Mastering disaster in a changing climate: Reducing disaster risk through resilient water management

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According to the U.N. Office for Disaster Risk Reduction (UNISDR), between 1995 and 2015, over 6,400 weather-related disasters claimed a total of 606,000 lives and affected more than 4 billion people worldwide.[1] To respond to the magnitude of these disasters, the 2015 Sendai Framework for Disaster Risk Reduction was created to prevent and reduce disaster risk with the goal of returning regions and communities back to normal after the disaster. However, as climate change alters the size and scope of weather-related hazards, the standard methods to return to normal lose meaning as 'normal' itself gets redefined. Unfortunately, in most regions disaster responses are not evolving at a similar pace; nor are they aligning with the broader climate change agenda and implementation at local or global scales.

Climate change influences disaster risk reduction (DRR) policies and actions for preparation

and recovery, and the influence of climate change must be accounted for moving forward through DRR preparation and recovery processes. DRR *preparation* includes how risks and potential risk-reduction measures are identified and implemented before a disaster. Risk assessment is especially difficult in a climate-shifting world. Hazard frequency, magnitude, and intensity are shifting over time due to climate change. Novel events featuring "new" extremes such as Typhoon Haiyan in 2013[2], the disappearance of high-altitude frozen water resources, increasingly widespread Glacial Lake Outburst Floods[3], and exceptional droughts or floods are increasing.[4] Identifying new or shifting risks means accepting uncertainties in future climate projections.

Climate change also influences DRR *recovery* goals. Traditional DRR views recovery as returning to "normal" pre-disaster conditions as quickly as possible. But what if "normal" conditions no longer exist due to climate change? Following a major fire, for instance, a forest may grow back as before, or it could become a savannah or another type of forest due to shifting precipitation patterns and drought frequency. The climate community has already recognized that responses to climate shifts ought to focus more on resilience than returning to "normal"; resilience is seen as creating space for adaption, transformation, and learning in a cross-sectoral approach.[5]

Space for Collaboration in Climate and DRR Policy

While both the 2015 Sendai Framework for Disaster Risk Reduction and the UNFCCC's 2015 Paris Agreement recognize the linkages between climate change and disasters, in practice, the two policy communities and their respective implementing bodies have little connection or coherence particularly with regard to implementation. As both frameworks move into the implementation phase, national parties risk duplicating work, intensifying competition for investment, and/or inadvertently planting seeds that challenge future climate adaptation efforts (i.e., fostering mal-adaptation).

Yet, increased collaboration and integration of these agendas would be mutually beneficial. Climate-aware preparation processes could help to reduce or avoid impacts from climate

change intensified disasters while DRR recovery processes could accelerate climate adaptation by recognizing past conditions may not be useful targets. Furthermore, well-managed adaptation options that reduce the vulnerability of human and natural systems align with sustainable development goals (SDGs), such as ensuring food and water security, reducing disaster risks, improving health conditions, maintaining ecosystem services, and reducing poverty and inequality.[6] Blending insights and perspectives from the DRR and climate change communities could ensure their respective choices do not undermine or inadvertently heighten risks for the other.

Globally, attempts to bridge the Sendai goals and the UNFCCC Paris Agreement targets have made some progress. The Sendai Framework, for instance, mentions the need to identify how climate change may influence existing and new risks. Article 8 of the Paris Agreement recognizes the need to address the loss and damage caused by climate change including extreme weather events. UNISDR, which coordinates closely with the Sendai Framework, has a very progressive vision of how to include climate perspectives in DRR preparation and recovery efforts.[7]

The 2015 Paris Agreement recognises the linkages between disaster and climate, but more could be done. Source: UNClimate, Creative Commons.

Bridging Two Agendas with a Third

For two main reasons,, the essential connector between the climate change and DRR communities may be resilient water resources management. First, water is itself often the instrument of disaster. Roughly 90% of the 1,000 most severe disasters since 1990 have been water-related.[8] Viewing water as a systemic threat — one very sensitive to even small shifts in climate[9] — is a critical element in identifying hazards. Recent advances in analytical and governance approaches help identify new risks quantitatively, even in the context of deep uncertainty.[10] The DRR community could apply these methods to identify shifts in known hazards and to determine new, previously unexperienced threats.[11] Together this can lead to the identification of robust, flexible solutions.

