Mastering Disaster in a Changing Climate: Adaptive Water Management For Disaster Risk Reduction

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There is wide recognition that climate change has a strong impact on disasters. However, current disaster risk reduction (DRR) and national, as well as global, climate policies, practice, and financing do not always reflect these linkages. Managing water is an essential component for addressing and adapting to these risks. We believe that improving community resilience and reducing chronic vulnerability to disasters – particularly in an era of increasing climate uncertainty – requires the mainstreaming of adaptive water management strategies within DRR and climate change policies and plans to ensure a resilient and thriving future for people and ecosystems.

The nature of natural hazards is evolving as climate change alters the size and scope of weather-related hazards. Unfortunately, in most regions our response to disasters is not keeping pace with the quickening pulse of climate change. These gaps are visible at multiple levels, from local-scale extreme event preparation and response to global policy frameworks, such as the Sendai Framework for Disaster Risk Reduction. Climate change influences disaster risk reduction (DRR) policies and actions at two levels: preparation and recovery.

DRR *preparation* is about identifying risks before a disaster. Under the influence of a changing climate, hazard risks are shifting over time. Novel events continue to emerge with impacts that are exponential, such as the disappearance of snowpack and glacial water resources in the Himalayas and Andes, as well as "new" extremes such as Typhoon Haiyan in 2015, or exceptional droughts or floods on nearly every continent. Understanding the nature of new and shifting risks will therefore be an increasingly important aspect of future climate projections and decision-making.

Climate change also influences how we establish *recovery* goals after a disaster event. Traditional DRR views recovery as a process intended to return to "normal" pre-disaster conditions as quickly as possible. But what if "normal" conditions no longer exist as a result of ongoing climate change? Following a major fire, for instance, a forest may grow back as a savannah or grassland or a different type of forest as a result of shifts in precipitation patterns and drought frequency.

Same goals but different approaches

While the Sendai Framework includes little mention of climate change, the UNFCCC's Paris Agreement (2015) similarly includes little or no reference to DRR as an important modality for coping with climate impacts. A blending of insights and perspectives from the DRR and climate change communities may be timely.

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For instance, the UNFCCC and its affiliated bodies recognize that hazards alter over time and that risk must be viewed as a shifting quality for preparation purposes. "Recovery" may also have insights from climate impacts science. The Intergovernmental Panel on Climate Change (IPCC) recently defined climate resilience as the capacity of "social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation."[1] In many cases, returning to pre-event conditions may not be possible, economically feasible, or prudent as ongoing climate change impacts foster new environmental states. Implementing climate resilience may therefore result in different decisions than when implementing traditional DRR resilience.

Thus, climate-aware preparation processes could help to reduce or avoid impacts from climate change intensified disasters, while climate adaptation could be accelerated through recovery processes that recognize that past conditions may not be useful targets. Clearly, alignment and integration of these agendas would be of mutual benefit.

Bridging Two Agendas with a Third

Water — specifically, resilient water resources management — may be the essential connector between climate change and DRR communities. First, most disaster events manifest themselves through water — e.g. floods, drought, storm surge, etc. According to UNESCO, roughly 90 percent of the 1,000 most severe disasters since 1990 have been water-related.[2] Viewing water as a systemic threat — one very sensitive to even small shifts in climate is a critical element in how we identify hazards. Recent advances in water resources management show improvements in quantitatively identifying future risks even in the context of so-called deep uncertainty in order to develop robust, flexible solutions.[3] These methods could also be applied within the DRR community to identify shifts in known hazards as well as to identify new, previously unexperienced threats.

Water resource management can also be a systematic solution for preventing, reducing the impact of, or recovering from natural hazards. Cross-sectoral coherence methods such as Integrated Water Resources Management, IWRM, can ensure that both preparation and recovery processes coordinate energy, water supply and sanitation, agriculture, and cities sectors before, during, and after disasters. This can be even further strengthened when coupled with an awareness of potential climate impacts. Moreover, including eco-hydrological systems such as surface waters, snowpack, and groundwater in these efforts can ensure a broader vision of economic and ecological sustainability in DRR efforts (for example, the WWF / USAID green flood guide[4]). Together, the water community can foster a common language for policy and action between the climate change and DRR communities.

Divergent Perceptions of Resilience

Globally, attempts to bridge the Sendai goals and the UNFCCC Paris Agreement targets have made some progress. For instance, the Sendai Framework, mentions water as well as the need to identify how existing and new risks may be influenced by climate change. The UN International Strategy for Disaster Reduction (UNISDR), which coordinates closely with the Sendai Framework, has a very progressive vision of how to include climate perspectives in preparation and recovery efforts.

In theory, both the Sendai and Paris Agreement frameworks define overlapping goals. In practice, the climate and DRR policy communities remain relatively uncoordinated, disconnected, and disjointed. As we move further into the implementation phase for both, national parties risk duplicating work, intensifying competition for investment, or inadvertently planting seeds that challenge future climate adaptation efforts (i.e., fostering mal-adaptation). Although resilient water management is key to both DRR and climate adaptation, water is mentioned only twice in the 2015 Sendai Framework and not at all in the UNFCCC Paris Agreement. Defining national and local operational agendas will be instrumental to integration and is the only way forward.

Opportunities already exist for formally integrating water and climate insights into DRR policy frameworks as well as water and DRR mechanisms into climate policy frameworks. At national levels, frameworks for climate and disaster risk often need to be aligned, such as the UNFCCC's Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) or the Sendai Framework's National Action Plans. Indeed, water is the sector most often mentioned for adaptation actions in developing countries' NDCs, presenting a clear opening for DRR preparation and recovery. Likewise, Goal E of the Sendai Framework intends to substantially increase the number of countries with national and local disaster risk reduction strategies by 2020. This provides a unique momentum for the water sector to align both the climate and DRR agendas by building on elaborated resilient water management perspectives.

