Resilience to Disaster Is No Small Measure

Disaster risk reduction policies can mitigate the most harmful impacts of natural hazards. Lack of political support has often hamstrung effective prevention and preparedness, even though early action yields multiple benefits – to more than just the economy. A global conference in Geneva in May 2019, co-hosted by the UN and Switzerland, calls for political, financial and societal investments to reap the 'resilience dividend'.

By Tim Prior and Florian Roth

Earthquakes, floods, storms, heatwaves, tsunamis, pandemics – disasters come in various forms, all posing significant threats to human life, economic development, and ecological diversity around the world. Particularly in fragile contexts, natural hazards also pose a risk to peace and security. In March 2019, Cyclone Idai hit Mozambique, Zimbabwe, and Malawi, causing massive damage to local communities, infrastructures, and farmland. This not only created a huge setback for the development of these countries, but could also potentially trigger long-term social and political instability.

Aerial firefighting in California – fostering resilience to reduce disaster risks is a challenge for developing and developed countries alike. *U.S. Air Force, J.M. Eddins Jr. / flickr.com.*

Highly developed countries can also suffer immensely from disasters. Recent devastating wildfires in the USA, Sweden, Greece, and Australia were likely caused by ongoing climate change and, in some cases, intensified by dangerously inappropriate land use practices or policies. The wildfires in California alone cost over a hundred lives and caused more than USD 3.5 billion in damages.

Such events offer reminders that there is no such thing as a "natural disaster". Social structures, economic conditions and political decisions determine how severely a community or country is affected by a natural hazard – that is, how catastrophic the disaster is. Therefore, effective disaster risk reduction (DRR) policies must not only manage hazards, but also consider exposure and tackle issues of vulnerability. Done well, the societal rewards from DRR are diverse and numerous, though difficult to measure. That difficulty typically translates into political disinterest in proactive investment in disaster risk reduction. As an international leader in disaster risk reduction and advocate for comprehensive disaster risk management, Switzerland is well-placed to encourage global political action to minimize the devastating consequences of natural and technical hazards.

Global Risk Politics

While natural hazards mostly impact societies on a local scale, mitigating disaster risks is a global challenge. Indeed, the interconnectivity of natural and social processes across borders continues to increase, especially through globalization. Tsunami early warning systems, river flow management, or pandemic preparedness plans are rarely effective if they are executed solely at the national scale.

Since the 1990s, international efforts in DRR have been directed towards develop-

Key Terminology in Disaster Risk Reduction

Hazards: events or processes with natural or human-induced (technical) origins that have the potential to disrupt society.

Disaster: the resulting impact on people and property from a natural hazard or some other significant disturbance.

Exposure: the presence of people, livelihoods, environmental services and resources, infrastructure, or economic, social or cultural assets in places that could be adversely affected by hazards.

Vulnerability: the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard

Risk: A probability function of loss that considers hazard, exposure, and vulnerability.

Resilience: the capability of systems to absorb shock or stress and maintain or regain vital functions.

ing global strategies to reduce disaster risks. Over time, international governance mechanisms have become more refined, coordinating and overseeing global efforts to prevent disasters. The evolution of international disaster risk governance was kick-started in 1994, with the establishment of the Yokohama Strategy for a Safer World, the first comprehensive international DRR strategy. It defined broad goals for reducing disasters, but included few concrete measures or actions. In 2005, soon after the Indian Ocean earthquake and tsunami, and almost exactly a decade since the Great Hanshin Earthquake that devastated Kobe, Japan, the Hyogo Framework for Action (HFA) was agreed upon at the Second World Conference on Disaster Reduction. It placed a focus on disaster resilience, preparedness, and early warning, and introduced a global reporting system on national efforts towards resilience for all signatory states.

The most recent, and current international DRR governance regime is the Sendai Framework for Disaster Risk Reduction (SFDRR). It was adopted by UN member states in 2015 (see CSS Analysis No. 173), following the Great East Japan Earthquake and Tsunami that struck the Myagi Province of Japan in 2011. The SFDRR seeks to highlight the interdependencies between the issues of sustainable development, human development and DRR. It sets out priorities for action and defines a number of global targets to be achieved by 2030, but remains legally non-binding. Among others, important targets include the substantial reduction of global disaster mortality and economic loss, the establishment of effective early warning systems, and the implementation of national and local DRR strategies. 38 key indicators are used to assess national progress towards the Framework's agreed goals, and results have, to date, been collected in the biennial Global Assessment Report (GAR). In addition, progress is reviewed at biannual Global Platform for Disaster Risk Reduction conferences, the next taking place in Geneva, in May 2019.

Investing for the Resilience Dividend

Effective security increasingly requires finding solutions to problems that manifest domestically but demonstrate global interdependence. Therefore, threats, including those posed by natural processes, are more complex and more uncertain, creating a situation in which it is difficult for traditional national security organizations to sufficiently protect their citizens against the myriad of fluid threats. The concept of resilience offers a hopeful paradigm to address this modern security conundrum, especially because of the open and prospective approach it encourages, and because it has created a setting in which distributed actors, not just those of the state, can play a role in providing security. Since the Hyogo Framework for Action (2005–2015), resilience has taken center stage in the theater of global disaster risk governance.

