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PAPER**

**Boosting systemic risk governance:
Perspectives and insights from
understanding national systems
approaches for dealing with disaster and
climate risks**



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Boosting systemic risk governance: Perspectives and insights from understanding national systems approaches for dealing with disaster and climate risks

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Abstract

The climate and COVID-19 crises demonstrate that risks are becoming increasingly severe, uncertain, and systemic. COVID-19 illustrated how a quickly evolving pandemic can bring social, economic and financial systems to a standstill. The climate crisis is already causing system failures and existential impacts, especially as compound events further challenge existing decision-making and governance structures that are often unequipped to manage systemic risks and cascading impacts.

In this background paper, we review the governance of systemic risk with the aim to identify opportunities and enabling factors for improving governance by managing what are increasingly interdependent risks with the potential for cascading impacts. We use insights from the IIASA-ISC “Building pathways to sustainability in a post-COVID world” initiative (Mechler et al., 2020) and forensic reviews of disasters, the Post-Event Review Capability (PERC; Venkateswaran et al., 2020), to illustrate how sub-national and national systems have governed systemic risks. More specifically, we explore risk governance successes and failures with the goal of developing insights on how to bolster systemic risk governance in policy and practice.

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Introduction: Systemic and compound risk governance in an era of crises

Risks are becoming increasingly severe, uncertain, systemic and are likely to have cascading and existential impacts on communities, societies, and ecosystems due to enhanced interdependencies (Gaupp et al. 2020; Jongman et al. 2014). The impact of the COVID-19 pandemic illustrates how quickly a public health crisis can cascade to bring socio-economic systems across the globe to a standstill. Climate change is expected to have similar cascading and existential impacts, as compound risks increasingly challenge conventional approaches for governing risks single-handedly (IPCC 2018a,b, 2019).

Against this background, risk governance - defined by the UN General Assembly (A/71/644) as the “institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction (DRR) and related areas of policy” no longer suffices for addressing the growing impacts and challenges resulting from compounding risks. Instead, there is a need for taking decision-making arrangements a step further towards systemic risk governance. Systemic risk governance acknowledges that adequately managing risks requires recognizing their interconnected nature and cooperating across the institutional and administrative boundaries of risk management through inclusive channels (IRGC 2018, Aven and Renn 2018). With the COVID-19 pandemic causing cascading disruptions far beyond the health sector (Rizwan et al. 2021), there is growing consensus that systemic risks need to be better understood and managed; however, there are few examples of what the systemic risk governance arrangements facilitating this would look like in practice.

In this paper, we review the governance of systemic risk with a focus on disaster and climate risks in national systems (IRGC, 2018) building on three lines of inquiry –i) a discussion of the case for systemic risk governance and its theoretical base, ii) forensic analyses of disaster events - in this case floods - as a grounded method for identifying opportunities and enabling factors for improving systemic risk governance; iii) insights from an expert consultation examining how different national systems have governed risks in the wake of the Covid-19 pandemic.

Methodologically, we first build on a short theoretical review of the systemic risk governance literature. Then, the Post-Event Review Capability (PERC; Venkateswaran et al., 2020) methodology, developed and widely applied by the Zurich Flood Resilience Alliance, provides case study insights on systemic risk governance across diverse contexts, identifying what has failed and worked in practice. Finally, we share lessons learned from the IIASA-ISC “Building pathways to sustainability in a post-COVID 19 world” initiative, where consultations with global experts identified examples of how different national systems have governed risks that are becoming increasingly systemic and co-generated options for improving systemic risk governance. We conclude with an overview of the lessons learnt from these two research initiatives and outline options for promoting systemic risk governance.

Systemic Risk Governance: What does it entail and why it involves an important shift in risk governance

Our societies and economies are increasingly exposed to systemic risks as physical and social interdependencies increase. During disasters, these interdependencies can trigger cascading effects that lead to system failure and, sometimes, collapse (IRGC 2018, OECD 2003). Thus, systemic risks threaten the stability of our socio-economic systems and can be felt far beyond the initial impact of a risk, irrespective of administrative boundaries (Aven and Renn 2018, van Asselt and Renn 2011, Kaufman and Scott 2003). Climate change, for example, can upend supply chains locally through events such as major floods and wildfires, which in turn can spiral into global disruptions. For example, the Thailand 2011 floods disrupted local agriculture, but also some 10000 IT and automotive part manufacturing facilities. This disruption caused large-scale unemployment in the region but also stalled hard-drive and car production globally (Moser and Finzi Hart 2015). Similarly, indirect effects, such as productivity loss due to excessive workplace heat (UNDP 2016), or broader changes in the economy and infrastructure triggered by events such as climate-related migration and resulting labour force changes (ILO 2019), can trigger cascading disruptions. Health-related hazards, too, can cause severe disruptions to global networks that go far beyond the health sector, causing social and economic shocks across the world. COVID-19, for example, caused industries, cities and nations to shut down, which in turn has led to economic devastation globally (Rizwan, Ahmad and Ashraf 2020). If these risks compound - defined as multiple, otherwise unrelated stressors interacting (Zscheischler et al. 2018) - their potential for large-scale systemic impacts increases (Hochrainer-Stigler 2020). Therefore, we urgently need a paradigm shift in how we manage and govern risks, especially in light of climate change and its emerging and predicted impacts.

