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DISCUSSION PAPER

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

June 2021

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ABBREVIATIONS

AAL	Average Annual Loss
ASBP	Aral Sea Basin Program
CDRI	Coalition for Disaster Resilient Infrastructure
CCRI	Coalition for Climate Resilient Investment
CCRIF	Caribbean Catastrophe Risk *Insurance* Facility
CREAD	Climate Resilience Execution Agency of Dominica
CPP	The Cyclone Preparedness Programme, Bangladesh
ECLA	Economic Commission for Latin America
FDI	Foreign Direct Investment
GAR	Global Assessment Report
GFDRR	Global Facility for Disaster Risk Reduction of the World Bank
GSPS	Growth and Social Protection Strategies in Dominica
ICAB	Interstate Council for the Aral Sea Basin
IFAS	International Fund to Save the Aral Sea
IPCC	Intergovernmental Panel on Climate Change
IRGC	International Risk Governance Council
LDC	Least Developed Country Category
LMIC	Low- and Middle-Income Countries
MPHSTF	Multi-Party Human Security Trust Fund in Uzbekistan
NDMA	National Disaster Management Authority
NRDS	National Resilient Development Strategy in Dominica
OECD	Organization for Economic Co-operation and Development
PCRIC	Pacific Catastrophe Risk Insurance Pilot - GFDRR
PML	Probable Maximum Loss
RMG	Ready-Made Garment Industry
SDG	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction
SIDS	Small-Island Developing States
SINIGERD	National Information System for Disaster Risk Management in Peru
SNET	National System for Territorial Studies in El Salvador
TFCD	Task Force for Climate-related Financial Disclosures
UNDP	United Nations Development Program
UNDRR	United Nations Office for Disaster Risk Reduction

GLOSSARY OF PRINCIPLE TERMS

The key process and management definitions used in this paper are as follows:

- **Conventional or idiosyncratic risk:** The probable direct impacts that can occur such as injury and death, loss or damage to physical assets and economic losses associated with existing stocks and provisions.
- ***Disaster Risk***: *"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".* (United Nations)
- **Extensive Risk:** The risk of low-severity, high-frequency hazardous events and disasters, mainly but not exclusively associated with highly localized hazards. Extensive disaster risk is usually high where communities are exposed to, and vulnerable to, recurring localized floods, landslides, storms or drought. Extensive disaster risk is often exacerbated by poverty, urbanization and environmental degradation. (UNDRR terminology)
- **Intensive Risk:** The risk of high-severity, mid- to low-frequency disasters, mainly associated with major hazards. (UNDRR terminology)
- **Resilience***: "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, CEB).
- **Risk governance:** *"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"* (IRGC). Disaster Risk Governance refers to the way in which the public authorities, civil servants, media, private sector, and civil society coordinate at community, national and regional levels in order to manage and reduce disaster and climate related risks. This means ensuring that sufficient levels of capacity and resources are made available to prevent, prepare for, manage and recover from disasters. It also entails mechanisms and processes for citizens to articulate their interests and exercise their legal rights and obligations. (UNDP Issue Brief, 2013).
- **Sequential, synchronous and simultaneous crisis***:* 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 (UNDRR, 2011).
- **Systemic**: An adjective: *"relating to or affecting the whole of a **system**, organization etc. rather than just some parts of it"* (Cambridge English Dictionary)
- **Systemic risk:** The ripple-effects of direct loss and damage, indirect impacts and wider effects, such as the disruption of infrastructure systems and essential services; failure of economic, financial or social systems; effects on employment and income; national and family debt profiles and ecosystem collapse.

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EXECUTIVE SUMMARY

Introduction

This document is a "thought piece" on systemic risk governance for the 21st century commissioned in January 2021 by the Disaster Risk Reduction and Recovery for Building Resilience Team (DRT) within the Crisis Bureau at United Nations Development Program (UNDP). It aims to contribute to the understanding and discussion of systemic risk and the actionable ways of promoting governance at local and national levels, while also offering a guide or path for promoting cross thematic (health, population migration, infrastructure, conflict, disaster risk management and climate change adaptation) collaboration within UNDP itself on risk reduction and prevention, and in its support to countries in their search for low risk, sustainable and resilient development. This study also contributes to the 2022 Global Assessment Report of the United Nations Office of Disaster Risk Reduction (UNDRR).

The paper examines systemic risk within the context of the Sendai Framework for Disaster Risk Reduction (SFDRR) adopted in 2015.The concept of disaster seen as a severe interruption of the routine functioning of a society, or economy, that condenses the risk accumulated in a system or systems is an appropriate frame for considering and studying systemic risk[1]. This is particularly so because the SFDRR encompassed a broader range of hazard events[2] than those previously considered to be components of risk or triggers of disaster and crisis, 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).

For the *governance of systemic risk to be useful and effective*, it must be framed in a way that is understandable and actionable for national and local stakeholders. This a primary objective of the present paper.

The paper is based on an extensive review of the specialized literature on the theme and a generic analysis informed by five case studies that examine distinct aspects and expressions of systemic risk (Bangladesh, Colombia, Dominica, Uzbekistan and Zimbabwe). These case studies were developed through stakeholder consultations and review of relevant literature specific to risk contexts in the respective countries.

The Concept of Systemic Risk

Since the turn of the century in particular, the term has been used 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 (IRGC, 2018; Renn, 2016; UNDRR, 2019).

Systemic risk has always existed. Local and national expressions of systemic risk, common throughout history, are now complemented by increasing manifestations of global systemic risk. Events since the turn of the 21st century would seem to indicate that the compression of time and space[3], as a defining characteristic of economic globalization, is consistent with increasing system interdependency, complexity and uncertainty and hence magnified systemic risk. 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).

The triggers of systemic risk and risk in general can be varied including those with physical, biological, technological, environmental, socio-political, and economic/financial origins. They may occur as single and separate occurrences or in more complex, compound, multiple, concatenated or cascading and sequential ways. Systemic risk, characterized by high levels of interdependency, non-linearity, feed-back loops and uncertainty may be expressed and realized as sequential, synchronous or simultaneous crises and failings.

To illustrate the differing possible expressions of systemic risk the paper analyzes the following types:

Systemic risk in interdependent infrastructure systems: 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. The impact of Hurricane Maria in Dominica and Hurricane Sandy on the New York metropolitan area are used to illustrate destruction and damage to assets and infrastructure and failure in diverse systems due to the primary impacts of the hurricanes.

Systemic risk in global supply chains: The series of fires in the Bangladesh ready-made garment industries in 2012-13 triggered sequential impacts in geographically discontinuous regions of Europe and North America, transmitted through global supply chains. The risks associated with sequential failure have 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*".

Simultaneous crisis from compound hazards: Multiple hazards may also be associated with simultaneous crisis, where risk manifests in different systems at the same time, further magnifying and compounding the impacts, for example in Zimbabwe, Syria or Sudan (macro-economic crisis compounded by COVID-19, conflict-driven refugee crises, drought, floods, and epidemics).

Existential risk in global systems: Nine critical and interdependent earth systems have been identified with thresholds or boundaries, that when breached represent existential risk. Non-linearity in these systems mean that small incremental changes in any one system may lead to a catastrophic breakdown in another. It is not only earth systems, however, that can potentially breakdown. 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 quotidian or every-day experience of systemic risk: Most people in LMIC experience systemic risk through the failure of local infrastructure systems, the interruption of local supply chains and the degradation or collapse of local ecosystem services, largely associated with extensive risk. Local infrastructure systems provide essential services, such as water and sanitation, power, telecommunications, health and education to urban centers and their economies. Local supply chains depend on road, rail, or river networks. Whereas in OECD countries (OECD, 2018), this problem is described as one of *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. Addressing the quotidian systemic risk associated with these failings is critical to the achievement of many of the SDGs including SDG9 (infrastructure) as well as 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).

The Social Construction of Risk

Systemic risk, as other risk categories, is socially constructed. The adjective *systemic* refers not only to the cascading and non-linear impacts in social and economic systems but, above all, to the process through which risk is socially constructed and accumulated in those systems. Political economies always internalize a tension and trade-off between the *privatization of benefits* and the *socialization of risks*. Moral hazard is a fundamental notion in understanding this process and is used to describe "*any situation in which one person makes the decision about how much risk to take, while someone else bears the cost if things go badly*" (Krugman, 2009). Underlying risk drivers such as poverty and inequality, badly planned and managed urban

and infrastructure development, environmental degradation, climate change, conflict and displacement and weak territorial governance configure hazard, vulnerability and exposure. These in turn generate patterns of everyday, extensive, intensive and systemic risk.

The unfolding of risk is *systemic* and manifests a self-similar ordering logic and dynamic. Whether the hazard is the SARS-CoV-2 virus, the collapse of financial entities, violent crime or flood, risk tends to become concentrated in the same social groups and territories, a reality expressed eloquently by the idiomatic expression "*screwed by the system*".

Risk Management

Consists of four interrelated strategies, approaches and goals that may be instrumented sequentially or in combination: Reactive, including disaster preparation and response, including rehabilitation, reconstruction and recovery; corrective, searching to reduce existing risk; compensatory, based on increasing post impact resilience and the ability to cope and thrive; and, prospective, searching to avoid future risk or limit it to socially acceptable levels. Forms or structures for enacting management principles include:

***Regulation*:** a predominantly prospective risk management strategy, designed to avoid the generation and accumulation of new risk, through regulating development and investment decisions in areas such as environment, land use, public health, finance, industrial and transport safety etc. This is normally more effective in high-income countries, with established mechanisms of compliance and accountability. It can, however, foment exclusion, by acting as a barrier to entry into formal economies and territories or to protect established interests and monopolies.

***Institutional frameworks for risk governance*:** multi-sector national systems for risk governance, based on principles of subsidiarity and transversality have been created in many countries**.** However**,** local governments outside of major cities in LMIC lack technical capacities and resources to fulfil assigned roles. Moreover, the systems are often coordinated by emergency management organizations that lack political authority and technical capacity. Typified by an approach that promotes protecting development from exogenous threats, little progress has been achieved in prospective risk management.

Implicit risk governance: formal frameworks, as 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. Limited by available risk information**,** involving tradeoffs between different risks**,** short term rather than long term focused**,** and with coping and survival rather than proactive risk management as a basis, implicit governance processes suffer many limitations. 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 a creative and positive way (C. Johnson, Jain, Nalla, & Martínez, 2021; Maskrey, 2011) or whether the symbolic political commitment expressed in global frameworks and declarations is actually realized in practice.

Systemic Risk Governance Characteristics Today

Systemic risk governance has become synonymous with strengthening resilience to transboundary and global risks, particularly in the financial system, in global supply chains and strategic economic infrastructure. Little concern has been shown internationally with systemic risk at the local and national levels in LMIC. Risk identification has been focused on the hazard triggers, in particular, on extreme, infrequent and difficult to estimate *black swan* events'- **uncertainty**. Far less attention is given to the underlying more **certain** conditions of exposure and vulnerability, which, as pre-existing conditions, can be modelled and estimated. And, the dominant approach to 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. I*n other words, its objective is to protect the same systems that are generating the risk.

The Central Challenge for Innovative Systemic Risk Governance

Corrective and reactive risk management, including resilience building continue to predominate. But, as risk is socially constructed, it is endogenous to development and new risk is configured and internalized faster than existing risk has and can be reduced. Little progress has been achieved in prospective risk management. Risk governance embodies a fundamental internal contradiction: its objective or its' primary result has been **the protection of the predominant development paradigm from the risks that the paradigm itself generates.**

Rather than a specialized governance framework to address a fashionable and exotic risk category called *systemic risk* what is required is a strengthened governance framework for social, economic, territorial and environmental development, that addresses the underlying risk drivers and factors in a way that strengthens sustainability and resilience.

Transforming the Governance of Systemic Risk

Six major directions are identified for moving towards a framework and paradigm for systemic risk in the 21st century:

- **From "systemic risk governance" to governance of sustainability and resilience**: The term "systemic risk governance" relays the idea of an approach that addresses pre-existing risk through largely corrective, reactive, and compensatory risk management strategies. Rather a strengthened overall, holistic, prospective governance framework for social, economic, territorial and environmental development is called for, that addresses the underlying causes and drivers of risk in a way that promotes sustainability and resilience, generating development benefits, that include the avoidance and reduction of systemic risk. Moving from identifying hazard triggers to a greater understanding of risk signifies more attention being placed on exposure and vulnerability factors and generating data and information on flows, relations, complementarities and contradictions, recognizing that independent of the trigger event it is the same vulnerable groups that suffer the most dramatic consequences of disaster and crisis whenever these occur.
- **Improve managing conventional risk to ultimately manage systemic risks**: Systemic risk usually unfolds from conventional or idiosyncratic risk to key assets, functions, infrastructures, services etc. or due to anticipation of future loss. This implies that if conventional risk can be effectively managed and reduced, this would significantly contribute to reducing or avoiding systemic risk. This requires strengthening existing risk governance arrangements. For example, the Colombian national risk management law and system highlights participation, intersectoral and interdisciplinary action, decentralization, human rights, structural and non-structural measures, risk communication and coproduction of knowledge, all features identified today as of importance for systemic risk governance, but implementation still remains a challenge even for conventional risk.
- **From identifying hazard triggers to understanding risk**: As long as systemic risk governance is understood or practiced 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. 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 with respect to underlying and pre-existing patterns of hazard, vulnerability, and exposure.
- **From corrective and reactive to prospective risk management**: The risks internalized in any public or private development or investment decision must be 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. 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 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 must be promoted. Investment in basic service provision and in the satisfaction of other basic development needs at the local level, plus 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.