Second, water resources management can also be a systematic solution for preventing and reducing the impact of or the recovery from natural water hazards. If implemented with an awareness of potential climate impacts, cross-sectoral coherence methods such as Integrated Water Resources Management (IWRM) and nature-based solutions (NBS) can ensure that DRR processes coordinate efforts for energy, water supply and sanitation, agriculture, and cities before, during, and after disasters. One example is Vietnam's IWRM approach that spans many sectors and administrative boundaries.[12] DRR efforts that encompass eco-hydrological systems—surface water, snowpack, and groundwater—can ensure a broader vision of economic and ecological sustainability.[13] The benefits of implementing this approach at a regional scale are evident in dozens of communities in India's Mahanadi River Delta, where flood absorption capacity was increased and natural flow patterns restored though a series of green and hybrid interventions.[14]

Blending DRR, Water, and Climate "Resilience" Policies

While resilient water management is key to both DRR and climate adaptation and could be

the needed link to align the two policy communities, that connection has not been widely made. Water is mentioned only twice in the Sendai Framework and not at all in the Paris Agreement. However, opportunities exist for formally integrating water and climate insights into DRR policy frameworks and water and DRR mechanisms into climate policy frameworks. Thus, defining national and local operational agendas that recognize how water can enable other elements may be instrumental to long-term success. Moreover, some basis for national and global policy alignments already exists, such as an IPCC report on extreme event risks[15] and a UNFCCC technical paper on aligning the SDGs and Sendai through adaptation.[16]

At the national level, frameworks for water management, climate, and disaster risk often need to be aligned. The three most appropriate frameworks are the UNFCCC's national-level action plans from the Paris Agreement [Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs)], the Sendai Framework's National Action Plans, and IWRM plans (both national and transboundary). In fact, 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, which could align the climate and DRR agendas through elaborated resilient water management perspectives.

Can Finance Mechanisms Integrate DRR and Climate Change through Water?

Finance instruments and processes—from budget prioritization to valuing assets—can mainstream and blend climate resilience and non-traditional DRR approaches. One important aspect is budget prioritization within climate and DRR. As noted earlier, DRR preparedness can link well with climate resilience; however, as of 2017, less than 10% of DRR funding is spent on preparedness with most of the funding focused on recovery which is costlier and less effective.[17,18] Prioritizing preparation has been recommended by the High-level Experts and Leaders Panel on Water and Disasters (HELP) among many others.[19]

1. Insurance plays a critical role in climate and DRR, and some new concepts have already

been implemented by the World Bank for the last decade. Insurance schemes can help fund some disaster preparation, e.g. compensating farmers for agricultural damage when using their fields as temporary floodwater storage to protect downstream assets. Catastrophic Deferred Draw Down Options (CDDOs) provide a contingent line of credit for immediate liquidity to countries in the aftermath of a natural disaster.

2. Project financing should assess climate and disaster risks to examine the significance and scope of climate and water risks in systematic, long-term planning. Innovative approaches to this include the World Bank "decision tree framework"[20] and green bond evaluation criteria.[21]
3. The economic valuation of assets—including infrastructure, 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 analyses, which should provide an adaptive preparation-recovery DRR assessment from the inception of investments.

Conclusions

Climate change and natural disasters are closely linked; however, their current policy, practice, and financing norms are often not. Managing water is an essential component for addressing and adapting to these risks and; integrating water management into DRR and climate adaptation plans can increase coherence and reduce costly duplication of effort. Finance may place a special role in how we scale up these practices. We believe that improving community resilience and reducing chronic vulnerability to disasters—particularly with increasing climate uncertainty—requires mainstreaming adaptive water management within DRR and climate change policies and plans to ensure a resilient and thriving future for communities and ecosystems.

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Founded in September 2010, the Alliance for Global Water Adaptation is a group of regional and global development banks, government agencies and ministries, diverse non-governmental organizations (NGOs), and the private sector focused on sustainable water resources management — even as climate change alters the global hydrological cycle. Water provides coherence to climate change adaptation and mitigation, integrating energy, water, food production and agriculture, and ecosystems and the environment. Our work covers a number of areas related to climate change adaptation: science, policy, economics, engineering, and more. AGWA is focused on how to help experts, decision makers, and institutions in the water community work more effectively. John H. Matthews is the Coordinator and co-founder of AGWA and is the corresponding author of this article.