerns are heard. This will require adaptation planners to be aware of power dynamics within a community, as well as issues surrounding gender, age, religion and ethnicity and how these factors affect vulnerability and adaptive capacity.

Community based adaptation places people at the center of adaptation. To develop contextually appropriate adaptation plans to reduce vulnerability and build resilience, adaptation planners consulted communities in the Nakai District in Lao PDR on what they needed to build their resilience to the hydrological changes taking place in the Mekong River due to climate and land use change. IUCN worked with community members to ensure that poor men and women's voices were heard. This was a challenge since people at the local level have very little autonomy and voice in making decisions about their future (Chaudhury 2016). IUCN worked with local community leaders to encourage people to participate in contributing to the community based adaptation plan. Initially, men participated more than women because culturally men play a larger role in public engagement. Women eventually participated with the help of local leaders who spoke to women individually and not in public, and encouraged them to contribute to the discussions. Local leaders played an important role in giving women voice and incorporating their views into adaptation plans. Engaging both men and women in different ways helped to identify adaptation needs to reduce vulnerability. This included the need for alternative sources of income when droughts occurred and water pipes that would prevent water waste in times of drought. Identifying needs through multi-stakeholder engagement enabled people in Nakai district to receive assistance from the Government to support constructing fish ponds as an alternative source of income and install water storage units and pipes that enable people to turn off the pipes to conserve water. Engaging communities through multi-stakeholder approaches empowers poor and vulnerable communities to decide how to build their own adaptive capacity.

(d) Strategy 4: Monitoring, evaluating and learning what works

Monitoring and evaluation (M&E) of adaptation options helps keep track of the implementation of adaptation plans and actions and assess their effectiveness and outcomes. Adaptation M&E can focus on the process of adaptation (is implementation taking place?) as well as on its outcomes, i.e. whether the objectives of adaptation actions are achieved (Adaptation Community Network 2017). M&E is important since it can help implementers of adaptation options adjust actions in case the activity being implemented is veering off course. M&E can support management under uncertainty, as well as learning and exchange about what works well and what does not, which also allows for improving adaptation actions (Leiter 2017). Finally, adaptation M&E offers accountability by transparently demonstrating and reporting on results. Because adaptation is context specific, there is no one-size-fits-all approach to adaptation M&E. M&E also differs based on the level of application, e.g. project level or national level. For instance, at the project level, M&E helps assess whether vulnerability is being reduced among socially marginalized groups.

More and more countries are focusing on adaptation M&E at the national level, especially since the Paris Agreement calls for enhanced transparency of adaptation action and stipulates a Global Stocktake of collective progress (GIZ 2016). National level M&E systems will help understand the progress in

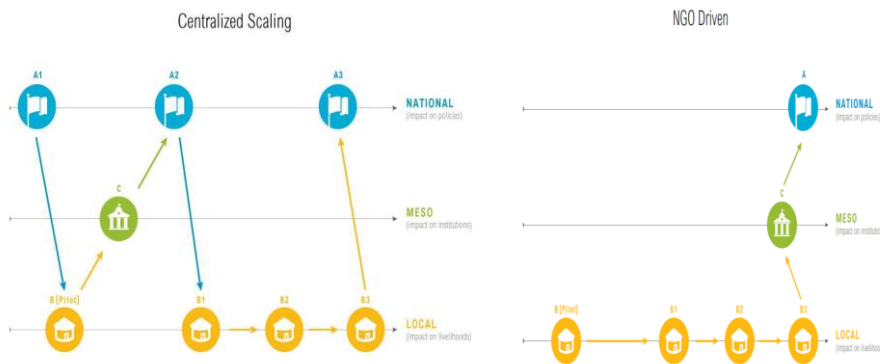
implementing Nationally Determined Contributions (NDCs) and National Adaptation Plans. Often, national level M&E systems are based on existing data and monitoring mechanisms and provide a comprehensive view of adaptation progress. This then informs planning and policy making and can assist in meeting provisions of the Paris Agreement regarding transparency and accountability. For example, the Philippines' National Climate Change Action Plan focuses on seven strategic priorities including food security and water sufficiency (GIZ 2016). To monitor its implementation and results, the Climate Change Commission developed a results-based M&E system where outputs, outcomes, and indicators are defined for every strategic priority. The M&E system is complemented by the introduction of Climate Change Expenditure Tagging, which allows the Philippines to monitor its spending on climate change and the achieved results.

