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The Social Construction of Systemic Risk: Towards an Actionable Framework for Risk Governance

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The Social Construction of Systemic Risk: Towards an Actionable Framework for Risk Governance

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Contents

Introduction[1]

Since the turn of the century, growing attention has been given to the concept of "systemic risk" in academic and policy discourses. The term has been employed to refer to physical, biological, social, environmental or technological hazard events triggering not only direct loss and damage but also spiraling, cascading or ripple effects within one or more interdependent social, economic or environmental systems, often associated with feedback loops and non-linear effects (UNDRR 2019; Renn 2016; IRGC 2018).

The concept has been used to analyze events ranging from the 2007 – 2011 financial crisis (Dijkman, 2010), the closing of air space when the Eyjafjallajökull volcano in Iceland erupted in 2010 (UNISDR, 2011), the interruption of global supply chains, following the East Japan nuclear reactor crisis and the Chao Phraya River, Thailand, flooding in 2011 (UNISDR, 2013b), the collapse of New York's infrastructure when Hurricane Sandy hit in 2012 (Haraguchi and Kim, 2016), the Syria crisis (Erian, Katlan, and Babah, 2010), the COVID-19 pandemic (Simonovic, Kundzewicz, and Wright, 2021) and human induced climate change (Schweizer and Renn, 2019). The mid-February power crisis in Texas and the Evergreen episode in the Suez Canal, both in early 2021 can also be considered as recent materializations of systemic risk.

Risk in interdependent systems has always existed. But events since the turn of the 21st century would seem to indicate that the compression of time and space[2], as a defining characteristic of economic globalization, is consistent with increasing system interdependency, complexity and uncertainty and hence magnified systemic risk.

Fields and disciplines as diverse as finance and agricultural systems[3], complexity sciences, climate change, engineering, evolutionary biology, public health, disaster risk, and sustainable development (Renn et al., 2020) have incorporated the concept and term. As in the case of the term 'resilience', despite common features, each of these fields defines the term in multiple ways within and across disciplines.

To be realized and manifest as loss and damage, systemic risk must already be 'internalized' and latent in a system. Even when the triggering hazard event may be difficult to forecast, accurately or at all, the underlying and accumulated risk always pre-exists the trigger. However, the non-linear impacts of many systemic risk events many times continue to catch the world by surprise, unaware and unprepared. The improvised response to the financial crisis and the COVID 19 pandemic, the two largest global shocks of recent years, reveal the absence, or at the very least, the inadequacy of governance arrangements to identify, estimate, and address systemic risks, and the lack of social understanding of these. A recent survey by the OECD highlighted that while many countries had strategies to manage risks in some critical infrastructure sectors, few map interdependencies across sectors and only half have the capacity to identify new, unforeseen and complex crisis (OECD 2018).

Systemic risk governance has become synonymous with strengthening response and resilience to transboundary and global risks, particularly in the financial system, in global supply chains and strategic economic infrastructure. Far less attention has been paid to

[1] The paper offers a summary of the results of a study undertaken originally by the authors for the Disaster Risk Reduction & Recovery Team of UNDP Crisis Bureau, on "The Social Construction of Systemic risk: Towards an actionable framework for risk governance", June, 2021.
[2] See Harvey, David, 1989, The Condition of Postmodernity, Wiley, UK for a discussion on space-time compression with respect to the organization of the global economy.
[3] See for example "systemic risk" on https://agris.fao.org/

reducing or preventing such risk, while there has also only been a limited concern with systemic risk at the local and national levels, especially in the context of low- and middle-income countries (LMICs).

Therefore, the objective of this paper is to highlight how systemic risk, as other risk categories, are socially constructed, and to identify guiding principles for systemic risk governance that could be actionable by and provide entry points for local and national governments, civil society and the private sector particularly in LMIC, in a way that is relevant to the achievement of the 2030 Agenda for Sustainable Development. This considers preparedness, response and resilience, but more importantly prospective and corrective risk control and reduction strategies and mechanisms. Only when systemic risk is framed in a way that is relevant to the political agendas of LMIC will it be possible to begin a dialogue for its governance.

The paper examines systemic risk within the context of the Sendai Framework for Disaster Risk Reduction (SFDRR) adopted in 2015 (UNISDR 2015b). The concept of disaster, seen as a severe interruption of the routine functioning of a society, or economy, condenses the risk accumulated in a system or systems and is, therefore, appropriate to frame systemic risk[4]. In particular, the SFDRR encompassed a broader range of hazard events[5] than those previously considered to be components of risk or triggers of disaster , including physical (for examples, earthquakes, floods or drought), biological (for example, virus and other pathogens), technological (for example, a nuclear accident) and social and economic (for example, financial, crime, insolvency or price spikes) hazards.

[4] By “condenses” we wish to express the way that risk, manifest in sectors such as health, finance, education and service provision, or in different territories, come together at the moment a triggering event occurs to generate the context called disaster or crisis. Disaster or crisis represents the coming together of risk scenarios and is thus the maximum expression of systemic risk and its existence.

[5] The SFDRR did not explicitly include conflict in the hazards considered. However, conflict could be considered in the category of social hazard, which would also include hazards such as crime, violence, genocide, forced displacement and others.

Characterizing systemic risk

Basic definitions of systemic risk and resilience

The Cambridge English dictionary defines ‘systemic’ as an adjective *“relating to or affecting the whole of a **system**, organization etc. rather than just some parts”.* A common interpretation of “systemic risk” refers to the risk that affects the functioning of “*the whole of a **system**…. rather than just some parts of it’*[6]. But given that a partial breakdown of a system may be severe enough without the entire system being affected, it has also been suggested (Aven and Renn 2020) that while systemic risks need to be differentiated by their scales (global, national, regional), they need not imply the breakdown of an entire system to be classed as systemic.

Conventionally, attributes of realized disaster risk include direct, indirect, and secondary losses and effects and a range of wider impacts (UN ECLAC, 2003)[7]. Direct losses refer to the damage and destruction of produced capital such as housing, infrastructure, crops and other assets, people through loss of life, injury and displacement and natural capital through downgrading, degradation or transformation of ecosystems[8]. These direct or asset losses may then translate into indirect losses in livelihoods, employment and production, which in turn may be associated with wider impacts, such as increases in the breadth and depth of poverty, declining health, interruptions to education and longer-term macroeconomic effects[9].

The indirect and wider impacts triggered by direct asset losses are often associated with a loss of system functionality, interruption or collapse which may be realized over different temporal and spatial configurations. For example, damage to an electricity sub-station may cause the shutdown of a power network, which in turn paralyses production, commerce and services elsewhere. Moreover, even the anticipation of direct loss and damage may trigger systemic risk. A severe weather event that shuts down a major airport hub, may severely disrupt air traffic without causing direct loss and damage to the airport infrastructure. COVID 19 led to the shutdown of economies and severe repercussion, without direct physical asset damage or loss.

Small initial loss and damage may, at times, lead to very severe and lasting impacts. The indirect and welfare impacts are difficult to measure and are many times largely unaccounted for or attended to, but have been estimated to be significantly higher than the cost of physical or direct impacts (UNISDR, 2015a, Hallegatte et al., 2017).