Six Elements for an Actionable Approach to the Governance of Systemic Risk

The development of integral national policies, strategies and plans. If governments identify a clear political and economic imperative to address systemic risk, a first element in a governance framework is the formulation of national sustainable development plans, policies, or strategies that integrate risk reduction and resilience building, and that clearly reflect an understanding of systemic risk as a social construct and the primordial importance of prospective risk management. The adoption of such national plans, policies, or strategies would need to be adopted as an *all of government* approach that requires sectors to responsibly fulfil their mandate and functions. The experience of national risk management systems to date highlights that for this approach to work, responsibility for ensuring that such national policies, strategies and plans are formulated, adopted and implemented needs to be vested at the highest level of government, either in the cabinet office or similar or else in a central ministry such as finance and planning. At the same time, to be effective, national policies, strategies and plans should include clear and measurable resilience targets.

Identifying and estimating pre-existing risk. A second element in the governance framework would be strengthened capacities for risk identification and estimation. While regular horizon scanning for early signs and future casting[4], to identify potential or imminent triggering events, is important, the function of a national risk information system should be to monitor the evolution of risk, the hazard, exposure and vulnerability factors and underlying drivers that configure systemic risk. Given the importance of extensive risk with respect to systemic risk at the local level, a core function of the information system would be to monitor local loss and damage patterns to identify and estimate patterns of extensive risk.

Strengthened accountability and compliance. National level prospective and resilience policies, strategies, plans and targets are unlikely to generate their expected outcomes, unless they are backed up by greatly strengthened mechanisms for compliance and accountability. Examples include the role of the National Controller's Office in Colombia in undertaking periodic reviews of the implementation of national policies on disaster risk management and climate change adaptation, through to the review of White Papers on risk management, which are produced by the Cabinet Office of Japan for debate and review by Parliament. The creation of a risk ombudsman to attribute responsibility and liability for risk transfer is another potential mechanism that could be discussed. Transparency portals, which enable the public to review all proposed public and private investment projects, for example, and the use of social media to identify potential transgressions are all examples of mechanisms that can be explored

Financial mechanisms and incentives. A national framework for the governance of systemic risk would also need to include financial mechanisms to encourage the allocation of capital to investments that prevent and reduce risk and strengthen resilience. To the extent that international rating agencies and indexes are now increasingly including risks associated with physical hazards, climate change and conflict into their overall country risk assessments the implementation of resilience standards backed up in independent certification could enable countries to compete more effectively for foreign direct investment (FDI) and to obtain more positive credit ratings.

Impact based early warning systems an improved understanding, identification and estimation of risk can also underpin the development of a new generation of more effective early warning systems: systems that not only warn of an impending hazard, but those that monitor key exposure and vulnerability indicators enabling real-time calculation of the potential loss and impacts, informing early action in the form of preparedness and reduction activities to be implemented to reduce risks.

Strengthened territorial governance. Strengthening territorial governance at the local level is critical to the prospective and corrective management of extensive risk. In turn, addressing extensive risk is essential to reduce systemic risk in local infrastructure systems, supply chains and ecosystem services. Strengthening the resilience of local infrastructure systems, ecosystems, and supply chains in the face of extensive risk, is the area where the governance of systemic risk can achieve greatest traction in the achievement of the 2030 Agenda for Sustainable Development. Strengthened territorial governance will be most effective when it is supportive of community initiative and builds on the implicit governance of risk, that characterize most localities. By doing so and through guaranteeing reliable services that meet basic needs governments will also create a strong political imperative to manage risk and strengthen resilience.

UNDP and Support for Countries

Identifying the political and economic imperative to support this cause will be key. To the extent that countries can demonstrate strengthened governance to manage risk and to ensure resilience and sustainability, this will strengthen their competitivity and their capacity to attract capital and investment, particularly under post COVID 19 conditions and the need for sustainable, green recovery.

From the perspective of UNDP, the governance of systemic risk, should not be considered as a new and specialized sub-area of risk governance, but rather as a characteristic of strengthened and enhanced governance designed to reduce risk and enhance resilience and sustainability at the national and local levels. Risk governance and systemic risk governance should be considered as attributes of strengthened national and local governance, rather than as specialized sectors. Concern should also exist for strengthening and making viable some already existing management systems that provide concepts and instruments highly relevant to the management of systemic risk concerns, from prevention through to response and resilience.

The challenge for UNDP is that its existing Global Practices are largely organized around specific hazards, for example disaster risk management, climate change adaptation and conflict prevention, none of which can address risk in a more holistic way, even though each may think and understand risk in holistic ways. To conclude, therefore, UNDP should approach the governance of systemic risk, not from a hazard specific practice, but from an integrated approach to strengthened national and local governance. A cross-cutting approach is required that could and should be central to the new Strategic Plan of the organization.

INTRODUCTION

Since the turn of the century, growing attention has been given to the concept of "systemic risk" in academic and policy discourses. Systemic risk refers 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, 2017).

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 earthquake, tsunami and 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 2021 power crisis in Texas and the Evergreen episode in the Suez Canal in March 2021 are more recent materializations of systemic risk.

All these events were large scale, global or national (with major impacts or concerns, in general, for more developed countries) and triggered mainly by intensive and apparently difficult to foresee, hazard triggers. Far less attention has been given, however, to systemic risk in low-and-middle income countries (LMIC), where risk governance frameworks remain challenged to manage even the more conventional, idiosyncratic risks that these frameworks were established to deal with. That is, extensive and intensive[5] asset loss and damage, mortality and morbidity, the everyday risks associated with pollution, crime, road accidents, fires and multidimensional poverty and the interruption of essential services.

Unfortunately, the academic literature on systemic risk is largely disconnected from contemporary risk governance concerns at the national and local levels in these countries. However, as this paper will demonstrate, concern for systemic risk and its' governance at the local level is critical for the achievement of SDG goals. This risk may be triggered by frequently occurring and well known extensive hazardous events (Renn et al., 2020; UNISDR, 2011)

Risk in interdependent systems is not a new phenomenon and has always existed. For example, the period 536 to 541AD has been described as the worst disaster and disaster related death quinquennium in history. In 536, volcanic eruptions in Iceland triggered extreme global cooling, leading to harvest failures and famines across much of Europe, the Middle East and Asia. In 541, a pandemic of bubonic plague may have killed 30% of the population of the Mediterranean and weakened an ascendant Byzantine Empire[6]. In today's lexicon it would be described as a *simultaneous crisis,* a category of realized systemic risk (UNISDR, 2011). However, events since the turn of the century would seem to indicate that the compression of time and space[7], as a defining characteristic of economic globalization, is consistent with increasing system interdependency, complexity and uncertainty and hence magnified systemic risk.

The term systemic risk is used in fields and disciplines as diverse as finance and agricultural systems[8], in complexity sciences, climate change, engineering, evolutionary biology, public health, disaster risk, and sustainable development (Renn et al., 2020). As in the case of the term 'resilience', despite many elements in common, each of these fields defines the term in multiple within and across disciplinary ways.

Systemic risk governance[9] has been used mainly to frame efforts to strengthen protection for and the resilience of financial systems, global supply chains and strategic economic infrastructure, faced with extreme, sudden and supposedly unforeseen or difficult to estimate global shocks including the COVID-19 pandemic or catastrophic climate change.

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 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 and response to 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).

Context and Objectives

Since 2015 increasing recognition has been made in global policy frameworks that threats and subsequent risks are more complex than before (see SDGs, Paris Agreement, Sendai, Secretary-General's Prevention Agenda, and others linked to health, migration, urban resilience) but all do not look at systemic risk comprehensively.

This 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, 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 holistically[10]. In particular, the Sendai Framework expanded earlier considerations of disaster risk, to encompass a broader range of hazard types than previously incorporated in disaster study[11] including, comprehensively, the physical (for example, earthquakes, floods or drought), biological (for example, virus or other pathogen), technological (for example, a nuclear or industrial accident) and social and economic (for example, financial, crime, insolvency or price spikes). The Sendai Framework thus provides a framing of risk broad enough to enable a discussion of how, on the one hand, a wide range of underlying drivers, in different sectors and domains, configure systemic risk over time and how, on the other hand, realized systemic risk then cascades and ripples through interdependent systems at different spatial and temporal scales.

A first objective of this paper is to highlight how systemic risk, as other risk categories, is socially constructed. The dominant interpretation of systemic risk, realized, for example, in the ongoing COVID-19 pandemic, is still that of the probability of autonomous, exogenous and difficult to forecast *black swan* or *emergent risk* events impacting negatively on development. This paper, in contrast, will highlight how risk is an endogenous characteristic of the political economy, which in most contexts reflects a trade-off between the *privatization of gains and the socialization of risks.* As such, the adjective *systemic* should refer not only to the cascading and non-linear impacts in social, economic and ecological systems but, above all, to the process through which **risk is socially constructed and accumulated** in those systems (illustrated by the well-accepted notion that earthquakes don't kill people, poorly constructed buildings do). Decades of social research has shown how risk systemically accumulates, **concentrates and manifests in the same exposed and vulnerable individuals, households, communities and businesses,** irrespective of whether the triggering event is the SARS-CoV-2 virus, a price-spike, a hurricane or a conflict (Bull-Kamanga et al., 2003; Deshingkar & Start, 2003; Dodman, Leck, Rusca, & Colenbrander, 2017; Jain, Jigyasu, Pahwa-Gajjar, & Malladi, 2015; Lavell, Mansilla, Maskrey, & Ramirez, 2020).

A second objective of the paper is to identify a framework for systemic risk governance that could be actionable by and provide entry points for local and national government, civil society and private sector actors in the LMIC and which is, in this way, useful, effective and relevant to the achievement of the 2030 Agenda for Sustainable Development[12]. It is only by identifying a political and economic imperative for the governance of systemic risk that it will be possible to translate the concept of systemic risk from an abstract global concern and begin a dialogue on its governance with national and local government.

Approaching risk governance from the perspective of its social construction necessarily means that **the locus of attention changes from a focus on protecting development from apparently exogenous threats to a focus on reshaping and redefining or transforming development** in a way that enables potential and real endogenous risks to be recognized,

visualized, and managed. If the governance of systemic risk is to be relevant to the achievement of the 2030 Agenda for Sustainable Development, then risk governance needs to address the trade-offs between the *privatization of gains and the socialization of risk* and thus the pathways through which risk is *systemically* constructed, concentrated and accumulated. Current frameworks and discussions for post COVID 19 recovery, couched in terms such as "Green Recovery", "transformational development", the "new normal"[13] and others, must take this seriously into account.

This paper is divided into three chapters. Chapter 1 conceptualizes and characterizes systemic risk and examines its social construction. Chapter 2 highlights the challenges faced by existing paradigms of risk governance to address systemic risk. Chapter 3 identifies actionable pathways to cut through the conundrum of risk governance and enable low-and-middle income countries to address systemic risk.

The paper is based on a wide literature review and on contemporary frameworks for the conceptualization of risk and its governance. The overriding integral and holistic analysis in this paper is illustrated by selective case studies from Bangladesh, Colombia, Dominica, Uzbekistan and Zimbabwe, undertaken with the support of UNDP Country Offices. These cases are grounded in a preliminary, indicative analysis of a particular systemic risk concern in each country, with the exception of Dominica, where the overall development challenge associated with environmental hazard-based shocks, risk and disaster are considered. Boxes on each of the five countries are included in Chapter's 1 and 2, while an Annexure contains a fuller description of each of the case study contexts and relevant cartography of the countries. The case studies are the result of a four-day procedure including research and writing. Due to this, they should be considered preliminary and indicative.

CHAPTER 1: CHARACTERIZING SYSTEMIC RISK

1.1 Basic Definition 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"*[14].

At the same time, 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"*.

A popular interpretation of "systemic risk" refers to risk that affects the functioning of *"the whole of a **system** …. rather than just some parts of it"*[15]. 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 necessarily 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)[16]. 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[17].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.

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 time periods 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. Small initial loss and damage can, at times, lead to very severe and lasting impacts. These indirect and welfare impacts often go unaccounted for, but have been estimated to be significantly higher than the cost of physical or direct impacts (UNISDR, 2015a, Hallegatte et al., 2017). Here it is interesting to note that the UN definition of disaster risk quoted above does not explicitly consider indirect, ripple or systemic effects suggesting, without intention, that disaster is defined by the immediate impacts on assets, infrastructure and people and what follows is an aspect of some other or a new reality.

Meanwhile, even actions taken to avoid potential direct loss and damage may trigger systemic risk. For example, shutting down a major airport hub following an early warning of a future severe weather or volcanic ash event may severely disrupt air-traffic even though no direct loss and damage to the planes and airport infrastructure occurs (overall losses may in fact be reduced if the event did in the end affect airports). Similarly, the paralysis of national economies in the ongoing COVID-19 pandemic was not a direct consequence of physical asset loss or damage, but due to the policy response consisting of lockdowns, border closures and quarantines. In this case, direct physical losses did occur, not as a cause, but rather as a characteristic of the systemic risk manifested. For example, the hospitality industry was forced to discard large quantities of existing food products and beverages, while infrastructure and assets were down-graded due to lack of maintenance in some contexts. In some major global cities falling real estate prices in central areas reflects a potential revival of suburbia and the emergence of new urban forms.

As systemic risk is to do more with flows than with stocks, it is not only a function of hazard, exposure and vulnerability, but also of resilience. 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, 2017a)

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-to-fail" (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, its 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, & Luque, 2012). Systems with low levels of resilience, therefore, often internalize high levels of systemic risk.

1.2 Hazard Triggers, Scale and Complexity

Systems 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. 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, even the smallest local ecosystem forms part of interdependent regional and global earth systems, including climate, hydrological and ocean systems.

Non-linearity is a core defining characteristic of systemic risk (Renn, 2016; Renn et al., 2020). The level of complexity and non-linearity in systemic risk is associated with the degree of system interdependence. 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).