(e) Strategy 5: Scale successful adaptation interventions

This paper does not prescribe adaptation options that help reduce vulnerability because adaptation options that work differ by context. However, if a certain adaptation options shows evidence that it benefits many people in terms of reducing their vulnerability and building resilience, it should be scaled through replication. Scaling is an important component of building resilience because it enables more and more people to benefit from an adaptation option that works to reduce vulnerability (WRI 2015). Scaling adaptation options that reduce vulnerability can take many forms. Because adaptation options are context and location specific, it is difficult to identify options that work across various contexts. Constant monitoring of what adaptation options work and evaluating whether these options reduce vulnerability and poverty is a critical part of the scaling process. Monitoring and evaluating allows those implementing adaptation options to learn about which option has the potential to benefit many people, and therefore, should be scaled.

Figure 4 shows various scaling pathways. For instance, in a centralized scaling pathway, the government at the national level can initiate pilot testing of an adaptation option at the local level. Monitoring, evaluating, and learning from the pilot can be shared with stakeholders at the meso (i.e. state, district, or province) and national level until the government at the national level implements a nationwide initiative to scale the options in many more villages, which then influences policies at the national level. Alternatively, non-governmental organizations can help replicate an adaptation option across the local scale from one village to the next by starting with a pilot test at the local level. By monitoring, evaluating and learning from the pilot, evidence of good results could lead to scaling across many more villages until it leads to policy reform at the meso and national levels.

Figure 4: Scaling Pathways



Source: WRI 2015

The Stress Tolerant Rice in Africa and South Asia (STRASA) project, led by the International Rice Research Institute (IRRI) and AfricaRice, has developed rice varieties that are tolerant of floods and increases in salinity. The flood- and saline-tolerant rice varieties have been scaled across multiple countries due to project members taking a proactive role in building support among national science institutes for varietal release, promotion of seeds and policy implementation. IRRI and AfricaRice have an extensive network of partners from the public sector, private sector, non-government organizations (NGOs), seed companies, and farmers' organizations that they use to enhance awareness about these varieties, and for seed multiplication and dissemination (Ismail et al. 2013). IRRI and AfricaRice also worked directly with rice farmers to monitor the impact of flood and saline tolerant rice and evaluate whether it reduces vulnerability to floods by protecting crops and food security. Learning through trials has helped such organizations understand how to improve and scale climate resilient crops. Because of successful pilots, ten varieties were released in six countries in 2011. The Sub1 variety of flood-tolerant rice, which can survive submergence for between four and 18 days, is spreading at an "unprecedented" pace in India, Bangladesh and Nepal, reaching over 3.8 million farmers by the wet season of 2012 (Ismail et al. 2013). Improved varieties are currently being planted on 1.4 million hectares in South Asia and are expected to increase yields by 50%, providing nutrition and income even under climate stress, which will help reduce poverty due to climate change impacts. This example demonstrates that scaling is possible with strong partnerships between scientists who develop climate resilient crops, farmers who help test the crops, and strong government support policy for climate resilient crops to ensure food security. Scaling such adaptation options, such as flood and drought tolerant crops, has the potential to help meet SDG Goal 2 on ending hunger under the context of climate change (UN 2016c).

3. Messages on Strategies to Reduce Vulnerability and Build Resilience

Reducing vulnerability by adapting to climate change and building resilience is a difficult and complex challenge because the impacts of climate change are diverse and often unpredictable. However, integrating these building block strategies into climate and development plans will enable those working to build resilience to place vulnerable people and poverty reduction at the center. Three key messages on these strategies include:

- **This set of five strategies can address both climate change and poverty.** To reduce vulnerability, it is critical that the needs of the poor, who are most vulnerable to climate change, be identified. This is one of the objectives of a vulnerability assessment. The vulnerability assessment identifies ways in which the adaptive capacity of the poor and vulnerable can be strengthened. It is also important that the voices of the poor and vulnerable be heard through multi-stakeholder dialogues with regards to their adaptation needs and future uncertainties they face so that they can be addressed and integrated into resilience plans. If monitoring, evaluating and learning from implementing adaptation options are proven to be successful in helping to reduce vulnerability, they should certainly be scaled up so that more poor and vulnerable people benefit from certain adaptation interventions.
- **Multiple strategies should be used together for greater impact.** Using just one strategy will not be enough. For instance, implementing an adaptation option just based on a vulnerability assessment without engaging stakeholders at the local level to incorporate their views and gain their support will lead to a low or no impacts. Or, just providing weather information to people who are impacted by climate change and not building their adaptive capacity to read and understand forecasts will not allow people to think about future vulnerabilities and how address

uncertainties. It would not be possible to justify scaling an adaptation option if there is no monitoring and evaluation system in place that demonstrates success of the adaptation activity. Multiple strategies or using these strategies in sequence will lead to building resilience.