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[6] https://dictionary.cambridge.org/dictionary/english/systemic

[7] Despite the fact indirect or secondary effects of primary impacts were highlighted in evaluation methodologies such as that of the Economic Commission for Latin America- ECLA- more than 30 years ago, most risk analysis and evaluation of disaster impacts concentrates on direct impacts and little attention is given to the indirect ripple effects. The definition of disaster by the UNDRR does not make reference to such effects concentrating on direct impacts. The debate on the ripple effects was the basis of the discussion started 40 years ago on disasters and development (Cuny,1983; Wijkman and Timberlake, 1984), but this has not been taken up on or resolved satisfactorily even to date.

[8] The use of downgrading, degradation, or transformation, as opposed to “damage to” ecosystems transmit the idea that ecosystems cannot be “damaged” as such if the event that impinges on them is naturally occurring. “Damage”, which is an anthropogenic notion, can only occur as such where ecosystems have been intervened ex ante and an event thus impinges on a weakened, less resilient environment; a context much present in our anthropogenic, exploitative world.

[9] The United Nations (United Nations General Assembly, 2016) defines disaster risk as: *“The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity”.*

As systemic risk is to do more with flows than with stocks, its severity is not only a function of hazard, exposure and vulnerability but also of the compensating effects of the resilience[10] of the system as a whole. The resilience of systems refers to their innate, existing capacity to buffer direct impacts in a way that allows them to continue providing or accessing services, to quickly recover or to adapt, and be "safe failing" (Ahern, 2011; Kim et al., 2017, 2019). For example, if a health system can continue to provide services despite the collapse of a hospital, due to its capacity to quickly divert patients to other facilities, it would be considered more resilient than a health system that depended on a single facility. In other words, the systemic risk would be lower.

As such, systems characterized by variety and redundancy and with greater capacity to buffer losses, organically evolve, adjust and adapt to changing contexts are considered more resilient than rigid or brittle systems, that are dependent on single nodes or pathways for their functionality (da Silva, Kernaghan, and Luque 2012). Systems with low levels of resilience, therefore, often manifest higher levels of systemic risk.

Hazard triggers, scale and complexity

Systems exist at all scales and levels of complexity and can consist of biotic and abiotic (including anthropogenic) elements and agents (Sterk, van de Leemput, and Peeters, 2017), connected across transboundary globalized networks (Young et al., 2006), a country, a particular territory, an urban area (Frank, 2017), or a sector, supply chain or infrastructure network and can range from local to global in scale. Interactions between systems and sub-systems may be slow or fast-moving, and linear or non-linear (Sterk, van de Leemput, and Peeters, 2017). Similarly, local ecosystems form part of interdependent regional and global earth systems, including climate, hydrological and ocean systems.

The level of complexity and non-linearity in systemic risk is associated with the degree of system interdependence[11]. Interdependence implies that even the smallest manifestation of risk in one system may generate impacts in other systems. As system complexity and interdependence increases, the channels through which direct impacts are translated into indirect impacts and wider effects are characterized by non-linearity and multiple feedback loops (Renn et al. 2020).

As is the case with systems themselves, systemic risk may be realized at different levels of complexity. It may be triggered by single, multiple, compound or cascading-concatenated

[10] The United Nations defines resilience as: "*The ability of individuals, households, communities, cities, institutions, systems and society to prevent, resist, absorb, adapt, respond and recover positively, efficiently and effectively when faced with a wide range of risks, while maintaining an acceptable level of functioning and without compromising long-term prospects for sustainable development, peace and security, human rights and well-being for all*." (United Nations 2017)

[11] The concept of interdependence has been explored in philosophy for millennia. For example, in the 2nd century, Nagarjuna put forward the notion that no phenomenon has an independent or separate existence but can only be understood in terms of its interdependence with all other phenomena (Jones, 2014). In the 14th century Ibn Jaldun (1977) highlighted how small events could only be interpreted in relation to broader and cyclical historical processes. Hegel (1968) argued that an accumulation of small quantitative changes can trigger major qualitative systemic change. In the 18th century, Von Humboldt demonstrated the interdependence between climate and ecosystems across different geographies (Von Humboldt, 1807)[11]. How specific phenomena and moments in time and space unfold from broader underlying processes has been explained in terms of the concepts of implicate and explicate order by quantum physicist David Bohm (1980).

hazards and lead to sequential, synchronous or simultaneous impacts (UNISDR, 2011). *Sequential crisis* has been used to refer to the impact of a hazard event in one system, that then produces cascading and non-linear impacts and ripple effects in other systems, which may be geographically and temporally discontinuous. *Synchronous failures* refer to breakdowns in multiple interlocking systems, which interact to generate compound impacts. *Simultaneous crises* refer to situations where different risks are realized simultaneously and produce a magnified impact in interconnected and interdependent systems that is greater than the sum of the parts (UNISDR, 2011). Cascading or concatenated hazards, which tend to assume greater importance as time passes, are illustrated, for example, with earthquakes triggering tsunamis, as in the 2004 Indian Ocean Tsunami; liquefaction resulting from earthquakes causing floods, as in Christchurch, New Zealand in 2010; early season drought and forest fires magnifying late-season flood and landslide hazard, as in the case of Hurricane Mitch in Central America in 1998, and so on.

Physical, biological, social, technological and economic hazard triggers may also be compounded, for example in the case of the East Japan earthquake, tsunami and nuclear reactor event, or in the case of Zimbabwe where the effects of drought on food production are compounded with macro-economic pressures, the COVID-19 pandemic and other health crisis. In Bangladesh, unregulated urbanization contributed to an increased incidence of fires and building collapse in textile factories and while the physical conditions were improved over the years, labour conditions and protection laws continue to perpetuate urban risks. This socio-economic stress has then been compounded by the COVID-19 pandemic.