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, idiosyncratic 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)[18]. 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).

Systemic risk may be realized at different scales and levels of complexity. It may be triggered by single, multiple and cascading hazards and lead to synchronous, sequential and simultaneous impacts (UNISDR, 2011). Systemic risk becomes magnified by synchronous failures in multiple systems associated with system interdependence. e.g., Dominica after Hurricane Maria; New York after Hurricane Sandy. Sequential impacts in complex ecosystems such as in supply chains affect across spatial and temporal scales. e.g., RMG Industry fires in Bangladesh in 2012-13 affected European and North American markets; tsunami in Japan and Chao Phraya floods in Thailand in 2011 affected global supply chains for a long time. Simultaneous crisis associated with multiple triggers can have compounded impacts e.g. drought in north-eastern Syria, food insecurity in Zimbabwe, massive immigration of low-income Venezuelans into Colombia already characterized by conflict, violence and income inequality. Detailed examples of these types are provided in following sections of this report (1.3 to 1.7).

Physical hazard triggers may be single, multiple, cascading or concatenated (sequentially interconnected). The latter are illustrated, for example, with earthquakes triggering tsunamis, as in the 2004 Indian Ocean Tsunami; liquefaction resulting from earthquakes causing floods, as in Christ Church 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 (see Box 4), where the effects of drought on food production was compounded with the macro-economic pressures, the COVID-19 pandemic and other health crisis. In Bangladesh (see Box 3), unregulated urbanization contributed to an increased incidence of fires and building collapse in textile factories. This increased economic stress, which in turn has 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, interconnected or compound hazard triggers are synonymous with systemic risk. However, irrespective of whether the trigger is a single, multiple or compound hazard, systemic risk, as risk in general, always reflects the interconnectedness of a range of hazard, exposure and vulnerability factors and is not an inevitable outcome of the triggering event.

The following sections 1.3 to 1.7 illustrate these concepts using examples and case studies from the global North and South and draw on those to illustrate some of the conceptual and practical challenges and gaps in governing systemic risks.

1.3 Systemic Risk in Interdependent Systems

On October 29, 2012, Hurricane Sandy, the largest Atlantic hurricane[19] ever recorded, made landfall in New Jersey, USA. Its storm surge hit New York City flooding streets, subways and tunnels and cutting power in and around the city. Forty-four people died and 69,000 residential units were damaged. However, Sandy became notorious not due to this direct loss and damage but due to the collapse of multiple interdependent infrastructure systems, which paralyzed economic activity and essential services in the city.

Systemic risk becomes magnified by the non-linear impacts associated with system interdependence. As Figure 1 illustrates, in large urban areas like New York City, 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.

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, in particular 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). Little has been published or analyzed as to the effects on people, their health and economy of these impacts.

As highlighted above, the impact of a hazard trigger, such as an intensive hurricane, in cities such as New York of 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 and diversified economies such as the USA. In contrast and as Box 1 highlights, in the case of Small Island Developing States (SIDS) where the hazard trigger may affect the entirety of a countries population, territory and small and undiversified economy, the impacts may be national and become existential in character.

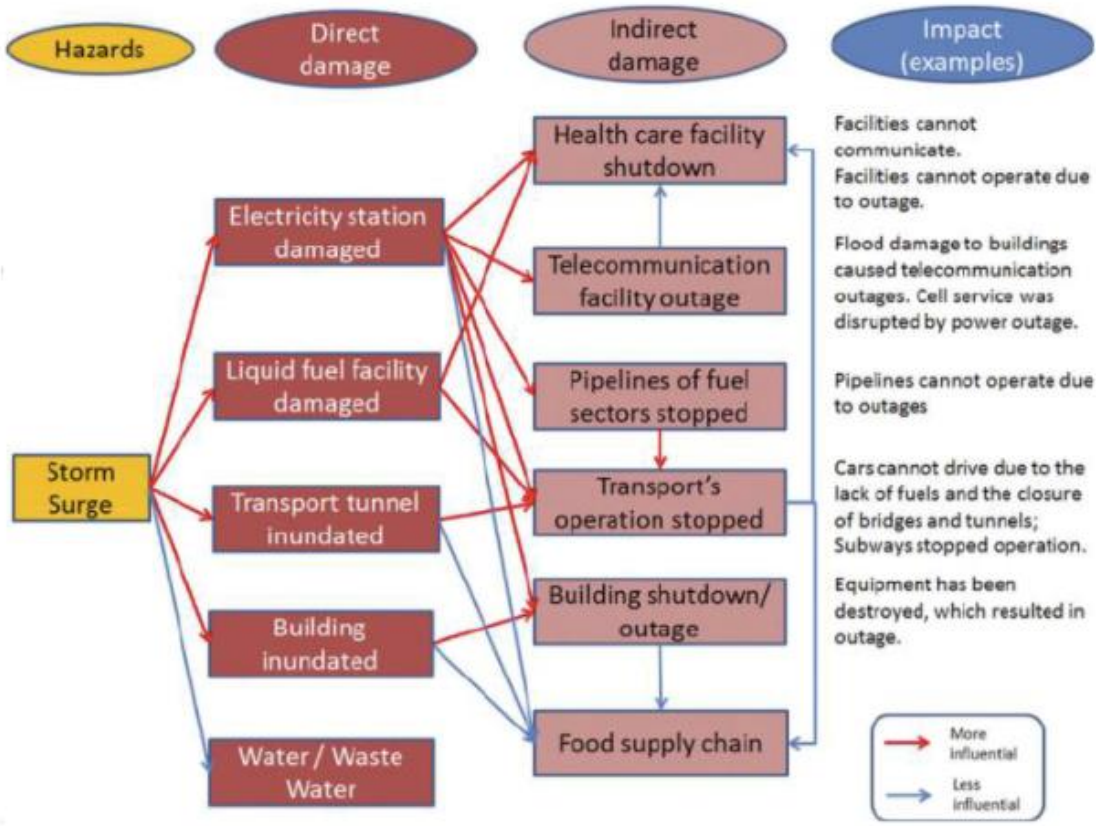


Figure 1: Interdependence of infrastructure systems affected by Hurricane Sandy in New York City (Haraguchi and Kim, 2016)

Box 1: Dominica and systemic risk in Small Island Developing States

Dominica has a total population of nearly 73,000, spread over a land area of 750 square km in the eastern Caribbean. Around two thirds of the population is urban with 15,000 living in the capital Roseau. Uniquely, Dominica is home to the Kalinango, a near to 3,000 strong ethnic Carib population, while a diaspora of more than 150,000 Dominicans lives abroad.

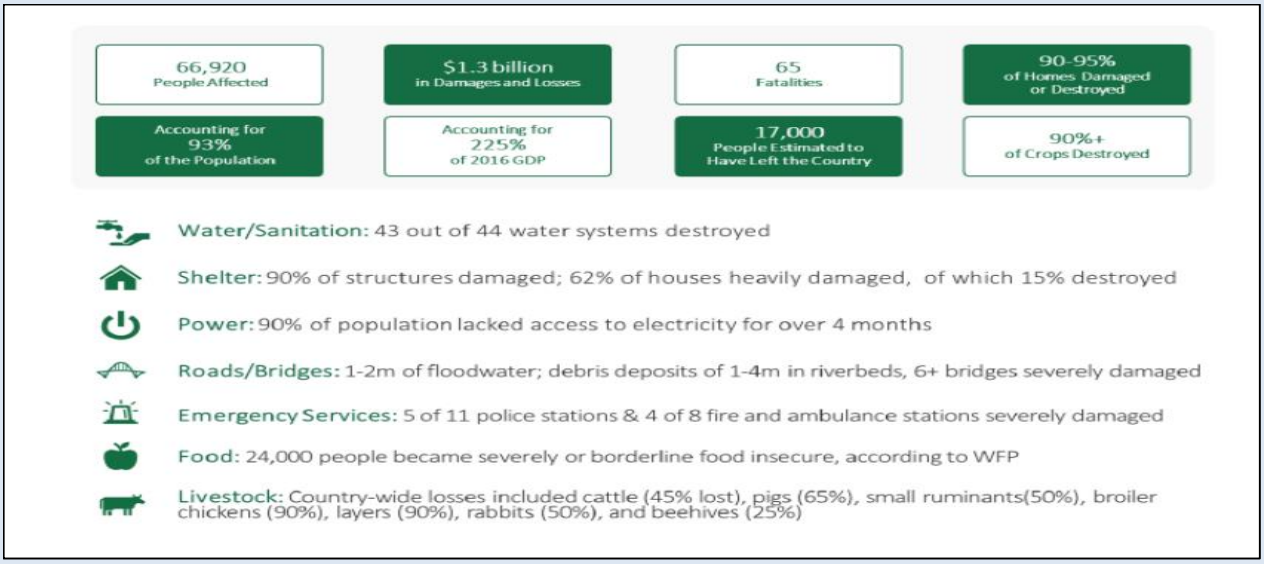
Historical processes of land occupancy and tenure, economy and social relations has led to 90% of the population and much of the country's infrastructure being located on the seaboard. This contrasts with the historical pre-colonial location of the indigenous Carib population in more protected inland areas. Today, the Carib-Kalinango are concentrated in a territorial reserve on the east coast, exposed to climate and oceanographic events such as hurricanes and storms, wave action and sea level rise.

Across the Caribbean, past investment decisions have led to an accumulation of exposure and vulnerability to hazards such as hurricanes and floods, now further aggravated by global warming, climate variability and change and sea level rise. These concerns are particularly important in an island of only 750 square km with 90% of population on the sea-bord. Tropical Storm Erika in 2015, followed by Hurricane Maria in 2017, revealed the breadth and depth of systemic risk on the island.

High levels of debt and dependency on external finance, economic instability, insularity, remoteness, and environmental fragility means that disaster impacts rapidly become systemic. The physical vulnerability and lack of redundancy in much of the country's infrastructure increases systemic risk in an already small, vulnerable and undiversified economy, with a GDP of under 1 billion dollars. Economic risk then aggravates the high social vulnerability associated with a poverty rate of over 25% percent and growing inequality. The country is ranked 94th position on the global Human Development Index.

At the same time, however, social cohesion, national identity and a willingness to learn from experience and adapt, are capacities that strengthen resilience in Dominica, along with in-flows of resources from the diaspora, investment programs for foreigners and international assistance.

Unlike in large and diversified economies, where even large disasters, such as Super-Storm Sandy in the USA only affect a limited proportion of the total population, infrastructure and economy, in SIDS like Dominica, the systemic impacts of hurricanes like Maria threaten the future existence and viability of its society as a whole.



Source: Dominica Climate Resilience and Recovery Plan 2020-2030 (Government of the Commonwealth of Dominica, 2020).

1.4 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, concatenated hazard which revealed conditions of exposure and vulnerability in coastal areas in general, and the nuclear power plant in particular, that had essentially been ignored or overlooked. 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, & 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 all its dimensions in Box 2. In Bangladesh, badly planned and managed urban development has 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.

Box 2: Urban risks in Bangladesh affecting its macroeconomy and global supply chains

Bangladesh became a nation-state in 1971 with its capital in Dhaka. It is the densest and the eighth most populous country in the world with more than 164 million people living on a landmass of 148 thousand square kilometers. According to the IMF, its per-capita income was US$1,906 in 2019, with a GDP of $317 billion. It is one of the "Next Eleven" emerging markets driven by strong domestic and international demand (World Bank, 2018) and has become a significant player in global supply chains.

Over 65% of the country's GDP is now urban. Urbanization has accompanied economic growth helping Bangladesh graduate from the Least Developed Country category (LDC) (UNDP Bangladesh, 2019a). However, urban areas in Bangladesh face a variety of risks associated with rapid population growth, migration from climatic stressed deltaic regions and other rural areas, as well as flows of refugees from neighboring Myanmar (CFE-DMHA, 2020). Urban growth in cities like Dhaka and Cox's Bazaar is badly planned and managed. City and local governments have limited resources and capacities to plan land use and to provide adequate infrastructure and urban services (Helal, Tariqul, & Jahirul, 2010).

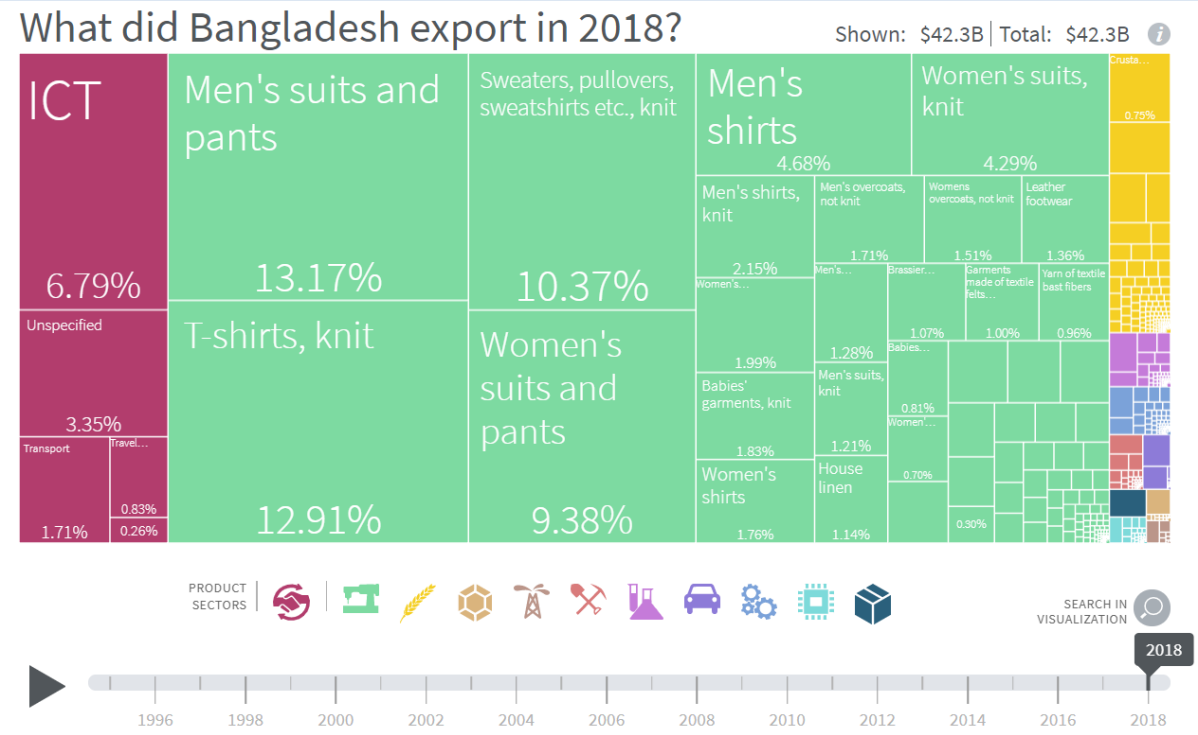
Nearly 30% of Dhaka's 14 million people live in slums characterized by multi-dimensional poverty, poor quality housing, lack of basic services such as water, sanitation, health, education, power and transport, tenure security and fear of evictions, and land controlled by land mafias (Ahmed, 2014a). The filling in of ponds and other natural drainage features for speculative real estate construction has increased the risk of flooding and water-logging, worsened by climate change and variability (Ahmed, 2014b). In general, poorly regulated construction increases the risk associated with fires as well as with earthquakes, cyclones and floods. In addition, traffic congestion accentuates poor air quality and productivity losses.