- **Reducing vulnerability and building resilience requires collaboration among multiple partners at various scales.** None of the strategies discussed in this paper are easy to implement. They are challenging because adaptation planners in many developing countries do not have the skills required to do vulnerability assessments. It is also not easy to plan 30 years into the future and ensure that adaptation interventions scale so that vulnerability is reduced and resilience is built among millions of people. It takes scientists, community leaders, non-governmental organizations, governments, citizens, and the private sector to work together to reduce vulnerability. Therefore, partnership is key to successfully building resilience.

References

- Adaptation Community Network (2017) Adaptation M&E Navigator Tool. Available from: <http://www.adaptationcommunity.net/knowledge/monitoring-evaluation-2/>
- Adger, N (2006) Vulnerability. *Global Environmental Change* 16: 268–281.
- CARE (2016) Adaptation Good Practice Checklist. Care Climate Change Information Center. Available from: <http://careclimatechange.org/publications/adaptation-good-practice-checklist/>
- CCAFS (2015) What does the future hold for Bangladesh? Modelling Scenarios for Better Climate Policies. Blog available from: <https://ccafs.cgiar.org/blog/what-does-future-hold-bangladesh-modeling-scenarios-better-climate-policies#.WN6B9TsrKDI>
- Chaudhury M (2016) Lesson from Implementing Adaptation Plans in the Lower Mekong Basin. USAID. Available from: http://mekongarcc.net/sites/default/files/usaaid_mekong_arcc_adaptation_lessons_032116-press.pdf
- Chaudhury M, A Dinshaw, and H McGray (2014) Designing Climate Vulnerability Assessments for Decision-Making Uptake: A Conceptual Framework and Case Examples. USAID. Available from: <http://community.eldis.org/.5c0ad22a>
- Chaudhury, M, J Vervoort, P Kristjanson, P Ericksen, and A Ainslie (2012). Participatory scenarios as a tool to link science and policy on food security under climate change in East Africa. *Regional Environmental Change* 13(2): 389-398. Available from: <http://cgspace.cgiar.org/handle/10568/24447>
- IFRCRCS (2016) World Disasters Report 2016: Resilience: saving lives today, investing for tomorrow. IFRCRCS: Geneva.
- GIZ (2016) Country-specific Monitoring & Evaluation of adaptation provides essential information needed to fulfil the Paris Agreement. Climate Change Policy Brief December 2016.
- IIED (2013) Ensuring devolution supports adaptation and climate resilient growth in Kenya. Briefing. Available from: <http://pubs.iied.org/pdfs/17161IIED.pdf>
- Ismail, AM, US Singh, S Singh, MH Dar, and DJ Mackill (2013) The contribution of submergence-tolerant (Sub1) rice varieties to food security in flood-prone rainfed lowland areas in Asia in *Field Crops Research* 152.
- IPCC (2015) Livelihoods and Poverty in Assessment Report 5. Available from: https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/drafts/fd/WGIIAR5-Chap13_FGDall.pdf
- Leiter, T (2017) The Adaptation M&E Navigator: A Decision Support Tool for the Selection of Suitable Approaches to Monitor and Evaluate Adaptation to Climate Change in J.I. Uitto et al. (eds.),

- Evaluating Climate Change Action for Sustainable Development, DOI 10.1007/978-3-319-43702-6_18.
- McCarthy, JJ, OF Canziani, NA Leary, DJ Dokken, KS White (Eds) (2001) Climate Change 2001: Impacts, Adaptation, and Vulnerability. Cambridge University Press: Cambridge.
- ODI (2010) Towards a characterisation of adaptive capacity: a framework for analysing adaptive capacity at the local level: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6353.pdf>.
- Sterrett, C. 2011. "Review of Climate Change Adaptation Practices in South Asia." Oxfam Research Reports (November 16). Available from: <http://www.oxfam.org/sites/www.oxfam.org/files/rr-climate-change-adaptation-south-asia-161111-en.pdf>.
- United Nations (2016a) Leaving no one behind: the imperative of inclusive development. Report on the World Social Situation 2016. New York: UN.
- United Nations (2016b) The Sustainable Development Goals Report 2016. New York: UN.
- United Nations (2016c) Transforming Our World: The 2030 Agenda for Sustainable Development. New York: United Nations. Available from www.sustainabledevelopment.un.org
- World Bank (2017) Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. World Bank: Washington, DC.
- World Bank (2016) Shock Waves: Managing the Impacts of Climate Change on Poverty. World Bank: Washington, DC.
- World Resources Institute (2015) Scaling Success: Lessons on Adaptation Pilots in Rainfed Regions of India. Washington DC: WRI. <http://www.wri.org/publication/scalingsuccess>