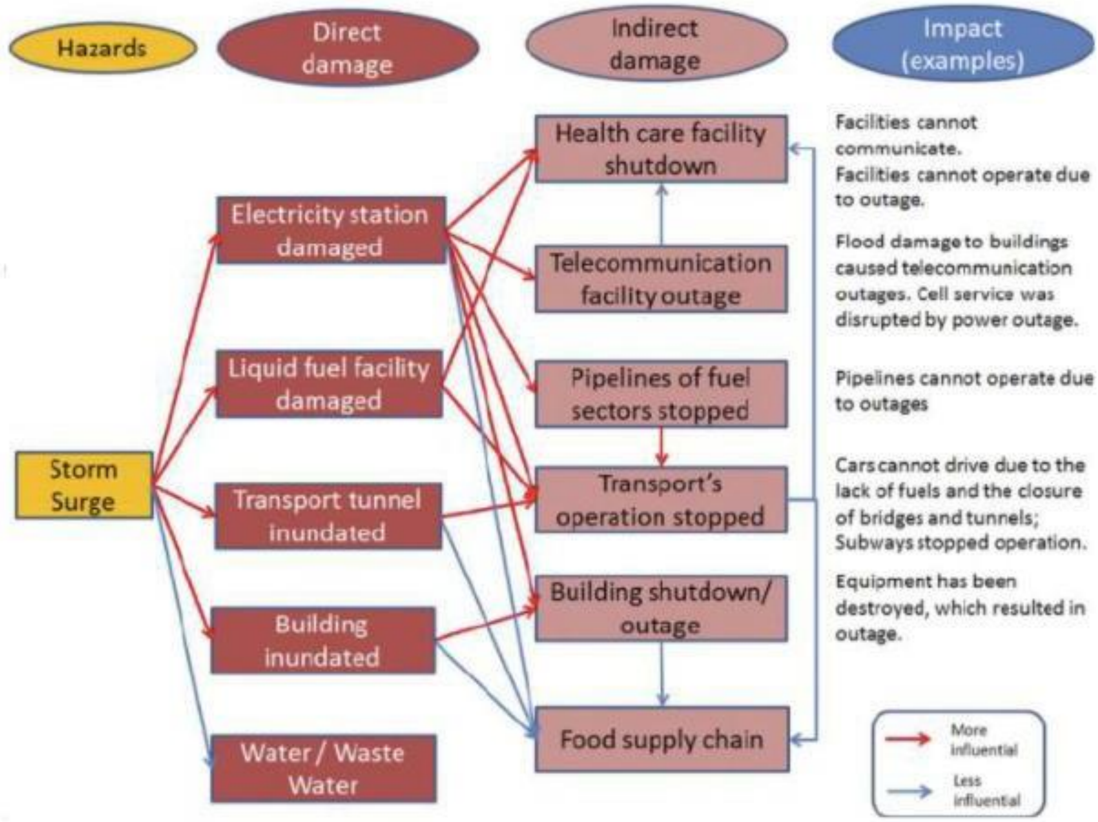
Unfortunately, in literature and practice, hazard is often confused with risk, and it is often assumed that multiple, concatenated or compound hazard triggers are synonymous with systemic risk. However, irrespective of whether the trigger is a single, multiple, or compound hazard, systemic risk always reflects the concatenation of a range of hazard, exposure and vulnerability factors and is not an inevitable outcome of the triggering event.

Systemic risk in interdependent systems

The magnum Hurricane Maria impacted Dominica in 2017, led to damage and loss equivalent to 224 per cent of its national GDP and affected, directly or indirectly, 93 per cent of the population. The collapse of multiple interdependent infrastructure systems paralyzed the economic activity and resulted in an estimated increase in poverty levels to 42 per cent, with 24,000 people (a third of its total population) suffering food deprivation.

Systemic risk becomes magnified by the non-linear impacts associated with system interdependence. Figure 1 takes the case of a large urban area like New York City post-Hurricane Sandy to illustrate that systemic risk is not limited to single systems, but rather is associated with synchronous failures in multiple interdependent systems, associated with factors such as physical proximity, functional interdependence and economic integration. Here, more than 2 million people lost power due to network shutdowns and damage to substations and electrical equipment. Refineries and pipelines also shut down reducing the supply of fuel. The loss of power caused synchronous failures in other systems, particularly in health and transportation. The combination of flooded tunnels and power outages paralyzed the city's subway and railway lines, causing a collapse in the urban transport system (Haraguchi and Kim, 2016).

Figure 1. Interdependence of infrastructure systems affected by Hurricane Sandy in New York City (Haraguchi and Kim, 2016).



The impact of a hazard trigger, such as an intensive hurricane, in cities such as New York or New Orleans, can cause the collapse of interdependent infrastructure systems and paralyze urban economies. However, at the national level, these impacts are normally buffered in large countries with large and diversified economies such as the USA. In contrast, in the case of Small Island Developing States (SIDS) where the hazard trigger may affect the entirety of a country´s population, territory and small and undiversified economy, the impacts may be national and become existential, as was the case in Dominica.

Systemic risk in global supply chains

The ash cloud from the eruption of the Eyjafjallajökull volcano in Iceland in 2010 paralyzed European air traffic systems, highlighting how non-linear impacts can manifest in geographically and temporally discontinuous systems.

In Japan, in 2011, a powerful earthquake triggered a devastating tsunami, which in turn caused failures in the cooling systems of the Fukushima nuclear power plant: a compound hazard which revealed conditions of exposure and vulnerability in coastal areas in general, and with the nuclear power plant, in particular, that had been underestimated. The combination of physical damage from the earthquake and tsunami and power shortages, due to the collapse of the electricity grid in east Japan, after 11 nuclear reactors were taken off-line, paralyzed the manufacture of critical components in both the automobile and information technology industries. The resulting component shortages were then transmitted along global supply chains, slowing down or halting production in Europe and other regions (Todo, Nakajima, and Matous 2013).

Later in the same year, the river Chao Phraya flooding in Thailand produced significant asset damage in the manufacturing industry around Bangkok, in the agriculture and fisheries sectors, as well as loss of life and injury. As in the case of Japan, the disaster was characterized by non-linear sequential impacts. Shortages of critical industrial components were transmitted through global supply chains paralyzing production in geographically discontinuous regions. The total loss of operating profit to Toyota and Honda alone was estimated at US$1.25 billion and US$1.4 billion, respectively (UNISDR, 2013a).

The risks associated with sequential failure had long been anticipated by the OECD (OECD, 2003) which stated "*If a system is assumed to be self-contained in space (physical or operational) and time, then it is likely the long-term consequences and impacts outside the system studied will be neglected. Only by understanding its complexities will it be possible to understand, and so be ready for, the long-term consequences of damage to a system – including the potential domino effect of harm to other systems".*

The global economy now depends on a complex ecosystem of supply chains. Based on *just in time* delivery systems, global supply chains have become increasingly lean and efficient. But as the disasters in Japan and Thailand highlighted, they also internalize systemic risk and low levels of resilience in the face of non-linear consequences from risk and disaster in other regions that have not been adequately identified or estimated. How systemic risk becomes internalized in supply chains is illustrated in the case of Bangladesh, for example, where badly planned and managed urban development generated and accumulated risks in the Ready-Made Garment- RMG- industry: one of the mainstays of the country's economy and a hub in global supply chains (Ali, Rahman, and Frederico 2021).

Simultaneous crisis from compound hazards

Multiple hazards may also be associated with simultaneous crisis, where risk materializes in different systems at the same time, further magnifying and compounding the impacts.

COVID-19 related lockdowns and restrictions, for example, affected the response and recovery from floods in Iran in 2020 (UNDP, 2020b; Simonovic, Kundzewicz, and Wright, 2021). In Honduras, the impacts of Hurricanes Eta and Iota in 2020 were layered on top of those of the COVID-19 pandemic and everyday risks associated with gang violence and extreme poverty. More anecdotally, in the United Kingdom in January 2021, flooding from Storm Christoph threatened to inundate a manufacturing facility producing the AstraZeneca vaccine, a cornerstone of the response to the COVID-19 pandemic.

The drought in northeast Syria in 2008-2009 (Erian, Katlan, and Babah, 2010) aggravated rural poverty and triggered a massive migration to urban centres. The arrival of contingents of impoverished migrants stressed urban economies and essential services in Syria's cities. This in turn coincided with and probably contributed to the political upheavals that began in 2010 and which subsequently triggered a regional scale conflict. Apart from the collapse of health, education, transport, and other systems, due to the conflict itself, in many areas of the country, another sequential crisis was triggered. Massive displacement and migration from Syria stressed economies and essential services in neighbouring countries and contributed to growing unrest in Lebanon. In 2015, the arrival of 378,000 Syrian asylum seekers[12] then triggered a political crisis in the European Union. Colombia with the arrival of near to 2 million

[12] https://www.pewresearch.org/global/2016/08/02/number-of-refugees-to-europe-surges-to-record-1-3-million-in-2015/ accessed on 20 Feb 2021.