The readymade garments industry contributes over 84% of Bangladesh's export earnings (see Figure 3). The availability and affordability of labor, together with strategic connections with international supply chains from its urban areas, has made Bangladesh the largest source of European and North American RMG imports, second only to China.

However, repeated fires in its garment factories, especially in Dhaka, Gazipur, Narayanganj, and Chittagong, has negatively affected Bangladesh's economy and increased the country's reputational risk. On November 22, 2012, a fire broke out in the Tazreen Fashion Ltd. garment factory in Dhaka killing 112 people. On April 24, 2013, another fire broke in the Rana Plaza building, which housed five garment factories, killing at least 1,132 people, and injuring more than 2,500. Since then, over 109 more accidents have occurred, including at least 35 in RMG factories, killing 27 and injuring 491 workers (ILO, 2017). The poor labor conditions and the unsafe work environment revealed by these events, generated negative sentiments towards importing RMG from Bangladesh (Berg, Chhaparia, Hedrich, & Magnus, 2021a).

This forced the country to make efforts to improve working conditions and improve transparency regarding factory safety and value chain responsibility.

However, while factory safety may have improved, the issue of badly planned and managed urban development persists. Accumulating every-day, extensive and intensive risk in urban areas continues to undermine the potential of economic growth, deflecting new investment opportunities that could ultimately contribute to rising productivity and economic and social development (UNDP Bangladesh, 2019b).



Bangladesh's exports are mainly textiles, IT services and fisheries products which do not amount to much economic complexity.
Source: https://atlas.cid.harvard.edu/

1.5 Simultaneous Crisis from Compound Hazards

Multiple hazards may also be associated with simultaneous crisis, where risk manifests 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 of 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.

Recent crises in Syria and Sudan described below show how, as systemic risk flows and mutates through multiple interdependent systems, successive hazards may trigger simultaneous crisis in different times and geographies.

The drought in north-east Syria in 2008-2009 (Erian, Katlan, and Babah, 2010), for example, aggravated rural poverty and triggered massive migration to urban centers. 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 neighboring countries and contributed to growing unrest in Lebanon. In 2015, the arrival of 378,000 Syrian asylum seekers[20] then triggered a political crisis in the European Union.

As Box 3 highlights, the massive exodus of people from Venezuela has also increased systemic risk in neighboring Colombia, aggravated by the consequences of decades of conflict, weakening economic growth and now the COVID 19 pandemic, and including increased disaster risk.

Box 3: Migration, internal displacement and systemic risk in Colombia

Colombia is a large upper-middle income country, with a population of 50 million in a territory of a million square kilometers. While a member of the OECD and rich in natural resources, it is also characterized by high levels of poverty, income inequality as well as the consequences of decades of conflict, political and social violence, and drug cartels and trafficking.

Colombians have migrated throughout the country 's history. Since the 1970s, large numbers (estimated at up to 4.5 million) moved to Venezuela in search of economic opportunities and to escape rural violence and conflict. At one point, in the 1990s, Colombians came to represent around 80 percent of all foreigners in Venezuela. At the same time, since 1948 around 8 million Colombians moved or were displaced from rural to urban areas within Colombia for the same reasons.

Until recently, the country was never a destination for immigrants. Before 2015, foreigners made up less than 0.2 per cent of the total population. Immigration from Venezuela to Colombia began in the early 2000s, when higher-income groups and households started to relocate as a consequence of the growing economic and political crisis in their own country and the firing of nearly 18,000 employees of the State oil industry. However, it was between 2015 and 2021, that a massive wave of 1.8 million, mainly low-income Venezuelans migrated formally or informally to Colombia. A large, but as yet uncounted number, were of Colombian origin with their Venezuelan families. These numbers were swelled by another 500,000, on their way to Peru, Ecuador, and Chile, many of whom became stuck in Colombia when international borders were closed in 2020 at the start of the COVID-19 pandemic.

Thirty per cent of Venezuelan migrants have located in the capital Bogota, with significant numbers in other regional capitals, such as Barranquilla, Medellin, Cali, and Bucaramanga, in the border region of the Guajira and on the southern border with Ecuador. A large number have expressed their intention to stay in Colombia.

The health and welfare of the most vulnerable groups, such as women headed households, the elderly and infirm, is challenged by poverty, insecurity and insufficient access to work and income, with negative impacts, particularly on the education and development of children. Migrants compete with nationals, many of whom themselves were internally displaced, for access to social services, work, housing, etc. While initially the Venezuelans were welcomed, xenophobia and discrimination have increased, especially during the COVID-19 pandemic, challenging social cohesion and coexistence.

In urban areas, many migrants have located in areas exposed to different physical and environmental hazards, driving a commensurate increase in disaster risk. This in turn stresses the capacity of the Colombian state to manage risk and disaster. In general, the migratory wave has placed an additional fiscal burden on the Colombian State, a situation that has worsened since the outset of the COVID-19 pandemic, while international finance and support has been seriously limited, especially when compared to Syria and the needs of its exodus to other countries.

The problems associated with the massive wave of migration from Venezuela are aggravated by ongoing and unresolved risk drivers in Colombia associated with violence, inequality and drug trafficking, internal displacement, environmental degradation, informal urbanization, and the COVID-19 pandemic. The resulting synchronic crisis is a manifestation of systemic risk, given that risk in any one domain feedbacks into and magnifies risk in all other domains.

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, United Nations Sudan, World Bank, & GFDRR, 2021; FAO & GoS, 2020; WFP, 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 which already had low levels of capacity and resilience. In late 2020, refugees from 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 sequential inter relationship between different drivers including price inflation, inaccessibility to markets during the lockdown and damaged crops following floods. In such a scenario, it is impossible to attribute food insecurity experienced by households to any one trigger but to a continuous and compounded accumulation of exposure and vulnerability to different hazards, including conflict, climate variability, biological agents, and economic crisis. In a similar vein, it is the same groups of people who do not just face food insecurity, but other challenges of poverty, health, employment, displacement, and increased violence and conflict. 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, where the key development indicators are lagging, and yet institutional capacities and resources are insufficient to fill these gaps, making it a vicious cycle. In such cases, risk is deeply entrenched in the system, and regularly experienced by people in a variety of forms. An analogous scenario of systemic risk as manifested in Zimbabwe, is illustrated by Box 4.

Box 4: Food insecurity in Zimbabwe

Zimbabwe, which gained its independence from Britain in 1980, is a lower-middle income economy with a population of 15.2 million in a landlocked territory of 390,757 square kilometers. The country's GDP has declined annually since 2016 and was USD 20.563 billion in 2020 (IMF, 2020). Owing to violent election procedures, non-democratic and non-peaceful transition of power and the simultaneous increase in the political dominance of the army, alongside the powers held within the gold and diamond industry, it has been a site of great combat, crimes, mass atrocities, murders, violation of human rights and trade through 'systematic abuse' (Nichols, 2020).

Even though Zimbabwe had a thriving agricultural sector, it is now in the 'serious' food insecurity category established by the Global Hunger Index (von Grember, 2020). Food insecurity affects around 5.8 million rural and urban Zimbabweans (ReliefWeb, 2020; UNICEF, 2020).

Food production is severely hampered by frequent weather-related hazards such as droughts, aggravated by a changing climate. Maize makes up 80-90% of agricultural output and is sensitive to variations in temperature and precipitation. In addition, a lack of investment in the agricultural sector, inadequate land reforms and market policies, widespread corruption, prolonged power shortages, and lack of investment by the Reserve Bank in water infrastructure are other concatenated risk drivers that constrain food production (Remigios, 2010; Rukuni, Masanganise, Jayne, & Chisvo, 2006; UNDP, 2017; UNICEF, 2020).

Shortfalls in food production contribute to severe shortages and highly volatile prices. This increases food insecurity for low-income urban households and reduces agriculture-based income in rural areas (UNDP, 2017). Food prices are also mediated by macroeconomic drivers such as high annual inflation rates, local currency devaluation and fluctuating exchange rates, multiple pricing systems for goods, the inelasticity of food production, volatile cotton and tobacco harvests and sales and the cross-border export of other cash crops that generate foreign currency (FEWS, 2021). At the household level, drivers of food insecurity include

deeply entrenched poverty, chronic conditions of conflict and social factors such as ethnic and gender inequality with negative and broad impacts on malnutrition and health. The burden of impact falls disproportionately on women and children.

The ripple effects and cascading impacts from low-quantity and quality food consumption in poor households include further impoverishment, calorific deficiencies, increased prostitution and child marriages along with increased incidences of HIV-AIDS, landlessness, sustained malnutrition, and higher incidences of stunting and wasting in children and anemia in women (UNDP, 2017). Lack of employment opportunities have led to increased labor migration, while reduced food access has left many families dependent on humanitarian aid and barter food-economy (FEWS, 2021).

In such a context, restrictions put in place to manage the COVID-19 pandemic have further compounded the cascading impacts of rising food prices, shrinking purchasing power, the lack of employment activities and a public health crisis associated with the prevalence of HIV-AIDS and cholera and inadequate health infrastructure (FEWS, 2021; UNICEF, 2020), even though these impacts are experienced differently across districts and households. The manifestation of systemic food and health insecurity and associated impacts in Zimbabwe, a consequence of multiple, concatenated drivers, is unfortunately mirrored in other lower-income countries, in Africa and elsewhere facing economic shocks and conflict situations (FSIN, 2020).

1.6 Existential Risk in Global Systems

Between 1601 and 1603 Russia suffered one of the worst famines in the country's history. It is estimated that over 100,000 people starved to death in Moscow alone and perhaps 2 million in Russia as a whole (Borisenkov and Paseckij, 1988). However, it was not until four hundred years later that climate scientists established a conclusive link between harvest failure in Russia in 1601 and the ash cloud produced by the explosion of the relatively anodyne Huaynaputina volcano in southern Peru on 19 February 1600. The Russian famine exemplifies the interdependence between food, climate and geophysical systems at the global scale and shows how hazard triggers in one system can generate non-linear and potentially existential risk in others. Another example is provided historically by the Paratethys Sea, that stretched from the eastern Alps into what is now Kazakhstan, covered more than 2.8 million sq. km. and was home to a wide variety of mollusks, crustaceans, and marine mammals found nowhere else on Earth including dwarf whales. But it ceased to exist over 6.9 million years ago, presumably due to changes in the climate[21].

The social and economic impacts of the present 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 a multiple system breakdown with risks that include famine, massive human displacement[22], 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 not only for biodiversity but also changes in the frequency and intensity of hydrological and meteorological hazards[23], 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 breakdown. Growing social and economic inequality at all scales, a generalized crisis of governance in a number of 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. These interdependencies are illustrated in Box 5, by the case of the drying of the Aral Sea in Uzbekistan.

Box 5: Uzbekistan and the tragedy of the Aral Sea

Uzbekistan, a territory of 447,440 square kilometers, has a young, mainly rural, population of 34.5 million. Its population is the largest of the five former Soviet Republics in Central Asia, and more than half the total of Central Asia.