Systemic risk governance approaches offer an opportunity to address the diverse and compounding nature of risks facing our increasingly more interdependent global economies and societies. At its core, systemic risk governance shares many parallels with risk governance, defined by the UN General Assembly (A/71/644) as the “system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy.” However, rather than focusing on individual risks single handedly, often in a siloed manner, systemic risk governance recognises the interconnected nature of risks and the systems-thinking approach stakeholders need to apply to see and address those risks. Drawing on data and insight from across relevant sources and an ensemble of risk models, such systemic risk analysis enables a holistic assessment of hazard and risks and their dimensions (IRGC 2018, Hochrainer-Stigler et al. 2020), such as interdependencies between critical infrastructure hubs such as energy providers, telecommunications, water provision, transport, and other economic activities (OECD 2019).

Crucially, systemic risk governance involves cooperation and co-management across the institutional and administrative boundaries of risk management, and building inclusive communication channels to engage decision-makers and stakeholders across interdependent sectors and knowledge communities and account for different values and risk perceptions (Aven and Renn 2018). Systemic risk governance arrangements based on inclusive communication channels can take different shapes, such as: dedicated systemic risk commissions at centers-of-government like those emerging in the financial sector (see e.g.

the European Systemic Risk Board in the EU); regular exchange platforms such as roundtables between responsible units and stakeholders; ad-hoc committees and advisory bodies such as the Systemic Risk Council in the US; and policy and table-top exercises for managing systemic risks (Aven and Renn 2018). The overall objective of such cooperative arrangements is to keep systemic risks as low as possible, while putting in place the necessary contingency-arrangements for when risk materializes.

Operationalizing systemic risk governance, however, is challenging. Most decision-making on conventional risks still takes place in institutional and administrative silos and available risk analyses are only slowly picking up on the increasingly systemic nature of risks (IRGC 2018). In section 3, below, we explore a set of short case studies drawn from PERC analyses of several major global flood events. The PERC approach is grounded in systems thinking and is therefore well adapted to identifying examples of systemic risk governance, including the bottlenecks and challenges illuminated by real-world stress-testing. In section 4, we complement the case studies with learning from a series of systems-focused, expert consultations performed in the IIASA-ISC initiative.

Understanding systemic risk governance in practice: insight from the governance of flood risks

Floods are inherently systemic – they do not adhere to administrative, jurisdictional, or sectoral boundaries. Their impacts are often wide ranging across scales, affect multiple sectors at once, and create long-term impacts, especially for the most vulnerable. Given the systemic nature of floods and the risks they pose to vulnerable communities, flood risk governance provides valuable insight into systemic risk governance more broadly. In this section, we review success factors and challenges identified through the Zurich Flood Resilience Alliance’s Post-Event Review Capability (PERC) (see box 1) with a specific focus on insights for systemic risk governance. The examples we provide below are illustrative of the successes and challenges we have seen across scales and contexts. They are not an exhaustive sample, but rather we have chosen the examples below to highlight that across urban and rural contexts, across local and national scales, and even in different political environments, systemic risk governance remains a challenge, but delivers tangible benefits when successfully implemented.

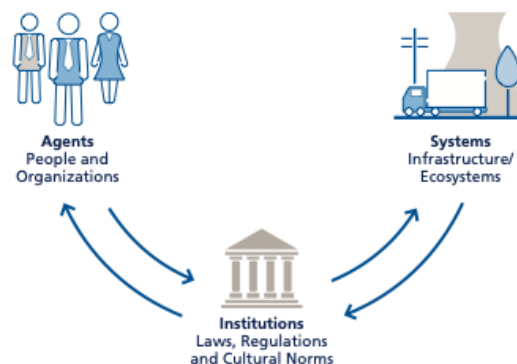
The PERC examples explored below highlight, in particular, two of the central needs of systemic risk governance identified in section 2: **strong and regular cooperation (co-management)** across the institutional and administrative boundaries of risk management, coupled with decision-makers and stakeholders across sectors and levels who are engaged in **inclusive communication channels** (Aven and Renn 2018). Drawing on these examples, we provide concrete insights into how systemic risk governance might be built. These examples, drawn from contexts around the world – river flooding in Nepal, Germany, and Boulder, CO, USA; hurricane/cyclone induced flooding in Houston, Texas, USA and Zimbabwe, Mozambique, and Malawi; ‘nuisance flooding’ in South Carolina, USA; and persistent heavy rains in Peru – illustrate the increasing prevalence of systemic risks no matter the context, while also underscoring that improving systemic risk governance is both valuable and within reach for urban, rural, developing, and developed contexts alike.

Box 1. The Post-Event Review Capability (PERC) - a tool for systems-level analysis of disasters.

The PERC is a methodological framework to conduct forensic, cross-sector and cross-scalar analysis of why a hazard became a disaster, and to identify opportunities for building resilience, including through systemic risk governance levers (Keating et al., 2016; Venkateswaran et al., 2020). Drawing on secondary research and key informant interviews the PERC methodology supports a greater understanding of the physical and socio-economic disaster risk landscape, as well as of the risk governance set-up and opportunities for fostering a systemic approach.

Focusing on understanding the dynamic interactions between systems, agents, and institutions and their role in creating and reducing risks, the PERC looks across the disaster risk management cycle and across scales and sectors to analyze why a natural hazard event manifested as a disaster and to identify key successes and critical gaps in how the event and the antecedent risk management provisions were governed (see Figure 1) (Friend and MacClune, 2012). This cross-sectoral, cross-scalar approach is directly in contrast to most assessments, evaluations and after-action reviews, which tend to be highly sector-focused. As a result, the PERC approach can be an effective tool for engaging policymakers from across sectors and scales in collaboratively addressing systemic issues.