Moreover, some basis for national and global policy alignments already exists, such as an IPCC report on extreme event risks,[5] and a UNFCCC paper on aligning the SDGs and Sendai through adaptation (2017),[6] as well as in the 2015 Sendai Framework for DRR.

1 IPCC. 2014. Climate Change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea and L. L. White, editors. Cambridge, UK: Cambridge University Press.

2 Adikari, Y, and J Yoshitani. 2009. Global Trends in Water-Related Disasters: An Insight for Policymakers. Paris: UNESCO, ICHARM.

3 Garcia et al. 2014, Patrick & Ray 2015, Mendoza et al. 2018.

4 WWF, US Agency for International Development (USAID). 2017. Natural and Nature-Based Flood Management: a Green Guide. Washington, DC: WWF, US AID.

5 IPCC. 2012: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.). Cambridge, UK: Cambridge University Press.

6 United Nations Climate Change Secretariat. 2017. Opportunities and options for integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction 2015–2030. UNFCCC Technical Paper. Bonn, Germany.

Financing water for DRR and climate change

Finance instruments may also hold promise to mainstream and blend climate resilience and non-traditional DRR approaches:

- Prioritizing preparation. As of 2017, DRR funding remains heavily skewed towards post-disaster recovery assistance, with less than 10 percent applied to preparedness,[7] despite numerous studies emphasizing this strategy. Post-disaster strategies, while a necessary component of DRR, are typically inefficient, more costly, and can perversely reinforce mal-adaptation over the medium to long term.[8]

- Insurance schemes to increase risk-sharing across public and private sectors. Policymakers are often important partners in empowering commercial entities to ask insured parties to bear a larger burden of risk, such as from flooding. Insurance schemes can also help fund some disaster plans, such as compensating farmers for agricultural damage when using their fields as temporary floodwater storage to protect downstream assets. The use of Catastrophic Deferred Draw Down Options (CDDOs) provide a contingent line of credit for immediate liquidity to countries in the aftermath of a disaster from a natural event. These instruments have been made available by the World Bank since 2008.

- Project finance that assesses climate and disaster risks. Efforts such as the World Bank Decision Tree Framework[9] are innovative approaches to examine the significance and scope of climate risk through an analysis of climate drivers, uncertainty, and robust solutions. Green bond evaluation criteria that explore climate-water risk over the operational lifetime of the asset (or longer) and over hydrologically relevant spatial scales, such as for a catchment or basin even when the asset is relatively localized, encourage more systemic, long-term thinking.[10]

- The economic valuation of assets including infrastructure, and natural and social capital, and alternative solutions is undergoing a quiet revolution. Most traditional economic analyses do not assess climate uncertainty or resilience and heavily discount investments that may only show long-term benefits or weak support for robust or flexible disaster preparation or prevention schemes.[11] The World Bank is starting to develop an economic framework to assess the economic dividend of adaptation and to incorporate resilience in ex-ante cost benefit analysis.

7 Kellett, J., and A. Caravani. 2013. Financing Disaster Risk Reduction: A 20-year Story of International Aid. Washington, DC: Global Facility for Disaster Reduction and Recovery, Overseas Development Institute.

8 Anderson, Sarah E, Ryan R Bart, Maureen C Kennedy, Andrew J MacDonald, Max A Moritz, Andrew J Plantinga, Christina L Tague, and Matthew Wibbenmeyer. 2018. The Dangers of Disaster-Driven Responses to Climate Change. Nature Climate Change 8(8): 651–53.

9 Ray, Patrick A, and Casey M Brown. 2015. Confronting Climate Uncertainty in Water Resources Planning and Project Design: the Decision Tree Framework. Washington, DC: The World Bank. doi:10.1596/978-1-4648-0477-9.

10 Climate Bond Initiative, Alliance for Global Water Adaptation, CDP, Ceres, and World Resources Institute. 2018. Water Infrastructure Criteria under the Climate Bonds Standard Background Paper: Background Paper. London: Climate Bonds Initiative.

11 Mendoza, Guillermo F, A Jeuken, J H Matthews, Eugene Z Stakhiv, J Kucharski, and K Gilroy. 2018. Climate Risk Informed Decision Analysis (CRIDA): Collaborative Water Resources Planning for an Uncertain Future. Paris, France, and Alexandria, VA, USA: UNESCO-IHP, ICIWaRM.

About this publication

This background paper, prepared by the Alliance for Global Water Adaptation (AGWA) and its members, is a contribution to the discussions and activities at the Conference of Parties 24 (CoP), 3–12 of December 2018, Katowice, Poland. AGWA and SIWI are once more involved in the Marrakech Partnership Global climate agenda water event as well as the cross cutting issues and other water related sessions.

Note on authors: Though all of the authors are associated with one or more institutions, we are writing here as individuals and members of AGWA: the Alliance for Global Water Adaptation, an international network to develop, synergize, and promote the emerging best practices and policies for resilient water resources management.

AGWA's member organizations stand committed to contribute to capacity building and support the integration and application of water knowledge in the climate mitigation and adaptation activities. This includes providing guidance and recommendations on how water management can contribute to an efficient implementation of the Paris Agreement and the 2030 Agenda.

Its secretariat is hosted by Stockholm International Water Institute (SIWI) and it is co-chaired by SIWI and the World Bank.

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