Venezuelans since 2015, fleeing the insecure economic, social, and political conditions in their country, comprises another recent example of such crises.

Systemic risk was realized in Sudan in 2020 in a context already characterized by internal displacement associated with conflict, drought and flood, underlying poverty, severe food insecurity and fragile governance. The national economy is heavily dependent on agriculture and the oil sector and thus exposed and vulnerable to macro-economic fluctuations in commodity prices. The global oil price crash in 2020 coincided with the first wave of the COVID-19 pandemic. At the same time, local commodity movement, market functions and cross-border trade were significantly affected due to measures to contain the pandemic. The compounding of these different hazards pushed domestic food price inflation to over 300%, threatening food security (Emergency Operations Centre et al. 2021; WFP 2020; FAO and GoS 2020).

Extreme rains in August 2020 then led to extensive flooding, which in turn triggered hemorrhagic fever and malaria epidemics, which compounded the effects of the COVID-19

pandemic to further stress a public health system that already had low levels of resilience. In late 2020, refugees from the conflict in Ethiopia began to arrive in eastern Sudan (UNHCHR, 2020). Food insecurity worsened for over 2.1 million households, over 600,000 households fell into extreme poverty (FSTS et al., 2020), more lives were lost due to other epidemics than to COVID- 19 and despite being eradicated in 2009, polio re-emerged due to a sudden drop in vaccination (Government of Sudan, 2020). Gender-based violence and displacement increased and local conflicts began to resurface (Emergency Operations Centre et al. 2021).

In this context, food insecurity is associated with a concatenation of different drivers and a continuous and compounded accumulation of exposure and vulnerability to different hazards. In a similar vein, it is also the same groups of people who do not just face food insecurity, but also other quotidian, everyday risk challenges. In this sense, it is not just the triggers or events that are compounded, but so are experiences of crisis, often by the same set of already marginalized or excluded groups of people. Undoubtedly, it is the underlying and entrenched conditions of exposure and vulnerability experienced by large segments of the population that characterize systemic risk, more than any specific hazard trigger. It is especially key to recognize the everyday nature of these experiences, especially in the LMIC.

Existential risk in global systems

The social and economic impacts of the COVID-19 pandemic are not existential *per se*. Societies and economies have recovered from more severe pandemics in the past, including those associated with the bubonic plague, the Black Death, and the Spanish flu of 1917-21. However, the pandemic has focused concern on the growing accumulation of risk in the climate and other critical earth systems, which could potentially lead to multiple system breakdowns with risks that include famine, massive human displacement[13], and conflict.

The 2019 Global Assessment Report on Biodiversity (Díaz et al. 2019) highlighted global declines in 14 of the 18 regulating or provisioning ecosystem services on which societies depend. The report also identified how climate change was magnifying biodiversity loss. A recent special report from the IPCC (2018) highlights how global warming of 1.5 degrees C above pre-industrial levels is likely to be reached between 2030 and 2052, with consequences

[13] See for example, Brooks, Nick, Winkels, Alexandra, n/d, Moving On: Towards a Policy Framework for Addressing Climate Change and Migration (no publication data).

not only for biodiversity but also changes in the frequency and intensity of hydrological and meteorological hazards[14], sea-level rise, and increased risks in other systems, including health, livelihoods, food security, water supply, human security and economic growth. The risk of a catastrophic breakdown in the earth systems that support life, with non-linear impacts in all related social and economic systems is therefore increasing.

It is not only earth systems, however, that can potentially break down. Growing social and economic inequality at all scales, a generalized crisis of governance in many countries, difficulties to plan and manage urban growth and to provide land and essential services, point to the interdependence of social and economic systems with earth systems. Such interdependencies are well-illustrated in the case of the drying of the Aral Sea in Central Asia (Hoskins 2014). The Aral Sea was once the world's fourth-largest lake, home to 24 species of fish and surrounded by fishing communities, lush forests and wetlands. It has been severely desiccated by the overuse of its tributary rivers, and its environmental, climatic, socio-economic and humanitarian consequences pose a direct threat to the region's sustainable development, health, gene pool and future of the 62 million people dependent on it.

The quotidian or everyday experience of systemic risk

As highlighted in the previous sections, current literature uses the concept of systemic risk to describe national and global level impacts, associated with diverse hazard triggers. At the local level, however, for many individuals, households, communities, or businesses in LMIC, the quotidian expression of systemic risk is associated with the failure of local infrastructure systems,

the interruption of local supply chains, the degradation or failure of the local ecosystem services and with other every-day hazards such as crime, accidents, pollution, and disease.

Infrastructure systems are conventionally classified by sectors but can also be categorized according to their scale, purpose, and topology. *Strategic or critical economic infrastructure*[15] refers to the power stations, ports and airports, large dams, refineries and logistic hubs and the major highways, railways, high-tension transmission lines and pipelines that connect them, and whose role is to support strategic sectors, regional and global trade, and economic integration. *Local infrastructure systems,* in contrast, refer to the water, drainage and sanitation networks, local road, river and rail networks, bridges, health and education facilities, post-harvest processing and storage facilities, among others, that provide essential services to individuals, households, communities and businesses[16].

Local infrastructure systems provide essential services, such as water and sanitation, power, telecommunications, health and education to urban centres and their economies. Local supply chains depend on road, rail, or river networks. Trade and population movement to and from a local area may depend on a single bridge, road, or transport medium. Similarly, healthy ecosystems are required to sustain agriculture and fishing, regulate climate variability, protect biodiversity and provide clean water and air (Schröter et al. 2014).

In many developing regions, there is still a large infrastructure deficit. For example, in Asia and

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[14] Changes in the frequency of hazard recognizes that some hazards may become less frequent.
[15] This implies that the primary function of the infrastructure is to sustain economic growth and not necessarily societal welfare.
[16] In this paper the term *business* is used to refer to the small and medium enterprises that provide most employment in regional economies and their urban centres.

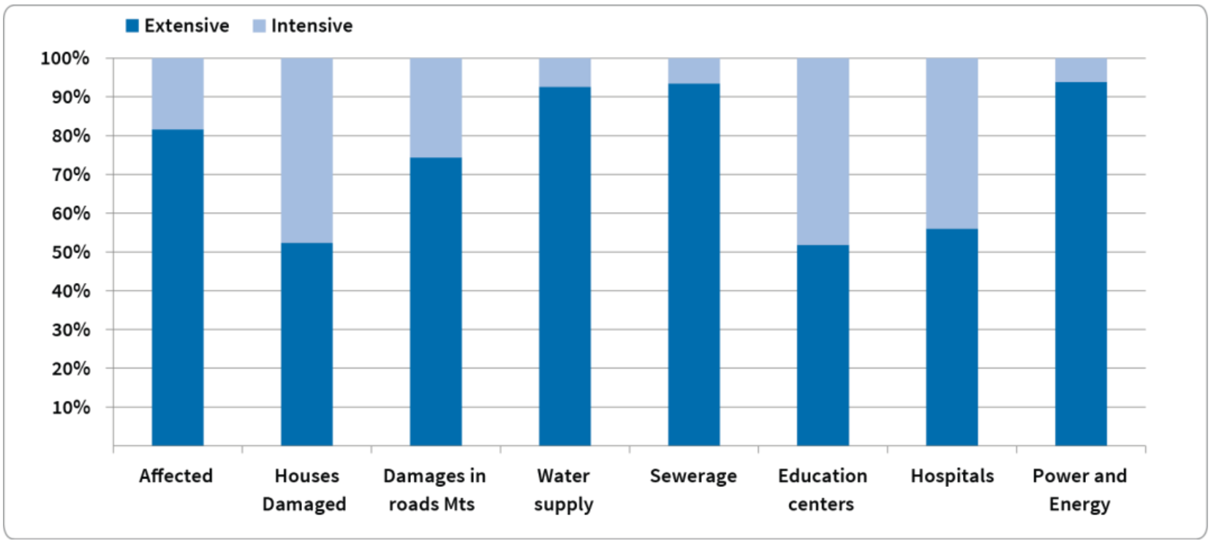
Pacific LMIC, rural access to electricity stands at 65% (World Bank Group, 2017). In low-income ASEAN countries and Pacific Island countries, household access to piped water is only 20 to 30% respectively. However, when local infrastructure systems have been built, they often internalize risk, due to inadequacies in their planning and design and deficient systems for their operation and maintenance.