Figure 1. The interacting components analysed through the PERC.



The PERC includes consideration for the following (Norton et al., 2020):

- **Systems** – This is the ‘what’ component of resilience. It refers to a combination of ecosystems and infrastructure systems and the services they provide. Ecosystems provide basic foundational needs (water, air, food) as well as more advanced needs such as coastal defence, and water absorption capacity. These ecosystem services are mediated, either positively or negatively, by physical infrastructure and services (e.g. transport, water distribution, drainage, power and communications) that are central features of human settlements.
- **Institutions/Governance** – This is the ‘how’ component of resilience. It refers to the rules, norms, beliefs, or conventions that shape or guide human relations and interactions and influence access to and control of systems. While institutions shape agents—equally, agents can shape institutions, thus opening the possibility of change.
- **Agents** – This is the ‘who’ component of resilience. It refers to people and their organizations, whether as individuals, households, communities, private and public sector organizations, or companies, and their capacity to respond to and shape the world around them. Agents have different sets of assets, entitlements, and power, that enable or constrain access to systems.

To date, 18 PERCs have been conducted addressing a range of natural hazard events including riverine, coastal and flash flooding, hurricanes, and wildfires. Further information can be found here: <https://floodresilience.net/resources/collection/perc>

Box 2. An institutional landscape map can help visualize gaps in systemic risk governance .

Institutional landscape maps are a useful tool that have been utilized in several PERC studies for visualizing gaps in systemic risk governance. They are developed using a thorough analysis of governance systems, their connections, and their fragilities (as identified via desk review and interviews regarding how governance systems functioned during the disaster in question). More specifically, the institutional maps can be developed to show:

- The institutional, political, and civil system in which disaster risk management takes place, and for visualizing the system boundaries and connections,
- The key actors from across scales involved in disaster risk governance,
- Key decision-making and communication channels and structures, and
- Where there are bottlenecks and where there were failures in the disaster risk governance system. For example, the map can identify where the whole response system is at risk of collapse when one agency or person is not able to perform.

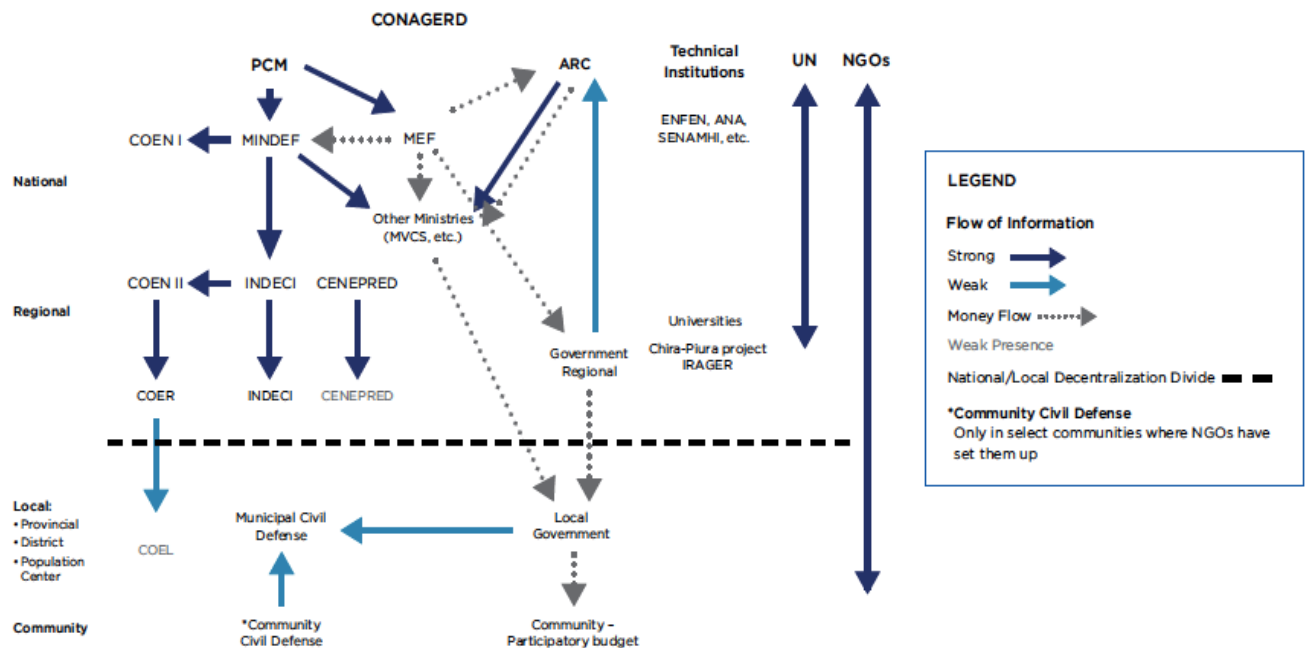
Figures 2 and 3 are institutional landscape maps from PERCs that have been conducted that demonstrate (1) issues in co-management across institutional and administrative boundaries and (2) fragilities in communication channels. Both of these issues are seen across the body of PERC studies to constrain disaster risk governance and/or contribute to compounding impacts.