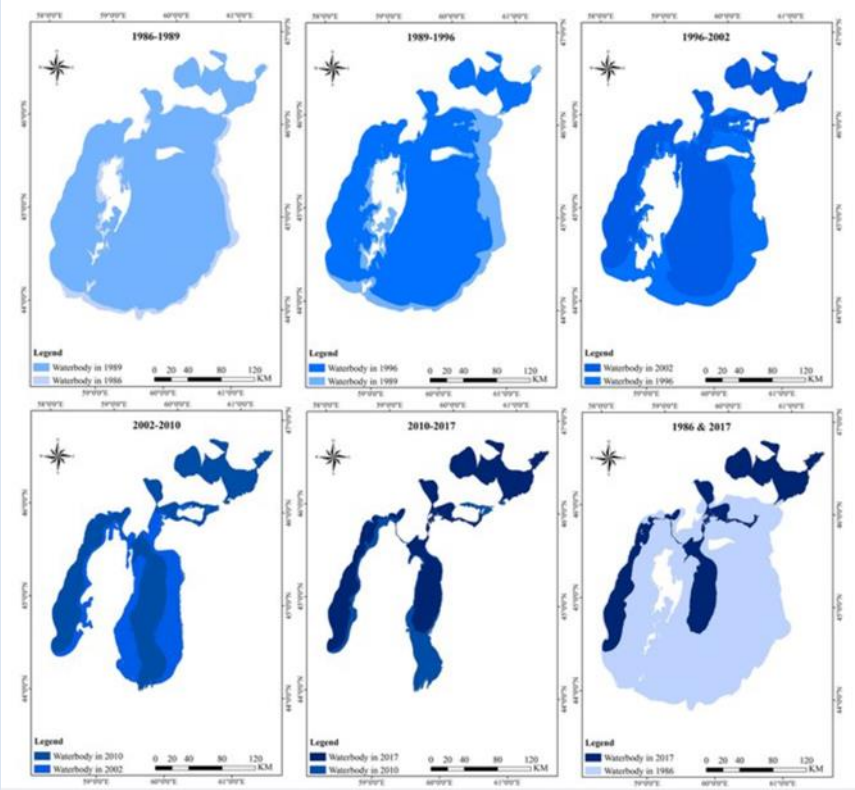
The Qizilqum (Kyzyl Kum) Desert in the northern part of the country occupies almost 80% of its landmass. The Fergana Valley in the east is the country's center of population, agriculture, and industry. Broad, flat intensely irrigated river valleys border the courses of the Amu Darya, Syr Darya, and Zarafshon rivers. The first two drain into the shrunken Aral Sea in the west.

The Aral Sea, half of which is in Uzbekistan, has shrunk over the last 70 years, largely due to the deviation of river flows to irrigate cotton production: a shrinking process magnified by unregulated and unsustainable agricultural practices and more recently by climate change. Water extraction from the rivers that flow into the Sea in exacerbated by the inefficiency of irrigation systems in neighboring Turkmenistan and Kyrgyzstan. Consequently, the total area of the Aral Sea has shrunk by 74%, its volume by 90%, while its salinity grew from 10 to more than 100g/l.

The drying of the Aral Sea has been accompanied by ripple effects in multiple systems, for example, biodiversity loss, including extinction of some species, fragmentation and decimation of native fish species, negatively impacting the agricultural, fishing, and animal husbandry sectors and the communities dependent on them, especially in the delta and downstream areas of Karakalpakstan surrounding the Aral Sea (Micklin, 2007). The loss of economic opportunities then triggers emigration and rapid urbanization, a vicious cycle of unregulated water consumption and growing inequality between regions.

One effect has been the emergence of a 5.5-million-hectare salt desert. For 90 days a year, dust storms over this desert spread over 100 million tons of dust and salt into the atmosphere for thousands of kilometers around. The salt, poisoned by agricultural pesticides, is now found on the coast of Antarctica, on the glaciers of Greenland, in the forests of Norway and many other parts of the globe (United Nations, 2017b).

In addition, without the moderating influence of the sea, winters have become significantly colder and summers hotter, posing risks for the agricultural sector and the livelihoods of the rural population as well as for the broader economy.



Comparative change maps of the Aral Sea water surface area in the period 1986–2017.
Source: Deliry, Avdan, Do, & Avdan, 2020.

1.7 The Quotidian or Everyday Experience of Systemic Risk

As highlighted in the previous section, current literature predominantly uses the concept of systemic risk to describe national and global level impacts, associated with compound hazard triggers. At the local level, however, for many individuals, households, communities, or businesses in LMIC, the quotidian or every-day expression of systemic risk is associated with the failure of local infrastructure systems, the interruption of local supply chains, the degradation or failure of 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*[24] 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[25].

Local infrastructure systems provide essential services, such as water and sanitation, power, telecommunications, health and education to urban centers 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, to regulate climate variability, to protect biodiversity and to 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 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.

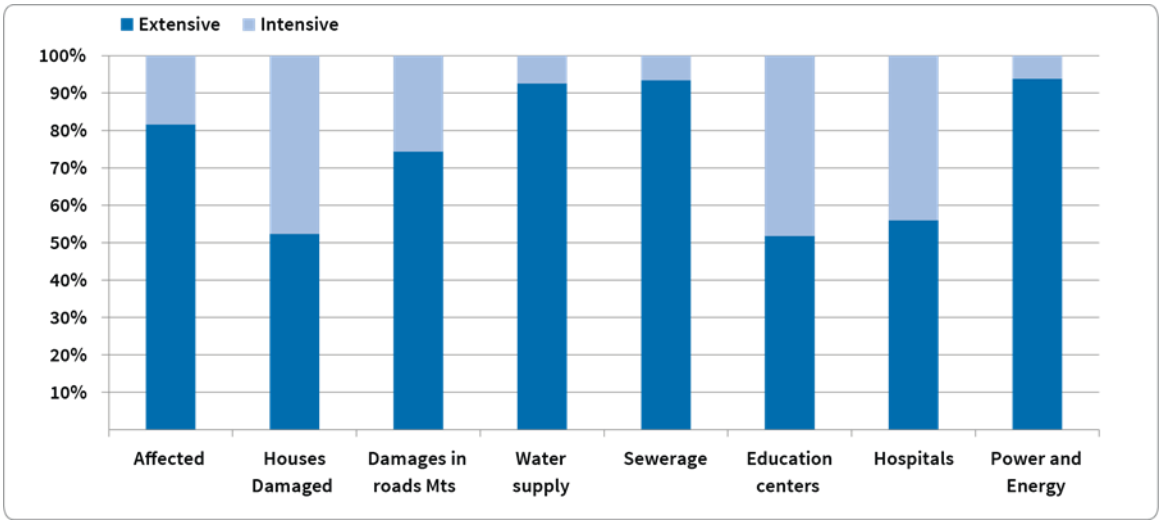


Figure 2 Percentage of loss and damage to infrastructure associated with intensive and extensive risk (UNISDR, 2015a)

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, the resilience of all those that depend on them is undermined. A resilient education system, for example, would be one where teaching is rapidly restored even when

facilities have been damaged or cannot be used. 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[26], 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.

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% were rural roads and 59% 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 resilience of local infrastructure systems, supply chains and ecosystem services needs to be strengthened and extensive risk reduced. Whereas in OECD countries (OECD, 2018), this problem is described as one of *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.

1.8 The Social Construction of Systemic Risk

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, and as illustrated in the case studies used in this report, systemic risk is not an independent or autonomous variable. Systemic risk, in the first instance, results from the concatenation and interrelationship of hazard, exposure, vulnerability and resilience. 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. Despite the dominance of interpretations of hazards as natural or technological, hazards are many times directly socially constructed as is the case with socio-natural hazards - those constructed in the interface of society with the environment due to subsequent processes of environmental degradation and change. As time passes hazards become more and more socially constructed. The case of humanly induced climate change and the new or accentuated hazards associated with this clearly demonstrates this. Increasingly society is its own enemy, constructing the very conditions that threaten its local, national or global existence.

The operation of these 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 makes the decision about 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[27]. Fossil fuel use, however, contributes to global warming, 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, Small Island Developing States (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[28]. SIDS are the most obvious recipients of spiraling, systemic risk generated by climate change and sea level rise resulting, amongst other things, from fossil fuel production and consumption by others (see Box 1, Dominica case study).

The underlying risk drivers are ultimately an expression of moral hazard 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, drivers such as global warming and climate change or high levels of inequality, can be seen not only as risk drivers but also 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.

When the latent risk accumulated systemically in any system is *activated* by a hazard trigger, the risk unfolds and materializes. The way those impacts reverberate reflects not only the magnitude of the hazard trigger, but 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, whereby every day risk provides the basis for much disaster, health, conflict and existential risk. Every-day or quotidian risk (Bull-Kamanga et al., 2003)[29] refers to the accumulation and concentration of risks associated with poor health, deficient of non-existent infrastructure, crime, unsafe living and working environments, air and water pollution in certain social groups or territories. As mentioned earlier, in OECD countries these would be described as *pockets of vulnerability*. But essentially, they offer a generalized backdrop of everyday risk in the LMIC context.

Systemic risk then assumes the characteristic of extensive risk in local infrastructure systems, supply chains and ecosystem services. Increasing levels of extensive risk, layered on top of a 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. 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 vicious loop 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, follows a *systemic* logic and dynamics. This logic suggests risk will become even more serious in the future if action is not taken to control and reduce it.

The ongoing COVID-19 pandemic exemplifies this *systemic* logic and dynamics in all its dimensions. The dominant interpretation of the COVID-19 pandemic continues to be that of an exogenous and unforeseen pathogen (the SAR-CoV-2 virus) taking national health systems and economies by surprise. However, the pandemic can and should be understood as the manifestation of endogenous risk, socially constructed and accumulated over time (Lavell et al., 2020).

Increasing interaction between humans and animals would appear to facilitate the emergence of new pathogens such as the SAR-CoV-2 virus (zoonosis). The transmission of the SAR- CoV-2 virus through global and national travel corridors, enabled the pathogen to rapidly spread from its origins in Wuhan, China to all corners of the world. Hazard levels and exposure, therefore, are higher in those countries and territories that are closely integrated into the global air traffic network and are lower, for example, in isolated island states. The same logic is associated with the spread in any single country where dominant and frequented travel routes between large metropolitan areas and regional or local cities and towns would increase the likelihood of spread there, as opposed to less travelled and frequented rural areas, although travel from rural to urban areas for commerce would increase the potential spread to such areas bit by bit.

The exposure to the SAR-CoV-2 virus is socially constructed by factors such as inequality, overcrowded living conditions, poor ventilation, occupations that require close contact with others and dependence on public transport.

In terms of vulnerability, age is an intrinsic factor as is the genetic structure and levels of immune system development, efficiency and response. However, it has been found that pre-existing health conditions, such as diabetes, overweight, heart conditions, which may be innate or socially constructed, greatly increase vulnerability to the SAR-CoV-2 virus. Many of these health conditions are strongly correlated with patterns of multi-dimensional poverty and everyday risk, including lack of access to timely and effective primary and secondary health care. The pandemic has revealed the uneven and precarious availability of public health services in many countries, some of which have been stressed to the point of collapse.

As a socially constructed risk, many of the social sectors and communities most affected by COVID-19, including in high-income countries, are those with higher levels of everyday risk (International Labour Organisation, 2020; UN Women, 2020). These are social sectors for whom risk management strategies such as home working and confinement are not available, given that they imply the existence of a home to be confined in and occupations that can be undertaken remotely.

The *systemic* logic and dynamics[30] associated with the COVID-19 pandemic illustrates why risks associated with different hazard triggers always tend to be disproportionately concentrated in the same social groups and territories. These groups are predominantly defined by social status and class, ethnicity, race, gender, age, employment and work type and various conditions of intersectionality. Socio-spatial segregation in cities and countryside, based on the previously mentioned factors, lead to the development of excluded, marginal or insecure areas that also concentrate risk and relative disaster loss and damage. This implies that the kind of hazard trigger (physical, biological, technological, or social) is ultimately of secondary importance, given that it is the unfolding of risk that is *systemic,* and which demonstrates 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 conceiving ideas and approaches to actionable systemic risk governance, whether in highly developed or low- and middle-income countries.

CHAPTER 2: THE PREVAILING PARADIGM FOR THE GOVERNANCE OF RISK

2.1 Risk Governance and Risk Management

The IRGC[31] 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"*.

For UNDP, DRG refers to "the way in which the public authorities, civil servants, media, private sector, and civil society coordinate at community, national and regional levels in order to manage and reduce disaster and climate related risks. This means ensuring that sufficient levels of capacity and resources are made available to prevent, prepare for, manage and recover from disasters. It also entails mechanisms and processes for citizens to articulate their interests and exercise their legal rights and obligations" (UNDP Issue Brief, 2013).

Risk management strategies can be categorized in four groups:

- Prospective risk management refers to actions to anticipate and avoid the construction of new risk (e.g., through controlling location in hazard prone areas or building, applying seismic safety codes).
- Corrective risk management refers to actions to reduce existing risk. (e.g., retrofitting existing buildings, constructing dykes to impede flooding of built-up areas)
- Reactive risk management refers to measures to address anticipated hazard events and manifest risk, (including through early warning, preparedness and response protocols and actions).
- Compensatory risk management refers to measures to mitigate or absorb impacts and strengthen resilience. (e.g., social safety nets; insurance)

This categorization and nomenclature for risk management is reflected and utilized in the Goals of the SFDRR, the United Nations Global Assessment Reports (GARs) on Disaster Risk Reduction (UNISDR, 2011) and in national risk management laws and norms, particularly, but not exclusively, in Latin America. The SFDRR and the GARs place particular emphasis on prospective and compensatory management, while also promoting improvements and innovation in the more well-established corrective and reactive management.

Different disaster and crisis 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 for the broad institutional, policy, legislative and normative framework within which the previously mentioned risk management strategies, are prioritized, adopted, and practiced. In general, the conceptual transition has been from so called disaster or emergency response frameworks and management to the more inclusive notion of disaster risk management, although experience shows that reactive disaster and crisis response still dominate to a great extent in most countries in terms of financial support, legislative coverage, institutional commitment, and action formats.

Crises can open policy windows (Kingdon and Stano, 1984). In many countries risk governance frameworks have been adopted or have evolved following the experience of major crises, even though there is usually a critical time lag between both. However, bureaucratic procedures, inertia, the difficulty of breaking with the past and the still dominance of short term private needs over security in society (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 takes root. It may be supposed

that the needs and opportunities for governance related to systemic risk "opened" by the financial crisis of 2007-11 and the present COVID 19 pandemic clearly exist and are being taken advantage of, but at the same time may also close or be ignored in the future.