Ultimately, infrastructure assets are only important to individuals, households, communities, and businesses to the extent they provide essential services. A resilient infrastructure system is one that continues to provide essential services, even when physical assets are lost or damaged. When services are unreliable or fail, those that depend on them are put under stress. A resilient education system, for example, would be one where teaching is rapidly restored even when facilities have been damaged or cannot be used. In this, COVID 19 has shown the importance of internet-based education and the inequality associated with lack of access by poorer, more marginalized and excluded groups, especially in rural areas.

In many LMIC[17], essential services cannot be guaranteed due to sub-standard and poorly maintained water, drainage and sanitation systems, unreliable electricity grids, inadequate, and overstrained transport networks. It is estimated that infrastructure disruptions impose costs between $391 billion and $647 billion a year on households and businesses in LMIC (Stéphane Hallegatte, Rentschler, and Rozenberg, 2019). Small and medium-sized enterprises are particularly affected by disruptions to power, telecommunications and water and their supply chains (UNISDR, 2013a).

As Figure 2 illustrates, a large proportion of the damage to road networks, water and sanitation systems, power and energy, health, and education infrastructure in LMIC is associated with extensive risk.

Figure 2. Percentage of loss and damage to infrastructure associated with intensive and extensive risk (UNISDR, 2015a)[1]



[17] A situation which can also be found in disadvantaged areas in high-income countries.

In Cambodia, nearly a fifth of the country's road network was damaged or destroyed by floods between 2000 and 2014 (UNDP and ADB, 2017). 89 per cent were rural roads and 59 per cent were roads connecting communes and /or villages, directly affecting the local supply chains which these communities rely on. This is the quotidian experience of systemic risk for local people who rely on local infrastructure systems in LMIC.

Systemic risk in local infrastructure systems, supply chains and ecosystem services, negatively affects livelihoods and income and conspires against the achievement of the SDGs. Addressing quotidian systemic risk is therefore critical not only to the infrastructure SDG (SDG9) but also to SDG3 (Good health and wellbeing), SDG4 (Quality education), SDG6 (Clean water and sanitation), SDG7 (Affordable and clean energy), SDG8 (Decent work and economic growth), SDG11 (Sustainable cities and communities) and SDG13 (Climate Action).

To achieve these SDGs, the resistance and resilience of local infrastructure systems, supply chains and ecosystem services need to be strengthened and extensive risk reduced and prevented. Whereas in OECD countries (OECD, 2018), this problem is described as one of the *significant pockets of vulnerability,* in LMIC it is a much more generalized challenge. In these countries, it would be more appropriate to describe *significant pockets of resilience* against a general backdrop of vulnerability.

The Social Construction of Systemic Risk

Systemic risk is endogenous

Like all other risk categories or types, systemic risk is socially constructed. This implies that the triggering hazard event or events, as well as the exposure, vulnerability and resilience, are endogenous rather than exogenous characteristics of the system or systems. It also implies that the ways systems are structured and organized and the ways they internalize risk are also socially produced.

From this perspective, systemic risk is not an independent or autonomous variable. Systemic risk, in the first instance, results from the concatenation of hazard, exposure and vulnerability. These variables in turn are socially constructed through a range of underlying drivers, including poverty and inequality, badly planned and managed urban and infrastructure development, environmental degradation, climate change, conflict and displacement and weak territorial governance. Resilience represents a means to mitigate these variables.

Moral hazard

The operation of the underlying risk drivers reflects the logic, dynamics and values that characterize the political economy at different scales. In all political economies, there is always a trade-off and tension between the *privatization of benefits* and the *socialization of risks*. How these trade-offs are managed is the fundamental underpinning of the social construction of risk.

The concept of moral hazard is intimately related to this trade-off and is used to describe situations where excessive risk-taking is encouraged because the risk-taker who privatizes the gains avoids the resulting socialized risks, by having access to government incentives and/or protection or insurance, amongst other things. This was a root cause of the 2007-2011 financial crisis, where essentially banks underwrote loans with the expectation that another party would likely bear the risk of default, creating a moral hazard and eventually contributing to the sub-prime mortgage crisis. Moral hazard, therefore, can be used to describe "*any* *situation in which one person decides how much risk to take, while someone else bears the cost if things go badly*" (Krugman 2009).

The social expropriation and concentration of the benefits of economic growth and the social transfer, in time or geography, of the risks that accompany that growth to other sectors is an expression of moral hazard and underpins the social construction of risk.

For example, the global oil and gas industry is estimated to have made profits totaling USD 404 billion in 2019[18]. Fossil fuel use, however, contributes to global warming and climate change, which in turn has non-linear impacts in systems as varied as biodiversity, exposure to sea-level rise, drought, and migration. However, this risk is not equally distributed. For example, SIDS have contributed only a minute proportion of global emissions but face a disproportionate impact on their economies from risks associated with coastal erosion, storm surge and coral bleaching[19].

The underlying risk drivers are an expression of the *privatization of benefits* and the *socialization of risks* which, unfolding at different spatial and temporal scales, configure hazard, exposure and vulnerability and scenarios of multidimensional poverty, every day, extensive and intensive risk. This risk then becomes internalized in systems at different scales and levels of complexity. From that perspective, risk drivers such as global warming or high levels of inequality can also be seen as consequences of moral hazard.

In a globalized economy, risks may be socialized in geographically and temporally discontinuous systems. Therefore, while some countries and economic sectors may be apparently managing their risks and strengthening their resilience, this may disguise and veil *risk transfer* to other sectors and geographies.

The accumulation of systemic risk

When the latent risk accumulated systemically in any system is *activated* by a hazard trigger, the risk unfolds and becomes realized as loss and damage. The way those impacts reverberate reflects not only the magnitude of the hazard trigger, but also the risk and resilience internalized in the system and its degree of complexity and interdependence. Finally, the impacts of system failure or disruption, enfold back into the risk scenarios from which they emerged, through different feedback loops, and ultimately back into the risk drivers and underlying political economy, leaving an imprint, which in time seeds new risks.