Enhancing co-management across institutional and administrative boundaries for systemic risk governance

The systems-thinking approach utilized in PERC studies provides insights into strengths and gaps in co-management across the institutional and administrative boundaries of risk management. The PERC studies reviewed below are illustrative of the challenges documented in many of the PERCs conducted to date. They highlight the challenges arising from unclear, and sometimes conflicting, division of responsibilities across and between institutional and administrative units.

National disaster risk reduction in Peru has been moving from an emergency-response dominated focus towards an integrated approach combining reactive, corrective, and prospective disaster risk management measures. Progress has been greatest at the national and regional levels, but there remains pressing need to strengthen disaster risk management capacities at local levels of government. An institutional map (Figure 2) of the key Peruvian DRR actors and financial and information flows shows a significant disconnect (as indicated by the horizontal dotted line) between national/regional and local levels where flow of information, capacity, and resources are concerned. While the regional government receives substantial national support and is therefore high capacity, the same cannot be said of the local level. Furthermore, the national and regional level disaster risk governance systems consist of several interconnected disaster-specific governing entities, whereas the local government is a single entity tasked with implement competing national level mandates and priorities, of which disaster risk management is just one component. Finally, while there are theoretically several funding mechanisms for local DRR, in practice funds are difficult to access and the timing for funding allocation and implementation limits the ability to use it effectively (Venkateswaran et al., 2017). This mis-alignment between scales means that even where there is good risk awareness at local levels, there is little ability to address that risk. Regional and national risk reduction investments tend toward high profile, high dollar investments that garner political attention, and fail to invest in maintenance of those systems. Overall, this leads to increased exposure of communities, especially with respect to compounding and systemic risks.

Figure 2. Simplified disaster risk management institutional map of Peru in 2017 (Venkateswaran et al., 2017).



The PERC in Peru also noted challenges resulting from vulnerable in-country migrants settling in high-exposure areas, driven by economic pressure to access improved livelihoods. In Peru, national government policy permits these settlements despite local awareness of the risk that will pose for new residents. PERC studies in Nepal and Texas found similar challenges despite different underlying drivers and very different cultural, political and economic conditions. The PERC on the 2017 flooding in Nepal (Bhandari et al., 2018) found that, due to a lack of coordinated land-use planning, development in flood prone areas in the Terai region increased. Similarly, the PERC on 2017 Hurricane Harvey in Houston, Texas, USA found that development occurred within flood control reservoirs, areas intended to flood, due to a confluence of factors including limited regulatory action around development, limited communication between developers and flood risk managers, and confusion around federal versus state versus county management and regulation of the reservoirs and surrounding areas (Norton et al., 2018). In Texas, this siloing of management, coupled with low risk awareness, led to catastrophic flooding of over 9000 homes and businesses following Hurricane Harvey (Norton et al., 2018). In all three of these cases, intensifying storms fuelled by climate change, coupled with increased development pressure, are highlighting gaps in cross-scalar communication and planning. Failure to address these gaps is becoming increasingly costly not just for those directly impacted, but also for the mid- and national-level governments who have had to mount response and recovery efforts, and for the unimpacted parts of the local communities who nonetheless suffer the broader economic consequences.

Several PERCs further highlighted the challenge in governing transboundary systemic risk. Watersheds do not adhere to administrative boundaries and action implemented along rivers may have unintended upstream and downstream effects. In Germany, for example, because flood protection falls within each individual state's mandate, different states can make decisions that may negatively impact other states, as happened during the 2002 floods when different levee heights and widths on opposite banks of the Elbe River in the states of Lower

Saxony and Schleswig-Holstein caused one state to flood before the other (Zurich Insurance Group, 2014a).

Our PERC studies have also found examples of effective multi-sector, multi-level, transboundary coordination – examples which clearly illustrate systemic risk governance good-practice. In Nepal and India, for example, trans-boundary cooperation has been improved over the years via the joint exploration of ‘win-win’ options for risk communication to alter local perceptions that development on the Indian side causes inundation in Nepal or that Nepal “sends” floods to India. During the 2017 floods, as a result of greater transboundary cooperation, Indian authorities rapidly managed the barrage where the Karnali River crosses between countries and opened sluice gates, reducing flood risk in both countries. Information sharing also enabled the dissemination of early warnings to two million people living along the river in the two countries and evacuation of 200,000 people (Bhandari et al., 2018). By recognizing the hazard boundaries, rather than solely governance boundaries, lives and assets were saved.

Cross-boundary thinking is as necessary within countries as between them, across both small and large scales, and across sectors. In Switzerland, following the 2005 floods where a lack of coordinated management of driftwood and debris exacerbated flooding, regulations governing the management and flow of rivers and lake levels were aligned across cantons (Zurich Insurance Group, 2014b). In Boulder, Colorado, USA, mountain communities established an informal network for ham radio operators following wildfires in 2010. The network played a vital role in maintaining communication between the communities and the county government during the 2013 floods when road access, power, and communications were lost (MacClune et al., 2014). In South Carolina, USA after repeat flooding in 2015, 2016, 2017, 2018, the Charleston Resilience Network (CRN), a regional network of government, non-government and academic stakeholders mobilized to develop systemic solutions, to facilitate intergovernmental and multi-sector coordination across municipalities and sectors and to address underlying issues at the watershed level (Venkateswaran et al., 2016; Norton et al., 2019). While diverse, these examples illustrate that, particularly when dealing with transboundary perils, cross-sector and multi-scalar collaboration is a key element to managing risk and supporting effective risk governance. As seen across multiple PERC studies, where cross-sectoral and cross scalar cooperation was strong, actors were able to mobilize and coordinate to address emergent concerns and underlying issues.