2.2 The Regulation of Risk

Within the holistic vision and framework for disaster and crisis risk management depicted above and accepting the current dominance of measures for planning and organizing preparedness and reaction when faced with disaster, a common approach to risk governance instrumented in most countries and regions is based on the adoption of norms, regulations, and standards to manage risks. These can be understood as a mainly prospective risk management strategy, as they are 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 (Johnson, 2006). Another was the adoption of the first seismic-resistant building code in Italy in 1920 following the 1908 Messina earthquake (Bellicoso, 2011) and the prohibition of the use of adobe for building in Costa Rica following the massive 1910 Cartago earthquake.

Many countries, from the global North and South, have now adopted measures for land use planning, building, environment, public health, industrial and transport safety and security, finance and in many other domains. These are normally sector-based, sometimes promoted in the context of an overarching national policy or strategy. As a risk governance framework, however, regulation has had mixed results in many countries, for several reasons, including lack of capacities, competing demands on under-staffed local governments, corruption and influence and the dominance of short term versus longer term growth and development goals (IFRC & UNDP, 2014).

In all contexts, regulation 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 how the political trade-offs between *privatizing gains* and *socializing risks* are negotiated in any given context.

These trade-offs were visible in the power crisis following winter storms in Texas in February 2021, when up to 4.5 million were left without electricity. The almost completely deregulated power market in the state, encourages fierce competition amongst power generators and retail electricity providers and provides power at about half the cost of that of California. However, it has not provided incentives to strengthen the resilience of the network through increasing its reserve capacity or through investments to protect the grid and its equipment against occasional but extreme weather[32]. Nor had lessons from a 2011 winter storm led to change. Independent of the different scale and significance of the problem, this contrasts with El Salvador, where, following a large1986 earthquake, the resistance and resilience of telecommunication systems was strengthened, reducing the impacts in the subsequent 1991 earthquake.

Secondly, regulation has been more effective in those high-income countries that have established mechanisms of compliance and accountability (IFRC/UNDP, 2014). In general, it is far less effective in many LMIC, where a significant proportion of economic activity and territorial occupation occur outside of formal regulatory systems (mHS Citylab, 2011). In countries characterized by fragile governance and low levels of compliance and accountability, public or private investment decisions that *socialize* risk are rarely sanctioned. In some contexts, moral hazard becomes *armed*, in which case conflict becomes an entrenched mechanism to *privatize gains* and to *socialize risks*.

At the same time, regulation can foment exclusion. It can be used as a barrier to entry into formal economies and territories or to protect established interests and monopolies. In this way, regulation plays a role in transferring risks from one

geography to another: strict regulation in one country (for example, in its labor market or environmental regulation) can encourage investment to flow to locations with weaker regulation, accountability and compliance. However, as highlighted in Chapter 1, in the case of the 2011 Chao Phraya River floods, risk transfer is not always a one-way street. Interdependency means that *socialized risks* may be transmitted back along global supply chains to haunt those who are *privatizing the gains*.

2.3 Institutional Systems for Risk Governance

The design and implementation of strategies, methods and instruments and concrete actions for enacting disaster risk management goals has normally occurred through specific institutional and legislative frameworks for risk governance. These have developed and changed historically as the concepts and understanding of risk changes and the impact of events on society leads to demands for new thought and practice.

Following the Second World War, specialized civil defense or civil protection offices were created in many countries within the defense or security sectors to respond to conflict and disasters. In other countries, particularly in Asia and Africa (for instance, see Box 10 in Chapter 3), these offices were layered over colonial level structures to address the risk of famine and located in other sectors, particularly agriculture.

In the 1970s, in response to iconic emergencies in different parts of the world, such as those associated with Cyclone Bhola and the war of independence in Bangladesh, the Sahel drought and famine and the earthquakes in Peru, Nicaragua and Guatemala many of these emergency management offices expanded their mandates to enhance and professionalize reactive and timidly introduce corrective risk management. This process was potentiated in the 1980s with the occurrence of further iconic disasters worldwide that preluded the establishment of the International Decade for Natural Disaster Reduction-IDNDR- by the UN.

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, with responsibility distributed across different sectors and levels of territorial government and with emphasis placed on social and local participation and accountability. This framework became paradigmatic and was later adopted in other countries in Latin America and beyond, but not without challenges[33]. Challenges to the Colombian system over the years and finally with the extensive flooding disasters associated with the 2010-11 Niña event led to the passing of a new even more comprehensive and conceptually advanced system-based law in 2012.

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 the technical capacities and resources to fulfil these decentralized responsibilities. While national governments have normative responsibilities, these are not actionable without strengthened and resourced implementation capacity at the local level (Revi and Rosenzweig, 2013). Local governments may also find a greater political imperative to invest in short term economic development rather than to manage accumulating risk over the medium and long term. At the same time, coordination across administrative boundaries may be difficult, although river basin authorities, for example in Europe, have proven to be a viable mechanism of transboundary coordination and integration, but only focused on one specific risk.

Even when political responsibility has been vested at the highest level of government, many systems continue to be coordinated in practice by emergency management organizations, particularly in 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 fundamentally centered on reactive risk management. In some OECD countries, there is no central authority with a mandate for risk management at all, which undermines political leadership (OECD, 2018). Coordination with the private sector is often

weak or non-existent, despite the fact in many countries infrastructure assets are owned and systems managed by the private sector.

Many national risk governance systems are yet to embrace the expanded scope of hazard and, thus, risk, provided by the SFDRR, that includes technological, biological, environmental and man-made hazards. For example, it is still the exception for the governance frameworks created for adaptation to climate change to be integrated with those for disaster risk management and hazards associated with conflict, terrorism or industrial accidents are rarely integrated in the governance systems that address physical hazards (OECD, 2018). Very few of the national and local plans and strategies completed by the September 2020 designed compliance date to address Global Target E of the SFDRR included a focus on biological hazards. To date less than 50 countries have in fact handed over such plans at all. A possible consequence of this is that national risk governance systems have played only a marginal role in addressing the COVID-19 pandemic, while the concept of systemic risk and its governance needs have most certainly not been taken up on to the extent the seriousness of the problem dictates.

As an additional challenge, in many countries it has been difficult to integrate scientific and technical information produced by meteorological, geological, environment and land-use planning agencies to strengthen the identification and estimation of risk. In many others, particularly small island and land locked states, territorially downscaled environmental hazard and risk information associated with critical global change processes does not exist.

Ultimately, most risk governance systems continue to understand their role as one of protecting development from what are perceived as exogenous threats, whether the SARS-CoV-2 virus, an earthquake or climate change, within a broader doctrine of national security. The still prevalent use among many development and development finance actors, politicians and the public in general of notions of "war" or "battle" against different physical and biotic threats (see the present COVID-19 crisis), of animist notions of "killer" hurricanes and "assassin" earthquakes and the still overly prevalent use of the notion of "natural disaster", confirms the existence of such perceptions and mental configurations or reflections of convenience (Few, Marsh, Jain, Singh, & Tebboth, 2021). This approach leads to an almost exclusive reliance on corrective and reactive risk management and dilutes and externalizes accountability and responsibility for the social construction of risk. At the same time, most corrective management is directed to protect assets and persons directly and individually and not to address ensuing systemic risk and system resilience challenges.

Limited progress has been achieved in prospective risk management, which, necessarily 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 becomes configured and internalized faster than existing risk is being reduced.

Ultimately, this dominant approach to risk governance embodies a fundamental contradiction. If the social construction of risk is an intrinsic characteristic of the development pathways pursued by most countries, then the objective of protecting development is, by definition, unattainable, unless the pathways themselves lead in a different direction.

2.4 Implicit Risk Governance

Regulation and the creation of specialized, formal risk governance frameworks are, as argued above, the mechanisms that most governments rely on to manage risk. However, these formal frameworks 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.

All individuals, households, communities, and businesses are involved in managing their risks, in a continual trade-off between risk and opportunity. They often are willing or forced to accept or even increase exposure to some hazards at the *cost* of reducing exposure to others. For example, informal settlement in flood or landslide exposed areas is rarely due to

ignorance of the risks subsequently generated. The opportunity to live in areas close to employment opportunities or urban services, on accessibly priced land and in community may outweigh increased hazard exposure. And, with time, ties to land and community consolidate occupancy even when offers of relocation or resettlement exist (Hino, Field, & Mach, 2017; C. Johnson, Jain, & Lavell, 2021). Similarly, informal sector employment in hazardous activities may be deemed an opportunity, faced with the risk of destitution and hunger.

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. The latter is demonstrated with the decisions of large companies such as Toyota and Honda to locate on the hazard prone flood plain of the river Chao Phraya, amongst other things to take advantage of location, sea access for exportation, labor and local tax incentives, or the Fukushima nuclear plant to locate on the immediate sea-bord in order to have access to renewable large scale water resources.

All such decisions reflect risk perception and knowledge, which in turn is conditioned by the information available and opportunities for asset accumulation[34] (Moser, 2007, p. vii). Risk knowledge may be lost through migration and displacement, as migrants may be unaware of the hazards in their new environment and adopt building or agricultural practices that increase risk. But, in general, the management of known short-term risks normally takes preference over longer-term risks, particularly when these have not manifested in living memory. For example, the Muslim Rohingyas who were politically, ethnically and religiously persecuted and ousted from Myanmar have moved to Bangladesh in phases, with the largest exodus in 1991 and latest in 2017 and have settled the Cox's Bazar area. Here, the Rohingya's refugee camps' vulnerability is further revealed with the exposure to consistent cyclone hazards, flash floods, landslides, communicable disease outbreaks and storm surges in this region. Evacuation processes, spatial distribution in cyclone shelters, access to food, relief, medicines and their rehabilitation also reveal risk conditions and disaster vulnerabilities.

In general, the residents of these localities are fully aware of the risks they face. But their choice as to where to live and work is normally heavily constrained by social and economic factors, including a lack of access to safer land, the need to be close to employment opportunities, insufficient investment in risk-reducing infrastructure by local and national authorities and different forms of discrimination and exclusion. With constrained opportunities, people faced with recurrent risk often have no choice but to live with that risk and periodically recover from disaster loss and damage.

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 or were conscious of 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 to 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 clearly outweighed any contingent liabilities posed by future floods.

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, Jain, Nalla, 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 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), in other words when local and national governments support rather than ignore or repress local initiative and where science and technology is articulated to local practices and knowledge: for example in structural improvements to earth building to increase seismic resistance or water harvesting techniques that combine modern technology with practices used for millennium. Building on local risk perception and knowledge, such strategies have been shown to be resource effective, sustainable, and supportive of local livelihoods and welfare. In the best of cases, these *win-win* strategies both support local social and economic development while managing and reducing risk.

However, despite calls for and movements in favor of 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 (C. Johnson, Jain, Nalla, et al., 2021; Maskrey, 2011) or whether the symbolic political commitment expressed in global frameworks and declarations is actually realized in practice.

2.5 Systemic Risk Governance

As discussed in the Introduction, while the term had been used in different domains for years, it first became really pervasive during and following the 2007- 2011 global financial crisis (Dijkman, 2010; IRGC, 2017; OECD, 2003; UNDP, 2020a; WCDRR, 2015). Analysis of systemic risk in the financial sector distinguishes between 'idiosyncratic' risk (also referred to in this paper as conventional risk) that only affects a given entity and 'systemic' risk that affects the whole financial system. It 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 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.

Three broad characteristics of what could be termed a dominant perspective for the governance of systemic risk can be identified.

Firstly, the governance of systemic risk has become synonymous with the governance of transboundary and global risks, mainly in the financial system, in global supply chains and strategic economic infrastructure. For example, most OECD countries have now put in place strategies to manage risks and avoid disruption in strategic economic infrastructure (OECD, 2018). In contrast, little or no attention has been given in the academic literature or in policy documents to addressing the quotidian, sustained, permanent or regular experience of systemic risk in LMIC, in local infrastructure systems, supply chains or ecosystem services or to the achievement of the 2030 Agenda for Sustainable Development. A recent survey by the OECD, for example describes few incentives to strengthen business continuity in small and medium sized enterprises (OECD, 2018). This failure to take up on an aspect of great significance can have many explanations, including the dominance of northern concerns and thought in a world of global concerns and existential conditions.

Secondly, risk identification focuses almost exclusively on the hazard triggers, particularly on extreme, infrequent and difficult to estimate *black swan* events, for example the emergence of new and potentially dangerous pathogens. Far less attention is given to the underlying conditions of exposure and vulnerability or lack of capacities to cope or respond, which

configure systemic risk, despite the fact that these, as pre-existing conditions, can be modelled and estimated. This focus on the trigger rather than on the underlying risk factors, indicates that the governance of systemic risk is still interpreted as the protection of development from exogenous threats rather than as addressing the social construction of risk. It is symptomatic that everyday risks associated with traffic accidents or air pollution are not considered to be *critical* risks because they are clearly endogenous to development and are both constant and persistent, a seeming part of "normalcy", despite the fact the human and production losses associated with such risks are staggering. Critical risks are considered to be only those associated with infrequent, intensive and unexpected hazard triggers (OECD, 2018) .

Thirdly, the risk management strategies adopted principally focus on strengthening system resilience: preparing systems and building redundancies, making them flexible enough to keep functioning despite some unavoidable failures – what is commonly referred to as a "safe to fail" approach (Ahern, 2011; Kim et al., 2019, 2017). From this perspective, systemic risk is typified in terms of the notion of "*too big and too interrelated to fail*". Risk reduction and anticipation in prospective terms is given little attention though it is obvious that if the initial impacts and asset loss do not occur or are reduced, so would the systemic effects. Here it is clear we are not dealing with an impossible or inaccessible action space given, for example, that other nuclear reactors near to Fukushima were located away from the sea-bord following a process of risk analysis and did not suffer damage. Moreover, we also know that location of much production, infrastructure, service provision and housing have been dictated more by convenience, the search for short term gain, due to government stimulus, the offer of cheap land or the lack of information on hazard and risk, than the search for risk security. The example of the companies located in the Chao Phraya flood plain has already been cited. The economic opportunities of locating in hazard prone areas, with the resulting socialized risk, shows how moral hazard can undermine the governance of systemic risk and increase the disadvantage for others.