This process of social construction leads to a layering of systemic risk. Every day or quotidian risk (Bull-Kamanga et al., 2003)[20] refers to the accumulation and concentration of risks associated with poor health, deficient or non-existent infrastructure, crime, unsafe living and working environments, air and water pollution in certain social groups or territories and provides a basis for disaster risk itself.

Systemic risk then manifests as an extensive risk in local infrastructure systems, supply chains and ecosystem services. Increasing manifestations of extensive risk, layered on top of a

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[18] https://www.globaldata.com/oil-and-gas-sector-continues-to-rule-2019-fortune-global-500-list-in-revenue-generation accessed on 20 Feb 2021. It should be noted that this figure is less than the total government fossil fuel subsidies, highlighting how the regulation of the political economy can encourage moral hazard.

[19] Given the lack of other economic opportunities, some SIDS also are involved in exploring for or exploiting fossil fuel reserves, potentializing short term gain at the cost of longer-term risk.

[20] Also referred to as chronic or quotidian risk.

backdrop of everyday risk is normally a real-time indicator of how risk is being systemically accumulated and concentrated in a territory or social sector. Accumulations of extensive risk, when activated with a major hazard trigger, may then materialize as intensive disaster, which, as discussed above, can generate non-linear impacts through interdependent infrastructure systems and global supply chains.

Here, threshold or tipping point effects are relevant when a dramatic change in the system's regime or state leads to an irreversible shift in these. Ultimately, and as described above, systemic risk gradually accumulates in global systems, with potentially catastrophic consequences (Peck, 2005; Wagner and Bode, 2009; UNISDR, 2009).

As such, systemic risk is not only characterized by ripple effects and cascading impacts in systems. It is the continuous process of unfolding and enfolding of risk drivers, risk scenarios and impacts in systems at all scales, reflecting the moral hazard internalized in the global political economy that is *systemic*. The social construction of risk, itself, manifests a *systemic* logic and dynamics. The ongoing COVID-19 pandemic exemplifies this *systemic* logic and dynamics in all its dimensions and can be understood as the realization of endogenous risk, socially constructed and accumulated over time (Lavell et al. 2020).

Screwed by the system

The *systemic* logic and dynamics[21] associated with the COVID-19 pandemic illustrate why risks associated with different hazard triggers generally tend to be disproportionately concentrated in the same social groups and territories. This implies that the kind of hazard trigger (physical, biological, technological, or social) is ultimate of secondary importance, given that it is the unfolding of risk that is *systemic,* and which manifests a self-similar ordering logic and dynamic, a reality expressed eloquently by the idiomatic expression "*screwed by the system*". This conclusion and statement are fundamental for constructing notions and ideas as to actionable systemic risk governance in the future, whether in highly developed, or low- and middle-income countries.

The challenge of risk governance

Risk governance and risk management

The IRGC[22] defines risk governance as "the actions, processes, traditions and institutions by which authority is exercised and decisions are taken and implemented. Risk governance applies the principles of good governance to the identification, assessment, management and communication of risks".

Risk management strategies can be categorized into four groups. Prospective risk management refers to actions to anticipate and avoid the construction of new risk. Corrective risk management refers to actions to reduce existing risk. Reactive risk management refers to

[21] The way in which underlying root causes lead to the configuration of vulnerability and risk has been postulated in modern disaster literature since the 1970s. (see for example, O'Keefe, P. Wisner, B. Westgate K, 1976, Taking the Naturalness Out of Natural Disasters, Nature, London, 260, pp. 566-567)., was actualized and further developed in Latin America in the 1990s (see. Maskrey, A. 1993, Los Desastres no Son Naturales, LA RED / Tercer Mundo Editores, Bogota) and has been confirmed empirically by quantitative risk modelling since 2009 (United Nations, 2009, 2011, 2013, 2015, 2017, Global Assessment Report on Disaster Risk Reduction, UNISDR, Geneva.

[22] https://irgc.org/risk-governance/what-is-risk-governance/ accessed on 20 Feb 2021.

measures to address realized risk, including through early warning, preparedness and response. Compensatory risk management refers to measures to buffer impacts and strengthen resilience. These categories are reflected in the Goals of the SFDRR, the United Nations Global Assessment Reports on Disaster Risk Reduction and in national risk management laws and norms, particularly, but not exclusively, in Latin America.

The experience of major crises many times pave the way for innovations in risk governance, even though there is usually a critical time lag between both. Major disasters can open policy windows (Kingdon and Stano 1984). However, bureaucratic procedures, inertia, and the difficulty to break with the past (Mitchell 1999) can mean that these windows of opportunity and the conceptual advances they were built on, shut again before change and transformation in risk governance can take root.

Different risk governance frameworks have emerged historically in different regions. These frameworks reflect the paradigms through which risk and shocks have been conceptualized and interpreted and provide the broad institutional, policy, legislative and normative framework within which risk management strategies, principally, to date, based on reactive and corrective approaches, are prioritized, adopted, and practiced.

The regulation of risk

One broad approach to risk governance common to most regions is based on the adoption of norms, regulations and standards to manage risks. Regulation can be understood, principally, as a prospective risk management strategy, as it is designed to avoid the generation and accumulation of new risk, through regulating development and investment decisions.

An early example of the introduction of regulation, following a major crisis, was the enactment and adoption of comprehensive public health legislation to address cholera epidemics in the United Kingdom in the mid-19th century (S. Johnson 2006). Another was the adoption of the first seismic-resistant building code in Italy in 1920 following the 1908 Messina earthquake (Bellicoso 2011).

Most countries have now adopted regulations in land use planning, building, environment, public health, industrial and transport safety and security, finance and many other domains. Regulations are a sector-based framework for risk governance, in which norms, standards and regulations are formulated in each sector, sometimes in the context of an overarching national policy or strategy. As an approach to risk governance, however, regulation has had mixed results, for several reasons.

In all contexts, regulation only becomes politically viable when it does not overtly challenge the *privatization of gains* (Harvey 2010) or when the *socialized risks* start to threaten those who benefit from the *privatized gains*, as occurred in the case of the cholera epidemics in the United Kingdom in the 19th century (Maskrey 1984). This implies that the effectiveness of regulation will always reflect political trade-offs between *privatizing gains* and *socializing risks.*

These trade-offs can be clearly seen in the power crisis, following winter storms in Texas in February 2021, when up to 4.5 million were left without electricity. The deregulated power market in the state encourages fierce competition amongst power generators and retail electricity providers and provides power at about half the cost that of California. However, it has not provided incentives to strengthen the resilience of the network through increasing its reserve capacity through investments to protect the grid and its equipment against occasional but extreme winter weather[23]. Nor had lessons from a 2011 winter storm led to change. On a different scale, this contrasts with El Salvador, where, following the 1986 earthquake, the resistance and resilience of telecommunication systems were strengthened, reducing the impacts of the next earthquake in 1991.

Secondly, despite the example given above, regulation as an approach to risk governance has been more effective in high-income countries, with established mechanisms of compliance and accountability, and far less effective in LMIC, where a significant proportion of economic activity and territorial occupation occur outside of formal regulatory systems (mHS Citylab 2011). In LMIC, public or private investment decisions that generate risk are rarely sanctioned, particularly in countries characterized by fragile governance and low levels of accountability. In such contexts, such as in Colombia, moral hazard may become *armed,* and conflict entrenched as a mechanism to *privatize gains* and to *socialize risks*.