Building inclusive communication channels for systemic risk governance

PERC studies also provide concrete learning regarding the importance of communication channels, highlighting both gaps and successes from extreme floods. and underscoring the importance of system approaches to governance that facilitate effective and inclusive risk communication and decision-making. Early warning systems (EWS) are an example of this. Effective EWS are cross-scalar and multi-sector, provide a useful, practical example of how risk governance arrangements can be set up to address risk in cross-scalar and cross-sectoral ways, and at the same time illustrate the amount of work and coordination it will take to do it effectively. In Mozambique, Zimbabwe and Malawi (Norton et al., 2020), for example, forecasting of Cyclone Idai in 2019 was accurate, and mechanisms existed for transmitting information to the local level, but forecasts did not generate the action needed to reduce risk, either because people didn’t know how to interpret the forecasts or because they lacked the

resources to act. The 2013 flood in Boulder County, Colorado, USA also highlighted gaps in the 'last mile'. The town of Lyons activated evacuation sirens, but there was confusion about where to evacuate to. In the city of Boulder, even with accurate modelling and early sirens, the general public underestimated their flood risk. These examples highlight the need for an end-to-end EWS where capacities are improved from production to use of forecasts such that people know what actions to take to minimize harm.

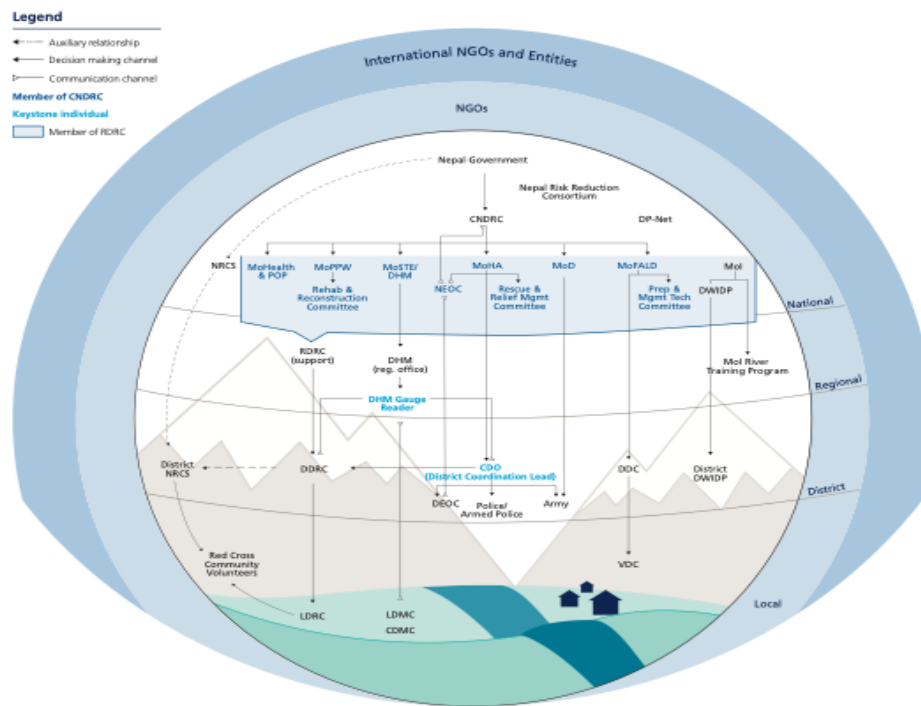
An end-to-end EWS, however, also necessitates strong communications channels between the national and local levels. The 2014 Karnali basin flood PERC in Nepal (MacClune et al., 2015) highlighted both a successful end-to-end community-based warning system and a failed one. The successful system built off existing community structures with broad stakeholder buy-in and helped protect lives and livestock during the 2014 floods. The failed system, in a neighbouring basin, failed because Nepal was at that time governed under a hierarchical, top-down system where decisions were made at the national level and communicated to the local levels. Local communities and governments were unable to push information back to the national levels to ensure that national-level decisions were reflective of local level realities and needs. Figure 3 illustrates this failure, where information flow from the local to national level was limited.

There are two particularly critical points of potential failure in the governance system (Figure 3):

- 1) the entire EWS system is dependent on a single person, the 'gauge reader,' at each gauge. The gauge reader must be able to access the gauge and communicate water levels to downstream stakeholders. In 2014, this failed at both the Chispani and Chepang gauges for periods of several hours. In Chispani, this was compensated for by the devotion of the individual and the support of the surrounding community; in Chepang it was a more significant failure.
- 2) the Chief District Officer (CDO), in the Chepang gauge district was relatively new, not from the region, and unaware of local flood hazards. Failing to understand the urgency and magnitude of the flood event communicated by the gauge reader he did not trigger the appropriate EWS alerts quickly enough.

Both failures significantly slowed national recognition of the disaster and mobilization of resources and relief, and the more acute failure in Chepang resulted in lost lives and assets. Strikingly, however, in both districts an EWS dependent on an individual gauge reader reporting to an individual CDO was an improvement over the previous system where gauge data was simply sent to Kathmandu and no local early warning system was available.

Figure 3. Disaster risk management institutional map of Nepal (MacClune et al., 2014).