Increasing societal resilience in the face of natural hazards involves many components. Traditionally, disaster reduction strategies have focused on strengthening the resilience of physical structures, for example through earthquake-resistant building standards or redundant infrastructure systems. In recent years, policies have increasingly focused on measures to foster the resilience of communities that are either exposed to natural hazards or vulnerable to hazard impacts. In practice, this primarily means building up capacities to prepare for, respond to, and recover from disaster events, for example through local preparedness planning, inclusive insurance schemes, and risk education. While these measures have successfully contributed to reducing the human cost of natural hazard events over the last several decades, they also pose a significant financial burden, especially for developing nations. In these countries, addressing systemic social, economic, and structural vulnerabilities requires fundamental economic or political change, and not simply a piecemeal approach. Even in relatively affluent societies, and especially during times of financial austerity, there is limited political will to invest early to cope with extreme events that are unpredictable and statistically unlikely.

Unfortunately, it is often only in the tragic aftermath of a disaster that political attention focuses on the issue of disaster risk. Consequently, most financial resources are available for disaster relief, even though there is broad consensus among experts and policy-makers that investing in disaster preparedness and preventative action yields significant societal benefit. The Geneva conference aims to show that the benefits of such investments are not only financial but that building disaster resilience also contributes positively to the achievement of sustainability and development goals, offering a so-called "resilience dividend" to those countries or organizations willing to invest. In total, 10 of the 17 Sustainable Development Goals (SDGs) have targets that relate to DRR. For example, target 9a (Goal 9: Industry, Innovation and Infrastructure) of the SDGs seeks the construction of resilient infrastructure to support economic development and human well-being. In reality, however, it is challenging to assess the actual investments in preparedness and prevention, their effects in terms of mitigating risks, and their broader effects on sustainability and development.

Measuring and Monitoring Resilience

For well over 10 years, the notion of resilience has been the darling of the security policy world (see CSS Analysis No. 142).

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As a concept, it is a laudable and perhaps obvious goal – who or what *should not* respond to catastrophe with poise and purpose? Yet, even applying resilience approaches across domestic and international

security policy domains in this context, concrete advances attributable specifically to the approach are difficult to observe or discern. This is mainly due to the challenges in measuring the resilience of complex socio-technical systems. In spite of the fast-growing availability of data and analytical capabilities, only few practical applications of resilience modelling outside of academia and specialized industries (e.g. financial markets, energy supply systems) exist. This creates a challenging backdrop against which to monitor resilience-building efforts and their effects across domains.

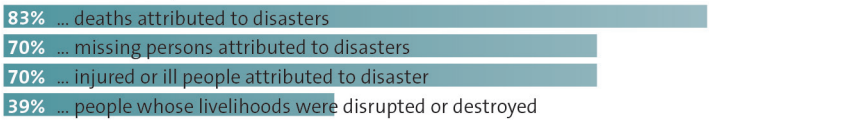
In a world of limited resources and political accountability, demonstrating the benefits of the resilience approach has nevertheless become imperative. In the context of disaster risk reduction, objective, reliable, and valid measurements of resilience are necessary to support disaster preparedness planning, both for policy evaluation and resource allocation.

Today, most disaster plans are based on technical risk analyses, mainly compiled by highly specialized agencies, for example environmental authorities, weather services, or regulating bodies in the energy industry. The results of these separate analyses are then typically aggregated into "integrated" risk reports. Critics have increasingly pointed to the limits of this methodology, especially the ability of aggregation to capture cascading effects and other non-linear relationships between environmental, technical, and human factors. The 2011 Fukushima catastrophe exemplifies the risks stemming from cascading events. By contrast, the resilience approach offers possibilities to consider interdependencies in complex socio-technical systems.

Selected Targets of the Sendai Framework for Disaster Risk Reduction

Targets A and B: Reducing mortality and number of people affected by global disaster

Of the 87 out of 193 UN member states providing data for the Sendai Data Readiness Review, share of countries who have provided data on the number of ...



Targets E and G: Increase the number of countries with DRR strategies and multi-hazard early warning systems

Of the 87 out of 193 UN member states providing data for the Sendai Data Readiness Review, share of countries who have adopted or implemented ...

Source: UNISDR 2018

In terms of policy evaluation and resource allocation, progress in the context of DRR is often associated with the claim that organizations or countries have established "good" or "best" practice in their DRR approaches; the assumption being that good or best practice equates to effective DRR policy. Critics of this "expert knows best" attitude argue that without an evidence-based approach that draws on robust, defensible and reliable methodologies, monitoring national progress in DRR will remain subjective. Empirically demonstrating the benefits of DRR will ensure disaster risk remains on the political agenda outside of disaster cycles.

> An evidence-based approach drawing on robust, defensible and reliable methodologies, will improve national progress in DRR.

In the last five years, resilience proponents (the Center for Security Studies included) have dedicated significant effort towards the development of resilience measurement tools and techniques – with widely varying degrees of success. Although these efforts have sought to popularize and improve resilience policy, demonstrating the potential societal dividends of resilience has proven more difficult than expected. Prominent issues in measuring resilience are the availability and comparability of data, level of analysis, and the limits of the underlying theoretical models of disaster resilience.