At the same time, regulation can also foment exclusion, by acting as a barrier to entry into formal economies and territories or to protect established interests and monopolies. The other side of the coin is that geographic unevenness may encourage investment to flow to locations with weak regulation, accountability and compliance. Regulation, therefore, can be a risk management strategy in some geographies and an underlying risk driver in others. However, as risks can be transmitted from one geography to another, as experienced after the fires in Bangladesh's RMG factories in 2012-13 that disrupted European and North American supply chains, this contradiction may easily be exposed.

Institutional systems for risk governance

While regulation, through standards, norms and legislation, has provided the primary instrumental basis for risk governance in high-income countries, many LMICs have developed specific institutional systems for risk governance.

Following the Second World War, specialized civil defense or civil protection offices were created within the defense or security sectors to respond to conflict and disasters. In the 1970s, in response to iconic emergencies, such as Cyclone Bhola and the war of independence in Bangladesh, the Sahel drought and famine and earthquakes in Peru, Nicaragua and Guatemala many emergency management offices expanded their mandates to include corrective risk management. At the same time, however, most remained anchored in the defense or security sectors.

In Colombia, the destruction of the city of Armero by a volcanic lahar in 1985 catalyzed the establishment of a multi-sector national system for risk governance. In this new model, responsibility moved from the civil defense office to a system with its apex in the office of the president and with responsibility distributed across different sectors and levels of a territorial government. This framework became paradigmatic and was later adopted in other countries in Latin America and beyond, but not without challenges[24].

The systems model is based on the principle of subsidiarity, in which primary responsibility is decentralized to second and third-tier territorial governments. Unfortunately, in most LMIC, local governments outside of major cities lack technical capacities and resources. While national governments have normative responsibilities, these are not actionable without resourced

[23] The Economist, 17th February, 2021.

[24] See UNISDR, GAR15 for a broad review of the challenges faced at the end of the Hyogo Framework for Action.

implementation capacity at the local level (Revi and Rosenzweig 2013).

At the same time, even when political responsibility is vested at the highest level of government, many systems continue to be coordinated in practice by emergency management organizations, especially in, but not limited to the LMIC. In general, these lack the political authority and technical capacity to ensure that national risk management policies and strategies become transversally adopted by line ministries in each sector. As a result, many national systems remain impregnated with an institutional culture of reactive risk management.

Few national systems have been able to embrace the expanded scope of risk provided by the SFDRR, which includes technological, biological, environmental and man-made hazards. The very low representation of biotic hazards in the national and local plans and strategies completed by 2020 to address the Global Target E of the SFDRR is symptomatic and consistent with the improvised response to the COVID 19 pandemic. It is still rare for the governance frameworks created for adaptation to climate change to be integrated with those for disaster risk management, while many national systems struggled to identify entry points to engage in the management of the ongoing COVID-19 pandemic.

As an additional challenge, in most countries but, again, particularly in the LMIC, it has been difficult to integrate scientific and technical information produced, for instance, by meteorological, geological, environmental and land-use planning agencies to identify and estimate risks.

Ultimately, the role of most risk governance frameworks continues to be one of protecting development from exogenous threats. As such corrective and reactive risk management continues to be used predominantly to protect development against *external* threats such as disasters, climate change and cross-border displacement: an approach that also dilutes and externalizes accountability and responsibility.

Little progress has been achieved in prospective risk management, which, to avoid and control the social construction of new risk, involves managing the underlying risk causes and drivers and addressing the trade-offs between the *privatization of gains* and the *socialization of risks*. Consequently, new risk has often been configured and internalized faster than existing risk has been reduced.

This approach to risk governance embodies a fundamental contradiction: the objective of protecting the predominant development paradigm from risks that the paradigm itself generates.

Implicit risk governance

The formal frameworks described above are often no more than a veneer layered on sets of implicit codes and mechanisms through which individuals, households, communities, and businesses manage their risks on a day-to-day basis in contexts where a significant proportion of economic activity and territorial occupation occur outside of formal regulatory frameworks. They manage their risks, in a continual trade-off between risk and opportunity and are often willing or forced to accept or even increase exposure to some hazards at the cost of reducing exposure to others. For example, an informal settlement in flood or landslide exposed areas is rarely due to ignorance of the risks. The opportunity to live in areas close to employment opportunities or urban services, on accessibly priced land and in the community may outweigh increased hazard exposure. And, with time, ties to land and community consolidate occupancy even when offers of relocation or resettlement exist (C. Johnson, Jain, and Lavell 2021; Hino, Field, and Mach 2017). Under almost all circumstances, hazard-prone areas can be considered as resources and opportunities, depending on the time frame and viewpoint of analysis. Long term resource returns may offset the momentary large-scale losses associated with low recurrence intensive events or the accumulative effects of extensive risk losses. This is true with both informal, low income, occupancy and higher income, large scale national and transnational enterprise. All such decisions reflect risk perception and knowledge, which in turn is conditioned by the information available and opportunities for asset accumulation[25] (Moser 2007, vii).

Thus, in contrast to informal settlements in flood exposed locations, it is probable that very few of the companies that built factories on the floodplains of the Chao Phraya River in Thailand before the massive flooding in November 2011 had bothered to investigate the risk they faced. Flood risk in the basin had never been modelled, and the scale of the disaster took global businesses, the government, and the insurance industry by surprise. However, despite massive losses, very few companies decided to relocate to less hazardous areas of Thailand or other countries. A survey conducted among Japanese businesses in Bangkok in 2012 showed that almost 80 per cent had decided to stay in the same locations (Government of Japan, 2012). For most businesses, the value creation opportunities provided by the location outweighed any contingent liabilities posed by future floods. Low cost land, local and national government incentives for location in the zone and easy access to the sea contributed to location.

These examples illustrate how disaster risk is never an objective and tangible externality and that risk awareness does not automatically lead to investments in disaster risk management (C. Johnson et al. 2021). Risk can only be understood in terms of the dynamic relationship between exposed and vulnerable individuals, households, communities or businesses and the probability of hazard events of different intensity and extent. While risk awareness may be a precondition, implicit risk governance always reflects the social, economic, territorial, and environmental constraints and opportunities faced.

While the strategies adopted by individuals, households, communities, or businesses to hedge and optimize the range of opportunities and risks they face can be described as an implicit framework for risk governance, it is critical to recognize that, as described above, the risk management strategies adopted by informal groups are generally defensive and shaped by the need to cope and survive in the face of severe social, economic territorial and environmental constraints. However, documented evidence shows how prospective, planned strategies to maximize opportunities and minimize risks, can work when formal risk governance frameworks are articulated to and support implicit risk governance (Maskrey 2011). Building on local risk perception and knowledge, such strategies are resource-effective, sustainable, and supportive of local initiative. In the best of cases, these win-win strategies both support local social and economic development while managing and reducing risk. Explicit in any consideration of perceptions, social preference and evaluation, decision making under conditions of choice or uncertainty, is the notion of equitable social participation both in the analysis of context and cause and in decisions as to the solution. This has been an

[25] Asset-based approaches in development focus on how the poor use their resource base to develop strategies for acquiring, mobilizing, expanding and preserving their assets, which could be physical/tangible in form, but also social, political, environmental, or economic. The asset accumulation approach is seen to address the important shortcomings in income-based or consumption-focused poverty reduction strategies by emphasizing the way the poor themselves establish a base of resources under their control.

important consideration in discussions of how systemic risk management may be improved or fomented.