PERC insights to inform systemic risk governance practice

The PERCs collectively highlight several cross-cutting insights that can and are successfully informing systemic risk governance practice, including the nurturing of inclusive communication channels and bolstering cross-scalar and multi-sectoral coordination. Vitally, delivering both requires long-term engagement with and capacity-building of key stakeholders across multiple sectors and levels of government. Indeed, within the body of PERC studies, we have seen promising examples of multi-scalar and multi-sectoral groups mobilizing to address risk, particularly at the watershed level. However, while these groups have broken out of sectoral and administrative silos, they often continue to operate within hazard silos. Communities face multiple, often overlapping risks, as has been demonstrated by the recent COVID-19 crisis overlapping with the 2020 floods in Bangladesh and the 2020 earthquake in Croatia. Given the example of COVID-19 and the emerging and projected risks posed by climate change, managing compound risks will require strong risk governance that takes systemic risks into account and incorporates mechanisms that can adapt to changing risk landscapes.

Learning from COVID-19 and climate risks - insights for fostering systemic risk governance

Our discussion so far identified systemic risks as ill governed, with opportunities for enhancement through a shift towards systemic risk governance. Turning from one chronic crisis – floods – to another crisis currently affecting societies everywhere – the, as of the time of writing, ongoing COVID-19 pandemic – we proceed to glean first lessons learned for risk governance.

The COVID-19 pandemic has forcefully revealed the increasing complexity and systemic nature of global risks. Current risk governance arrangements have struggled to respond, highlighting weaknesses that will be equally challenged by the complex and systemic nature of risk in a world beset by rapid change. Hyperconnectivity, environmental degradation, accelerating climate change, rapid technological change, and rising inequalities require new types of governance arrangements. COVID-19 is but one example in a string of increasingly frequent health and climate-related risks that the world has seen turn into disasters. As global warming continues, more and more risks will compound. Climate scientists are warning about global large-scale tipping points (Lenton et al., 2019), localized adaptation limits (Mechler et al., 2020), and ‘unknown unknowns,’ (Taleb, 2007) which demand capacity to take robust, nimble, yet evidence-based responses that find acceptance by affected societies. Addressing the new, compounding set of risks through effective systemic risk governance arrangements is key to prevent and respond to future extreme events.

The COVID-19 crisis provides encouraging, albeit challenging, lessons for enhancing systemic risk governance arrangements at national levels. In several countries, such as Australia, Israel, New Zealand Singapore, South Korea, and Taiwan evidence-based, swift national leadership coupled with clear crisis communication has proved useful for containing the spread of COVID-19 and bringing necessary recovery initiatives on the way (Choi et al. 2020, McKie 2021). In other countries, crisis arrangements have been characterized by governance challenges, such as crisis plans with layers of shared responsibility across levels of governance, as is the case in federal countries such as the United States and Germany, where it proved challenging to bring coherent, nationwide crisis response measures underway (Hallam 2021). In some cases, swift approaches have characterized the reaction to the first wave of COVID-19 while response to the second wave has been much slower: Examples include Austria where initial disaster response was swift, communicated by the highest level of government but not all measures were fully in line with legislation, an issue to be resolved in the response to the following wave through lengthy rounds of negotiations across levels of governance, resulting in much slower response and some of Europe’s highest reproduction rates until measures eventually took effect (APA 2020, Völker and Frey, 2020). In other countries, COVID-19 was an ‘infodemic’ where the crisis was enabled by the spread of inaccurate information and a lack of reliable data to inform decision-making such as in Ecuador (King et al. 2020), and further spiraled out of control by a combination of an ignorance of available scientific evidence (Taylor 2021) and a lack of political will to set up effective and coordinated public health response to the outbreak such as in Brazil (Ferigato et al. 2021, Ventura et al. 2021) and Tanzania (Mwakideu 2021). And some countries were overly optimistic regarding early successes, leading to subsequent catastrophe such as in India that has moved from relatively few infections throughout most of 2020 to a ferocious second wave with exponential transmission trajectories putting a heavy burden on the health care system