Following the 2007 financial crisis, strengthened regulation in the financial sector was introduced in many countries, obliging financial entities to maintain larger reserves to buffer risks and fulfil more stringent reporting and disclosure requirements. Following the 2011 Japan and Thailand disasters, large global businesses took steps to strengthen supply chain resilience applying new standards such as ISO 28002. In fact, supply chain resilience has now become a specialized area within the broader domain of systemic risk management.

Risk financing mechanisms, for example, regional insurance pools[35], and catastrophe bonds have also been introduced by multilateral development banks and the insurance sector to strengthen financial resilience. In many countries, specialized institutions for adaptation to climate change have been created, often in environment ministries, as a mechanism to strengthen system resilience in the face of climate risks.

In conclusion, the dominant approach to 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 approach to the governance of systemic risk therefore would appear 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[36], risk will continue to be generated *systemically* to the point where increasing investments in resilience generate diminishing returns.

CHAPTER 3: TOWARDS THE NEW PARADIGM FOR THE GOVERNANCE OF SYSTEMIC RISK

3.1 Governance for Sustainability and Resilience

As discussed in Chapter 2, the dominant approach to governing systemic risk, implies an approach that addresses pre-existing risk through largely corrective, reactive, and compensatory risk management strategies. Systemic risk is understood to be an outcome of an unexpected, exogenous threat that interrupts and negatively impacts *normal* social and economic development, particularly at the global and transboundary scale. *Systemic risk governance* thus becomes synonymous with approaches to reduce to the extent possible existing risk, through the use, amongst others, of improved monitoring and early warning, increased uptake on scientific knowledge and retrofitting or relocation of assets and infrastructure or/and by strengthening the resilience of financial systems, global supply chains and strategic economic infrastructure from hazard triggers that could take the world by surprise, whether new pathogens, cyberattacks or volcanic explosions.

The contours of a different approach to risk governance would start to emerge, however, if systemic risk is interpreted as a social construction, endogenous to the development pathways followed by most countries, many of these determined by processes external to them in an increasingly globalized, trans-nationalized, corporate world. *Systemic risk governance* would then probably be an inappropriate and overly circumscribed term to refer to such a governance framework. Rather than a specialized governance framework to address a new, fashionable and exotic risk category called *systemic risk (*which has always existed at one level or another*),* a strengthened overall, holistic, governance framework for social, economic, territorial and environmental development would be called for, that addresses the underlying risk drivers and factors in a way that promotes sustainability and resilience, generating development benefits, that include the avoidance and reduction of systemic risk.

This implies that **the governance of systemic risk should be considered less as a specialized area of risk governance, and more as a framework for governance that reappraises the trade-offs between privatizing gains and socializing risks in a way that favors sustainability and resilience**, for example through mitigating climate change, protecting biodiversity, reducing inequality, and reallocating capital to sustainable resistant and resilient infrastructure and urban development.

While any framework for risk governance would have to be appropriate to the specific governance arrangements in and challenges faced by each country, a number of general characteristics can be defined.

From managing conventional risk to governing systemic risk

Firstly, as discussed in Chapter 1, systemic risk normally unfolds from conventional or idiosyncratic risk to key assets, functions, infrastructures, productive facilities, services etc. or due to anticipation and prevision against future loss (for example, the closure of economies and restrictions over movement of people during the COVID-19 pandemic). This means that if conventional risk can be effectively managed and reduced, then also will important components of systemic risk. Unfortunately, many LMIC are challenged to even manage and reduce their conventional risk. The governance of systemic risk, therefore, is not a new exotic governance specialty, but requires the strengthening of existing risk governance arrangements, without which conventional risk will continue to increase.

Many conventional, existing risk management systems do in fact bring together and are based on many of the facets that are deemed to be required to manage systemic risk. The Colombian national system, created in 1989, reformed in 2012 and highly regarded worldwide, highlights participation, intersectoral and interdisciplinary action, decentralization, human rights, structural and non-structural measures, risk communication and coproduction of knowledge: facets that are now seen

to be critical for the governance of systemic risk. However, whether these principles are practiced effectively, in Colombia or elsewhere, is another question, even in the case of managing conventional risk. Hence the challenge remains to overcome the political economy barriers to risk management, which are likely responsible.

From identifying hazard triggers to understanding risk drivers

As discussed in Chapter 2, when *systemic risk governance* is understood as the protection of the predominant development paradigm from supposedly exogenous, unexpected, and difficult to anticipate threats, then the focus of risk understanding, identification and estimation inevitably becomes skewed towards the hazard trigger. Risk analysis then becomes largely concerned with the uncertainties involved in forecasting potential future triggers, whether volcanic explosions, new pathogens, or sources of financial instability.

When on the contrary, systemic risk is understood as a social construction, the focus of risk understanding, identification and estimation shifts from the trigger to the underlying risk drivers and the unfolding in time and space of patterns of hazard, exposure, and vulnerability. For example, in the case of the ongoing COVID-19 pandemic, the conditions of hazard, exposure and vulnerability that configured systemic risk could easily have been identified, estimated, modelled and mapped before the virus emerged: for example, people with pre-existing health conditions, those living in overcrowded housing, those with occupations that exposed them to the virus and areas with inexistent or deficient public health services, patterns of international, national and local movement for work and pleasure.

Improved understanding of hazard, vulnerability and exposure patterns provides valuable insight into systemic risk, irrespective of the specificities of the triggering event. Vulnerability and exposure are closely related to social and economic inequality, lack of financial options, multi-dimensional poverty, exclusion, lack of access to services, amongst other drivers, no matter what the type of trigger. This means that although **uncertainty** regarding the triggering event may be increasing, improved data and modelling makes it possible to increase **certainty** with respect to underlying and pre-existing patterns of hazard, vulnerability, and exposure.

Unfortunately, given that risk is still often confused with the hazard trigger or with multiple or compound hazard triggers, insufficient attention is given to identifying the underlying drivers and factors that configure risk. Identifying and modelling these drivers and factors could enable countries to prospectively manage and reduce their risks and strengthen their resilience irrespective of the exact nature and timing of the triggering event. Understanding risk is also a critical entry point for reactive risk management and can lead to more predictable and effective response.

To understand, identify and estimate systemic risk, data and information is required not only on exposed and vulnerable assets, but also on flows, dependencies, and relationships between parts of a given economic, production, employment or environmental system, the components under possible stress and challenge from different hazard events. This information, in the case of much critical infrastructure is restricted due to security concerns. However, without this information interventions to reduce or avoid systemic risk are impossible[37].

From corrective and reactive to prospective risk management

Understanding risk as a social construct, opens the door to an increased emphasis on prospective risk management. In the case of the COVID-19 pandemic for example, this could involve increasing investment to strengthen public health services (including resilience measures that increase redundancy) and in improving the living and working conditions of those most exposed and vulnerable to future pathogens. Given that the social construction of risk is *systemic*, to strengthen risk governance in this way would not only reduce risks related to future pathogens, but to other hazard triggers as well.

The balance of risk management strategies needs to shift radically from an approach that relies almost exclusively on corrective and reactive approaches to one that gives greater priority to prospective approaches. The essence of prospective

risk management is to ensure 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. For this to happen, committed participation in decision making is required for all parties involved and potentially affected. Taking responsibility and accountability are critical elements.

Unlike, corrective or reactive approaches, prospective risk management, does not address identified or now manifest risk. It addresses and manages the underlying causes and risk drivers to limit and defuse the construction and accumulation of new risk. By doing so, it directly addresses the trade-offs between *privatizing gains* and *socializing risks* in a way that seeks to minimize the latter. **As such the core challenge of prospective risk management is fundamentally political and economic, rather than technical and administrative.** As Box 6 highlights in the case of Bangladesh, while corrective measures have been taken to address building safety and dangerous working conditions in the countries Ready Made Garment- RMG- industry, the country is failing to prospectively address the underlying drivers of risk in its cities, namely badly planned and managed urban development, that create these risks in the first place.

Box 6: Governing urban risks in Bangladesh

Past crises have been moments of institutional reflection and reform in Bangladesh. For example, the 1991 cyclone and floods brought about an institutional shift from response and relief[38] to an approach based on risk management and a convergence of disaster risk with climate change. The Comprehensive Disaster Management Programme, a collaborative initiative of the Government of Bangladesh and UNDP with the support of bilateral aid agencies, established a Disaster Management Policy framework, preparing the ground for the Disaster Management Act in 2012, National Plan for Disaster Management 2010-2015 (later succeeded by NDMP 2016-20), and related Standing Orders for Disasters (SODs – first issued in 1997, revised in 1999, 2010, and 2019).

However, many of these new mechanisms were based on practices and experience from rural Bangladesh, that did not necessarily adapt successfully in urban contexts. For instance, the SODs are highly dependent on local governments, which in urban areas are constrained by jurisdictional limits, and a lack of access to resources and capacities. The Cyclone Preparedness Program (CPP), that relies on trained local volunteers, did not adapt well to mobile urban populations, where people are harder to trace at the time of crises. The National Social Security Strategy still lacks a clear urban specific component for social protection.

Meanwhile, the number and density of urban population continues to grow and with that the concentration of urban risks. Urban development is heavily centralized in Dhaka, including national administration, strategic infrastructure including banking and cyber/information systems, and enterprises. Any impact on Dhaka, therefore, would impact the entire country immediately and acutely.

Risk is rarely managed prospectively using tools such as land-use planning. Building codes are well developed, but institutional responsibilities for enforcement are nebulous, leading to weak compliance and low uptake of safe building practices. In the case of large-scale critical infrastructure, such as the Chittagong Port, which accounts for 90% of national exports, lack of compliance with building codes generates systemic risk for all export industries and those who work in them. In addition, there is no licensing agency for engineers and technicians, reducing accountability and creating further disincentives for safe building.

In terms of corrective risk management, limited resources are available for infrastructure upgrading or maintenance. There is a strong culture of volunteerism in Bangladesh, and implicit risk governance approaches are practiced individually and collectively by communities, private sector and the civil society. But most of it is reactive or compensatory – not prospective or corrective.

These and other aspects of weak urban governance were root causes of the series of fire accidents in the Ready-Made Garment factories over 2012 and 2013, which highlighted to the world unsafe building practices and dangerous working conditions. To reduce reputational risk and to protect its macro- and micro-economy, a National Tripartite Plan of Action (NTPA) was agreed between the government, employers and workers in 2013, to improve fire safety conditions in the RMG industry in Bangladesh (Wadud, Huda, & Ahmed, 2014). Significant improvements were achieved subsequently across the industry, especially in terms of making the factory buildings green and safe (Berg, Chhaparia, Hedrich, & Magnus, 2021b).

However, these improvements remained limited to the buildings and assets (and diversification of the supply chain and markets). Less progress was made in reforming labor laws and strengthening worker protection. Informal work remains rampant, and few workers enjoy employment based social protections. While the factory owners are insured, labor remains vulnerable and without cover.

Bangladesh's broader philosophy of social spending can potentially strengthen the resilience of the most vulnerable. Budgets in areas like climate and women can potentially promote cross-sectoral integration. Crucially, however, improvements to building safety and social protection, while important, are only palliatives, while the underlying risk driver of badly planned and managed urban development remains unaddressed. Unless prospective risk management takes root in the development of Bangladesh's cities, new risks will continue to be generated and accumulated faster than existing risks can be reduced and corrected.

From protecting privatized gains to managing socialized risks

Finally, if it is to offer actionable entry points for LMIC governments, the governance of systemic risk needs to shift 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*. As highlighted in Chapter 1 the quotidian, regular, persistent, experience of systemic risk for most individuals, households, communities, and businesses is the interruption of essential services and supply chains due to the interruption of local infrastructure systems associated with extensive risk.

A strengthened governance framework, that enables building local and community-level resilience, ensures prospective management of extensive risk, and guarantees reliable essential services, supply chains and ecosystem services, will provide maximum traction towards the achievement of the 2030 Agenda for Sustainable Development. "Win-win", co-benefit and "triple, multiple or dividend" rewards can be found in actions taken to affect the above conditions no matter what the hazard trigger, particularly when the governance frameworks explicitly build on local capacities and implicit risk management strategies.

Investment in basic service provision and in the satisfaction of other basic development needs at the local level, plus 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. For example, governments and other institutions can play a key role by enabling (rather than limiting) people in building and accumulating more assets. Social protection policies can help protect vulnerable populations from adverse risks and against the erosion of existing assets, as well as create more opportunities for households to build and accumulate more marketable and non-marketable assets on their own (Moser, 2011; Moser & Dani, 2008; Solimano, 2006). Mechanisms for mutual insurance among and within communities, can strengthen resilience against negative shocks (Bazaz, Lwasa, & Jain, 2021).

At the same time, managing systemic risk at the local level has a profoundly global outlook. **Manifestations and materializations 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. For example, even when the underlying risk drivers may be more aggregated at the global scale (climate change, for example) and the consequences extra-territorial (power failures nationwide because of damage to a specific transmission line in a locality), **it is only at the territorial level that the interlinkages between different systems can be articulated and where risk management issues can be resolved.**

Addressing these manifestations prospectively, therefore, contributes to addressing risk in global systems. Unlike intensive risk, which may only be realized over long-return periods, of decades or even centuries, extensive risk provides almost real-time insight into the operation of the underlying risk drivers. And rapidly accumulating extensive risk, for example in the case of informal settlement around cities, is often the visible facet of increasing intensive risk that may only be realized decades later. What today may be idiosyncratic problems of surface water flooding due to lack of drainage, or landslides

where settlements scale steep and unstable slopes, also represent accumulating intensive risk, that may be realized, when a severe fifty-year storm event occurs. The small disasters of yesterday are often the large disasters of tomorrow. Few large-scale disasters have not been preceded by smaller manifestations in the past, early warnings that went unheeded.