However, despite calls for participatory, social construction, perception and culture-based coproduction of knowledge and understanding of risk in the design of risk management strategies, including in the SFDRR, it is unclear how much real traction has been achieved in articulating formal and implicit risk governance frameworks in this creative and positive way (Maskrey 2011;

C. Johnson et al. 2021) or whether the symbolic political commitment expressed in global frameworks and declarations is realized in practice.

Systemic risk governance

Emerging approaches to systemic risk management

While there is a growing international concern with systemic risk[26], (Dijkman 2010; OECD 2003; UNDP 2020a; WCDRR 2015; IRGC 2018), this has yet to be reflected in most existing national risk governance frameworks, which continue to focus on risk to people or assets. At the same time, the way systemic risk has been described does not offer easily identifiable entry points for national and local governments, particularly in LMIC.

Analysis of systemic risk in the financial sector distinguishes between 'idiosyncratic' or conventional risk that only affects a given entity and 'systemic' risk that affects the whole financial system and is concerned with how the failure of a single entity, or group of entities, can generate a cascade or ripple effect that then affects markets and systems in their totality (Goldin and Mariathasan 2015; Lorenza, Battiston, and Schweitzer 2009).

Beyond the financial sector, the term is mainly used to refer to risk in complex and interdependent transboundary systems, triggered by unexpected, unanticipated, difficult to forecast and extreme events (Renn et al., 2020). Risk management practices reflecting that perspective have started to emerge, even though these have yet to consolidate as an established risk governance framework[27]. Four broad characteristics of what could be termed a dominant perspective for the governance of systemic risk can be identified as follows:

Systemic risk governance has become synonymous with strengthening resilience to transboundary and global risks, in particular the financial system, in global supply chains and strategic economic infrastructure. Little concern has been expressed with systemic risk at the local and national levels in LMIC, for example in local infrastructure systems, which often internalize risk due to inadequate planning and deficient systems for operations and maintenance.

1) Risk identification focuses on the hazard triggers, particularly on extreme, infrequent and difficult to estimate *black swan* events. Far less attention is given to the underlying conditions of exposure and vulnerability, which as pre-existing conditions, can be

[26] In the OECD terminology, the term 'critical risk' is often used instead of 'systemic' risk, because systemic risks affect the critical functions of governments. See for example https://www.oecd.org/gov/risk/recommendation-on-governance-of-critical-risks.htm accessed on 12 June 2021

[27] Proposals do exist though, as illustrated by the IRGC strategy and action proposals.

modelled and estimated.

2) Risk management strategies focus almost exclusively on strengthening resilience informed by a "too big and interconnected to fail" approach. Prospective risk management is given little attention.

3) The governance of systemic risk would seem to be largely preoccupied with protecting the *privatization of gains* and shows little concern for the *socialization of risks*.

This dominant approach to the governance of systemic risk appears to internalize the contradiction that characterizes risk governance in general: to protect the same systems that are generating the risk. While strengthening system resilience is an important risk management strategy, unless it is accompanied by prospective strategies to address the underlying risk drivers, risk will continue to be generated systemically to the point where increasing investments in resilience generate diminishing returns.

Towards a new paradigm for systemic risk governance

The impact of the COVID-19 pandemic on the economies of many countries will lead to significant setbacks to the achievement of the SDGs. The fact that these social and economic setbacks are occurring in contexts that are also stressed by geopolitical and climate risks, means that in many countries governance as a whole will be challenged and weakened (UN 2020).

At the same time, however, the COVID-19 pandemic, as an iconic global crisis, like others before may provide momentum and open opportunities for a paradigm shift in systemic risk governance, which gives far greater preponderance to prospective approaches, within an overall risk management strategy. Opportunities can be identified at both the global, national and local levels, which together start to offer visible contours of a viable framework for systemic risk governance. Some shifts in perspectives and practices are in order:

From "systemic risk governance" to governance of sustainability and resilience

The term "systemic risk governance" implies an approach that addresses pre-existing risk through largely corrective, reactive, and compensatory risk management strategies. On the contrary, what is called for is a strengthened overall, holistic, governance framework for social, economic, territorial and environmental development, that addresses the underlying risk drivers and factors in a way that promotes sustainability and resilience and generates development benefits, that include the avoidance and reduction of systemic risk.

Improve managing idiosyncratic risk to ultimately manage systemic risks

Systemic risk usually unfolds from conventional or idiosyncratic risk materialized in loss and damage to key assets, functions, infrastructures, services etc. or due to anticipation against future loss. This implies that if conventional risk can be effectively managed and reduced, so also will systemic risk. Therefore, rather than being viewed as a new exotic speciality on the menu, the governance of systemic risk requires strengthening and the reorientation of existing risk governance arrangements. For example, the Colombian national system highlights participation, intersectoral and interdisciplinary action, decentralization, human rights, structural and non-structural measures, risk communication and the coproduction of knowledge, all seen to be fundamenyal for systemic risk governance, but implementation remains a challenge.

From identifying hazard triggers to understanding risk

As long as systemic risk governance is understood as the “protection of the predominant development paradigm” from a supposedly exogenous and unexpected threat, the focus of risk identification & estimation will continue to focus on the hazard trigger. In contrast, improved understanding of vulnerability and exposure patterns provides valuable insight into systemic risk, irrespective of the specificities of the triggering event. Although uncertainty regarding the triggering event may be increasing, improved data and modelling makes it possible to increase certainty concerning underlying and pre-existing patterns of vulnerability, and exposure.

From corrective and reactive to prospective risk management

Ensuring that the risks internalized in any public or private development or investment decision are correctly assessed, including a clear definition of who owns and is responsible for the risk and who is accountable and liable for risk transfer to other sectors and territories, is critical. For this to happen, committed participation in decision making is required for all parties involved and potentially affected.

From a “global” phenomenon to local action and territorial governance

Managing systemic risk at the local level has a profoundly global outlook. Manifestations of systemic risk in local infrastructure systems, supply chains and ecosystems, are not ultimately autonomous local issues. They crystalize the operation of underlying global risk drivers and highlight how the social construction of systemic risk manifests in territories. It is only at the territorial level that the interlinkages between different systems can be articulated and where risk management issues can be resolved.

From protecting privatized gains to managing socialized risks

A shift is required from an almost exclusive focus on the protection of privatized gains in financial systems, strategic economic infrastructure, and global supply chains, towards the management and reduction of the socialized risks. Investment in basic service provision and the satisfaction of other basic development needs at the local level, plus the development of safety nets, insurance schemes and other mechanisms for resilience can have multiple positive effects including the reduction of risk to uncertain or increasingly complex hazard scenarios.

These proposed shifts in perspective are not just symbolic. Any move in this direction would already constitute a major change in the way risk is interpreted: moving from the still- dominant view of risk as an exogenous threat to forms of development that seem self-evidently *normal,* towards a recognition that the systemic nature of socially constructed risk is actually endogenous to how development is pursued. If there is a silver lining to the COVID-19 pandemic it may be that it provides a window of opportunity for that change.

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