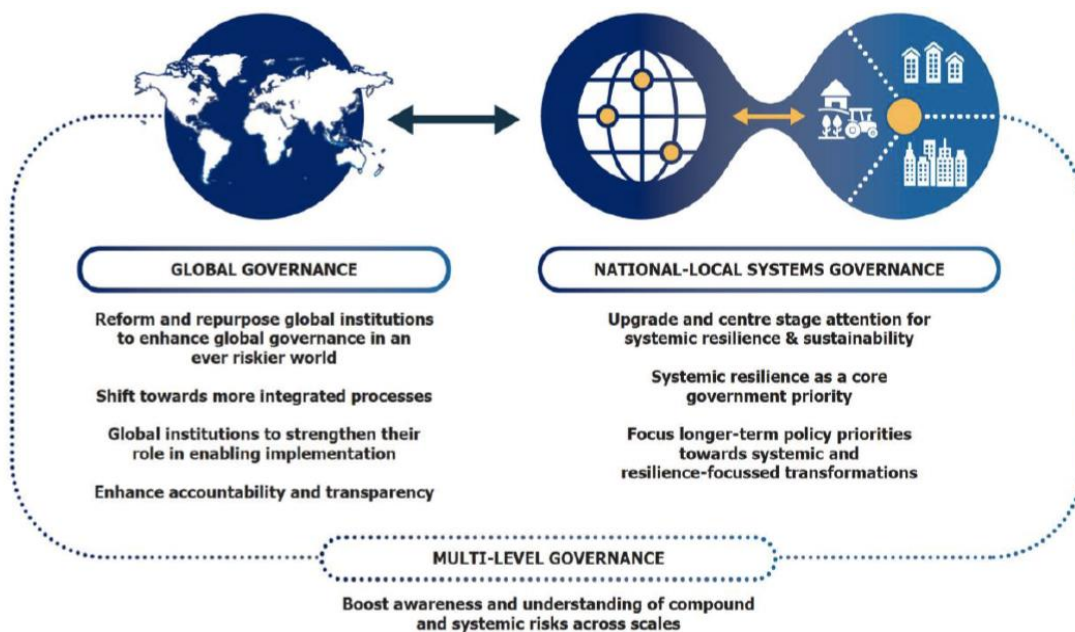
(Schumaker 2021, Priyamvatha 2021). Countries like Chile, on the other hand, provide a stark warning that fast vaccination rollout can only curb infection rates if governments couple it with apt risk communication and other public health measures (McKie 2021, Chambers 2021). These examples highlight the way that failure to take a systemic risk governance approach can reduce our collective capacity, across countries and across generations, to thrive and cope with crises and move towards sustainable futures. Ideally, we will use these insights from governing COVID-19 as a springboard for re-thinking systemic risk governance. The IIASA-ISC COVID-19 initiative (see box 3) identified learnings and co-generated options for translating the lessons from COVID-19 governance into options for enhancing systemic (risk) governance towards enabling more sustainable and resilient development pathways going forward.

Box 3. IIASA-ISC Initiative on “Transformations within reach: Pathways to a sustainable and resilient world”.

In recognition of the many challenges hampering success in delivering on the goals of the 2030 Agenda, and other international frameworks such as the Paris Agreement and the Sendai Framework, the International Institute for Applied Systems Analysis (IIASA) and the International Science Council (ISC) joined forces to establish a partnership combining the strengths and expertise of the two organizations to define and design sustainability pathways in the face of the COVID -19 pandemic.

As one of four themes, through research and a multi-stakeholder consultation, IIASA and ISC have worked together to review findings and co-generate options for translating the lessons from COVID-19 governance into options for enhancing governance towards more sustainable development pathways going forward. For the consultations, IIASA and ISC engaged a broad set of leading experts on global and national governance reform, disaster risk management and public health from research institutions, international organizations, national governments and non-governmental organizations. The three consultations brought together about 80 experts from Asia, Africa, Latin America and Europe from research, policy, private sector and civil-society.

Figure 4. Options for enhancing risk governance across scales and putting systemic resilience centre-stage post-Covid-19. Mechler et al., 2020.



For further information, see: <https://covid19.iiasa.ac.at/isc/governance/>

The IIASA-ISC initiative thus suggests to:

- Improve understanding of the systemic nature of disaster and climate change risks, and transparently map systems-wide and cross-regional impacts of potential and compound climate extremes, as a basis for shifting towards systemic risk governance.

The COVID-19 pandemic also provides a window of opportunity for structural changes that address deep drivers of risk, without which resilient and sustainable futures will be unattainable. Developing a deeper appreciation of how individual and collective choices and perceptions contribute to the creation and realization of such risks is imperative (see also Garschagen et al. 2020). Collaboratives involving both decision makers and those affected by such decisions, conducted in ways that address inequalities and vulnerabilities, build engagement and possibilities for self-determination, and make a major contribution to building societal and ecosystems resilience are needed if we are to move beyond business-as-usual. The IIASA-ISC initiative thus suggests to

- Actively engage non-state and non-traditional actors to ensure that systemic risk governance serves the most vulnerable.

To realize systemic risk governance, we require more effective coordination or decision-making processes across levels of government. This might involve developing a central coordination unit strategically close to highest decision-making levels (such as in the cabinet office). Ongoing support should be extended to decision-making and accountability across ministries, agencies and other players for systemic investments by mobilizing science communities and science advisors, for example in roundtables that involve the full range of competent ministries and agencies along with stakeholders from civil society, communities, private sector, or policy advisory bodies at arm's length from government. To achieve this, it is key to:

- Define clear roles and recognition for civil society and private sector as relevant transformation agents. In many countries these parts of society have shaped responses to COVID-19, and before this crisis already had taken charge to foster transitions and transformations. Further recognition for these achievements is desirable and necessary.
- Strengthen our focus and accountability to ensure solidarity with the most vulnerable. While societies during COVID-19 have shown enormous solidarity for those most vulnerable to COVID-19 (i.e., older segments of society), those most vulnerable to the response measures (such as migrant workers) have not been adequately taken care of. Further attention and better accounting must be developed.
- Establish and upgrade health, education and social protection systems to enhance human development, and resilience for all. As the crisis shows, the importance of the public sector in providing basic services and public good is key and institutional capacity needs to be built and maintained in this regard.
- Adopt a longer-term horizon for change and related planning procedures to anticipate emerging risks and potential cascading and systemic implications early on with view to take necessary risk management measures. From a governance perspective, engaging in strategic foresight and scenario planning with a long-term planning horizon enables fostering the necessary political buy-in for bolstering resilience in uncertain futures.