1. Data availability: Especially in fragile contexts where political institutions are weak, fine-grained, reliable data on resilience indicators are often unavailable. In contrast, highly developed countries often swim in an abundance of high-quality data. However, particularly in countries with decentralized federal governments, subnational structures typically create, and hold responsibility for, important information on local hazards and mitigation capabilities. Efforts to aggregate such information to create centralized databases are often hampered by technical difficulties, but also by political opposition. For instance, in Germany, several federal states blocked the creation of a countrywide resource management system for all civil protection authorities. The states' opposition to this proposition was associated with the perception that it would restrict their political autonomy.

2. Comparability: Under the SFDRR, all signatory nations are free to use their own methodologies when collecting and aggregating their nation's data. Inconsistent methodologies in counting the number of people affected by natural hazards annually, for instance, particularly hamper the ability to compare results between countries, which has been a key objective under the SFDRR.

3. Level of analysis: Measuring the resilience of narrowly defined entities is more manageable than measuring the resilience of complex socio-technical systems. In the former case, the resilience of a critical infrastructure object like a bridge or electricity sub-station, for instance, is relatively easy to measure – the parameters that might disrupt its functioning are probably well known and the operator (often from the private sector) likely collects data on performance over time, including during disturbances. This information can be easily used to measure the likelihood of function being lost, and the speed at which function can be returned. At the broader end of the scale, in a complex socio-technical system like the state, it is much harder to collect information directly on the innumerable factors that contribute to a state's resilience.

4. Model fit: Even if we were able to collect detailed, reliable, and comparable data on a broad array of resilience indicators and ag-

Selected Key Measures of Nations' Progress Under the SFDRR

- Number of **deaths and missing persons** attributed to disasters, per 100,000 population.
- Number of **directly affected people** attributed to disasters, per 100,000 population.
- Direct **economic loss** attributed to disasters in relation to global gross domestic product.
- **Damage to critical infrastructure** attributed to disasters.
- Number of countries that adopt and implement **national disaster risk reduction strategies** in line with the Sendai Framework for Disaster Risk Reduction 2015–2030.
- Percentage of local governments that adopt and implement **local disaster risk reduction strategies** in line with national strategies.
- Total official **international support**, (official development assistance (ODA) plus other official flows), for national disaster risk reduction actions.
- Number of countries that have **multi-hazard early warning systems**.
- Percentage of **population exposed to or at risk from disasters protected** through pre-emptive evacuation following early warning.

gregate it on the systemic level, this does not guarantee that we are actually measuring resilience. Socio-technical resilience is a complex concept that cannot be observed directly in the real world. To address this problem, proxies (indicators) are used that are *assumed*, when aggregated, to approximate a measure of resilience. If the theoretical model fits the empirical reality, we may expect those countries that perform well in resilience monitoring processes like the GAR to suffer fewer impacts by hazards and recover faster than other nations affected by similar disruptions. But since such empirical model tests are methodologically demanding, and therefore rare, we must remain cautious when interpreting the results of broad-scale resilience assessments.

Due to these challenges, it is very difficult to quantify the end-value of investments in resilience, measure the level of resilience of complex socio-technical systems, or even calculate the return-on-investment of resilience-enhancing measures. In future, however, advances in the methods of modelling, data collection and data analysis could create new opportunities to measure and benchmark national governments' DRR progress. Particularly promising in this context are developments in remote sensing technologies (for rapid landscape analyses), crowdsourcing (for improved citizen engagement in DRR), and Artificial Intelligence (to organize and analyze large, complex datasets).

Switzerland's Leadership in DRR

Switzerland claims to be a leader in the world of DRR, having established a tradition of functional action at local, regional and national levels, while also contributing internationally through active development and humanitarian support. Systemic resilience is more than the sum of its parts, and if Switzerland can find better ways to couple assessment of national or global DRR targets with policy-making by connecting practical actions with high dividends, Switzerland will continue to advance its leadership in the field.

Meaningful multi-scalar activities will strengthen Switzerland's future role as a leader in the international governance of DRR. At the local level, further investment to strengthen local communities' preparedness for hazards will be imperative. In this context, encouraging more Swiss cities (beyond Davos and Geneva) to join the UNISDR's "Making Cities Resilient" Campaign could be a first step in a coherent approach to fostering resilience at the city scale. At the cantonal level, support for the further development of preparedness planning and mitigation will solidify Switzerland's position as an international role model. In particular, incorporating social aspects (age, social isolation, physical and psychological disability, etc.) of DRR into the already strong traditions of science- and technology-based risk management will be decisive in securing the resilience dividend. Fostering civil society engagement in disaster risk assessment and management, participatory risk analyses, and risk mapping projects involving different stakeholder groups will also be helpful. Lastly, on the international stage, Switzerland must combine its political influence with practical national experience and scientific expertise to develop and promote coherent, evidence-based strategies that connect and advance the DRR, climate change adaptation and sustainable development agendas.

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