As we take up the challenges and address the gaps illuminated by COVID-19, a broad triple dividend framework can provide valuable structure for evaluating progress. The triple dividends framework presents a broad case for disaster and climate resilience and enables a track-record of the successes and bottlenecks in systemic risk governance along three main lines: reducing damages and losses to lives, livelihoods, and assets (1st dividend); unlocking development (2nd dividend); and garnering development co-benefits (3rd dividend) (Surminski and Tanner, 2016; Mechler and Hochrainer-Stigler, 2019).

Lessons learnt and options for promoting systemic risk governance

Given the increasingly interdependent and interconnected nature of our economies and societies, the systemic nature of risks - whether from natural hazards, climate change, or emerging disease - does not come as a surprise. And yet, the governance of systemic risks tends to be still siloed in spite of the clear need for cross-sectoral and multi-level initiatives. The examples provided above from both PERCs and the IASA-ISC initiative illustrate how single-focus risk governance limits opportunities for building resilience and effectively addressing the systemic nature of risks. They also highlight clear opportunities for shifting towards more systemic risk governance, one where risk is co-managed across institutional boundaries and risk reduction methods are founded on effective and inclusive communication.

The PERC analyses, focused on the management and governance of flood risks in the context of climate change, collectively indicate that systemic risk governance tends to be stronger where:

- Disaster risk management is prioritized (with investment), treated as a cross-sectoral issue, and mainstreamed into development.
- Local governments have high capacity and necessary resources to engage in cross-sectoral and multi-scalar disaster risk management, using resilience frameworks to identify systemic gaps and opportunities for action.
- There are strong, active, relationships between stakeholders and across sectors.

On the flip side, this means that for fostering systemic risk governance it would be critical to promote risk management as a cross-sectoral issue by setting up coordination mechanisms that, in particular, lift up local risk governance arrangements and foster strong, active, relationships between stakeholders and across sectors.

The Covid-19 initiative assessing risk governance in the midst of a global pandemic showcased that good systemic risk governance ought to set up provisions for:

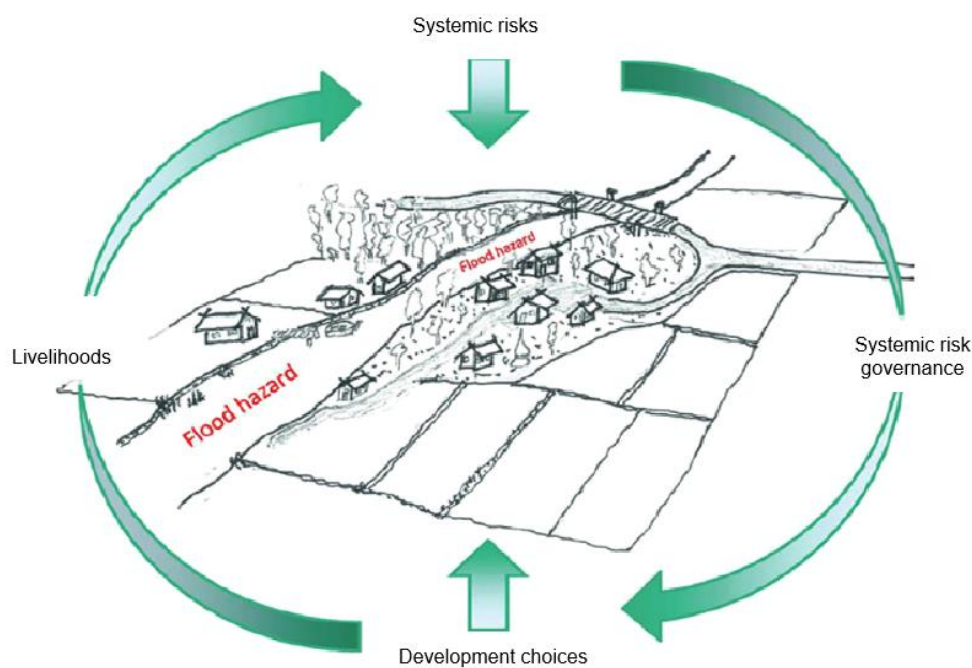
- Long-termism in terms of attending to currently rampant risks with a view towards creating future developmental benefits in line with the SDG 2030 imperative.
- Enabling improved understanding of the systemic nature of disaster and climate change impacts and transparent mapping of the systems-wide and cross-regional impacts of potential and compound climate extremes as a basis for shifting towards systemic risk governance.

Cooperation across governance and agency scales and across borders, as risks are becoming increasingly connected and transboundary. In this regard it is important to remind that, while governance many times is primarily associated with public actors, non-state actors can and need to play a strong role in systemic risk governance. Large-scale and compounding

systemic risks, such as floods and pandemics, cannot completely be avoided, but there are measures that can be taken through a systemic risk governance approach to ensure they do not diminish hard-earned development gains (see Figure 5).

Learning to live and thrive in a context of compounding risks means considering multiple and systemic risks in planning and investment decisions from their inception, taking steps to protect assets already at risk, and implementing both via a systemic perspective that involves cooperation and co-management across the institutional and administrative boundaries of risk management. It also means planning for response and recovery from systemic risks, with a view to protecting and even enhancing development potential in mutually reinforcing ways. Given increasingly systemic risk and the massive impacts brought about by COVID-19, it is clearly time to further invest in enhancing systemic governance across scales.

Figure 5. A systems view on governing risk and development in the face of multiple and compound systemic risks. Figure adapted from McQuistan 2015.



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