To the extent that the social construction of systemic risk can be managed extensively, risk accumulation is gradually defused at more intensive levels. **Addressing the drivers of extensive risk, through strengthened territorial governance, is therefore an actionable entry point for addressing the accumulation of systemic risk at the national and global level,** with a stepped incremental approach that encompasses increasingly intensive risk layers.

Managing systemic risk in local infrastructure, ecosystems and supply chains should not be seen as the last mile but as the first mile to systemic risk governance, given its potential to address the Sustainable Development Goals and to maximize human development outcomes keeping planetary pressures into considerations (UNDP, 2020a).

3.2 In Search of a Political and Economic Imperative

While the contours of a more appropriate approach to the governance of systemic risk can be described, it is also necessary to identify actionable entry points for national and local governments, particularly in LMIC. At present, systemic risk is not on the agenda of most LMIC (many government authorities consulted during this project have expressed that the notion is not discussed or understood or, where so, the topic is considered to have always existed even if under different nomenclatures or guises), while governance frameworks are still challenged to address idiosyncratic or conventional risks.

As discussed in Chapter 2, risk governance in LMIC remains concentrated on managing risk to people or to assets. Risk identification and estimation is primarily focused on direct loss and damage to assets, infrastructure, lives, livelihoods rather than the ripple effects and secondary and indirect impacts that characterize systemic risk[39]. While some utility companies have begun to model system resilience and address it through regulation and standard operating procedures, in general, little attention is paid to the identification and estimation of systemic risk, particularly when the hazard trigger may have a long return period and be located in distant geographies.

As the COVID-19 pandemic has shown, most countries struggle to deal with new risks they have not addressed in the recent past. Even when similar events may have occurred elsewhere or a long time ago (for example, the Spanish Flu pandemic, historically, and the SARS, MERS and global influenza event of 2017, more recently) the social and economic context normally is completely different. Inertia and rigidity may mean that risk governance frameworks cannot evolve and adapt quickly enough to respond to new and emerging systemic risks (Nalau and Handmer, 2015). For example, as Box 7 highlights, while Colombia has a sophisticated institutional system for risk governance, it has struggled to address the massive migration from Venezuela since 2015, as the country had never had to deal with immigration on a large scale before, particularly concentrated on poorer, informal populations with high social service and livelihood needs and demands.

Box 7: Governance of massive immigration in a context of multi-dimensional risk in Colombia

Faced with multidimensional risk, associated with physical and environmental hazards, climate change, forced internal displacement and internal conflict, Colombia has, over the years, developed highly sophisticated governance arrangements. The 2011 national risk management law, that replaced the 1989 version, provides an iconic example of legislature, norms, and regulations in the disaster risk field. Nevertheless, policy and institutional silos still exist with respect to managing risks associated with disasters, displacement, conflict, and migration, that ultimately are interdependent.

However, no governance arrangements were in place to address the massive inflow of Venezuelan migrants that began in 2015. While the smaller migratory flows of, in general, more well off and educated Venezuelans since 2000 had been easily managed and absorbed using existing governance arrangements and where employment and investment opportunities existed, the country had no prior

experience in dealing with immigration of a predominantly poorer, less educated, and more informal segment of society on such a large scale. Colombia has always been an "exporter" of population as opposed to a destination.

Colombia, perhaps more than any other country, has, since the beginnings of the migrant process, welcomed and developed mechanisms to regularize and integrate the Venezuelans. However, this process has faced numerous challenges. Initially, the government believed that the stay of Venezuelans in the country would be short lived and not permanent. Consequently, short-term work, health and education permits were issued. Subsequently, these mechanisms evolved. In May 2021, an official Temporary Protection Statute and registration process was established for all informal and formal migrants and a 10-year permit is being granted to all Venezuelan migrants which will allow stability and security, enabling easier access to employment, health, and education.

How these governance challenges will be addressed in the future, given that Venezuelan's now co-exist with Colombians in the demand for social services, housing, income and employment, is uncertain, especially under COVID-19 and post COVID recovery. Given that the challenges vary from territory to territory, governance mechanisms require coordination between national, regional, and local authorities and between civil society and government. Such mechanisms are evolving, guided by an early 2017 CONPES on Venezuelan migration and the latest CONPES 4023, 2021, on the Colombian policy for reactivation after the COVID-19 pandemic, but in the context of a severe fiscal deficit and a low-level of international financial support. These governance schemes include various regionally based and international civil society organizations that act as interlocutors between migrant populations and government.

In this state of flux, learning from national experiences in dealing with internal displacement and experiences from other countries, is critical. Strengthened territorial governance is required given the demands placed on localities and cities for services, housing, employment, and incomes. Place based planning is essential to address the multiple demands and needs that must be satisfied to avoid migration generating other risks, in particular every-day risks of poor physical and psychological health, violence, addiction, and lack of educational opportunities, as well as spilling over into social conflict and xenophobia. Many of the underlying drivers that *systemically* construct risk in Colombia, such as social and economic inequality and access to land, have yet to be addressed comprehensively. The challenges associated with migration from Venezuela cannot therefore be addressed as a stand-alone problem but only through a broader effort to address the underlying social construction of risk.

Similarly, **risk that accumulates gradually over time, and expressed in small scale loss and damage is generally ignored until the system reaches a tipping point when the consequences seem too overwhelming to address** (Nalau and Handmer, 2015; Renn et al., 2020; Nauser, 2015). This undermines the political will to address the risks related to drivers such as biodiversity loss and climate change through prospective risk management strategies.

Most risk governance frameworks still rely heavily on siloed institutional and legal frameworks to address risk in each sector, and which are not conducive to the analysis of systems that cut across sectors. Even OECD countries struggle to manage risks across administrative and territorial borders (OECD, 2018). Financial risk is managed through regulators of banking and insurance, biological risk through the public health systems and climate risk, through the environment sector, conflict risk is normally firewalled within the state security and defense sectors. For example, as Box 8 takes the case of Uzbekistan and shows how Central Asian countries are faced with the dual crisis of the Aral Sea, and with that in mobilizing resources to address not just the realized losses, but more critically, the underlying drivers that have created these conditions.

Box 8: Uzbekistan and the challenge of governing transboundary risk

Amu Darya and Syr Darya flow through several Central Asian countries before reaching Uzbekistan and the Aral Sea. Historically, the water distribution between these regions prioritized human needs, and only what was left unused, was left for the environment. In reality, limited water reached the Aral Sea, meaning that "*the tragedy was not that water disappeared, but that it disappeared very quickly, and people nor government could adapt to that change quickly enough*".

After becoming independent, the Ministers of Water Resources of Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, and Kyrgyzstan signed an Agreement on September 12, 1992, declaring a joint management system for the water resources in accordance with principles of equality and mutual benefit, taking into account the interests of all states in the region. From 1992 to 1994, the International Fund to Save the Aral Sea (IFAS) with headquarters situated in Almaty and the Interstate Council for the Aral Sea Basin

(ICAB) with its Executive Committee chaired by the Minister of Water Economy of Turkmenistan and its headquarters in Tashkent city, were established as intergovernmental organizations to manage this process. The main role of the IFAS was to raise and accumulate funds, while the ICAB was to prepare and implement the Aral Sea Basin Program (ASBP) (MFA Turkeminstan, 2021).

But most of these institutions predominantly focused on responding to the crisis at hand by investing in adaptation approaches largely with a sectoral view, rather than a long-term view of climate mitigation. For example, while the dominant reasons for water shortage are in the upstream, the Ministry of Emergency Situations in collaboration with the State Committee on Ecology and Environmental Protection, which is mainly responsible to implement its national environmental strategy, have been planting trees and cultivating 1.2 hectares of the affected area (also creating local employment). There are some interstate and inter-ministerial working groups at the Deputy Prime Minister level to monitor the development and progress across sectors. With these broadly corrective and reactive approaches, Uzbekistan has managed to reduce the use of water in agriculture and water intensive cotton cultivation by more than twofold, offering some prospective risk management co-benefits.

Meanwhile many of the risk drivers require cross-boundary cooperation, and to address them also requires substantial funding. However, it is increasingly difficult to attract funding for what is perceived to be an environmental disaster, even from development banks. This motivated the creation of the Aral Sea Region of Innovation and Technology, which through adaptation pilots attracted some private investment. The Green Climate Fund, UN agencies and IFIs also invested, and a series of donor conferences were held between 2008 and 2018, with mixed results. At the last conference in 2019, the Aral Sea Development Concept was presented and well received by the wider public and international donor community.

Subsequently, in 2018, the Multi-Partner Human Security Trust Fund (MPHSTF) was established by Uzbekistan under the auspices of the United Nations (UN), as a national pooled financing mechanism for a unified Programmatic Framework. This Framework was developed combining national and local priorities, on the basis of a detailed Needs Assessment Survey. MPHSTF was conceptualized following the Busan development effectiveness principles of local ownership, a result-oriented focus, partnerships, and transparency. Its Steering Committee is co-chaired by a High-level government representative, apart from the UN Resident Coordinator, and has representation from the key national ministries as well as the local government of Karakalpakstan (UNDP, 2021).

It aims to pursue an outcome-based approach, which would use multi-sectoral investments to be realized. These outcomes include: (1) Reduce the stress on local communities due to the deteriorating environmental situation; (2) Increase the employment and income generation opportunities for local communities; (3) Secure access to affordable and healthy food and clean drinking water for the local communities; (4) Improve the overall health of the local population and promote healthy lifestyle; and (5) Improve the living conditions of local populations, with particular focus on vulnerable groups such as women, children and youth. The interventions developed are aimed to be comprehensive, people-centered, context-specific and prevention oriented.

It is a single platform for all funding and aid, eliminating the need for donors to go to separate ministries and offers an open platform for monitoring area and sector-wise investment, results, and shortfalls. The pool funding can both be earmarked or unearmarked to particular objectives and offers flexibility to receive any amounts (big or small). This offers greater flexibility in terms of how the funds can be used – for addressing immediate needs, or for cross-sectoral underlying drivers. This open and transparent financial decision-making mechanism has attracted political will and government support, as it reduces administrative costs, attracts more funds, and provides sufficient flexibility for its uses.

At present, the MPHSTF focuses only on the Karakalpakstan region, and not the upstream areas, however as it grows in scale and scope, it may expand to other regions but still only within Uzbekistan. In addition, it is facing challenges pertaining to granular data that can be used for modelling future projections and anticipating risks in advance to inform prospective risk management approaches. Normally LMIC governments are too preoccupied with short term politically sensitive challenges at the national and local level to dedicate time and resources to address new and difficult to measure *systemic* risks. Space

and redundancy rarely exist in national institutions to allow for the flexibility, small-scale experiments and failures, innovation, and learning, that would be required to address systemic risk.

The ongoing COVID-19 pandemic is leading to reduced capacities for public investment and significant setbacks to the achievement of the SDGs. The fact that these social and economic setbacks are often occurring in contexts that are also stressed by geopolitical and climate risks, may lead to stressed governance in a number of countries (UN, 2020).

At the same time, however, the COVID-19 pandemic is also unfolding in a period of rapid transformation in the way energy is produced and used in the global economy. Together with this transformation, the experience of the pandemic itself and the changes it has provoked, for example in travel and work, may create space for a paradigm shift in the way risk is understood and governed and may help to identify a political and economic imperative for the governance of systemic risk, in a way that provides actionable entry points to national and local governments in LMIC.

Globally, concern with the risks posed by climate change is generating growing momentum to reallocate capital from fossil-fuel intensive industries towards sectors, such as renewable energy generation, electric transport, and green building, that explicitly address climate change. This momentum is being driven by a mutually supportive array of factors, including strengthened regulation, disclosure, and reporting[40], international advocacy, civil society movements, global agreements, target setting, rapid technological innovation, financing, and the threat of litigation.

Certification mechanisms, supported by new standards, in sectors such as sustainable forestry, fishing and green building are helping to change consumer and market priorities. Global initiatives[41] that bring together governments, the financial sector and other stakeholders are encouraging disinvestment from industries contributing to greenhouse gas emissions and are promoting risk-informed investment in infrastructure and in other sectors.

These global efforts are prospective risk management strategies given that by aiming to curb global warming, protect biodiversity and make more efficient use of resources such as water, they aim to avoid the construction of new risk. The call for Green Recovery post COVID19 constitutes in many ways a continuity of change now underway in many places and which can be fortified under existing conditions and the consciousness that exists as to the dangers of the route being taken development wise.

At the national level, some LMIC have attempted to introduce norms and procedures to identify and estimate risk in the planning and evaluation of public investment[42]. Others have developed new mechanisms to improve the availability of risk information or to strengthen accountability[43]. Up to now these initiatives are isolated, incipient and have produced mixed results in the face of strong political counter currents. Nor do they, in general, explicitly address systemic risk. However, they highlight a growing perception in many countries that existing frameworks for risk governance are not effective and that a new approach is required. It is significant that many of these mechanisms have emerged from mainstream development sectors, such as finance and planning ministries, rather than from specialized risk governance organizations. This is maybe indicative that risk although increasingly dealt with as an autonomous and exotic issue, is in fact a generic characteristic of social and economic choices.

The transition to low-carbon and resilient economies may help to generate an up-to-now elusive political and economic imperative for prospective risk management. As global capital actively seeks out opportunities to invest in new sectors such a green infrastructure or renewable energy in LMIC, there is at the same time, a growing awareness of risk and the need to strengthen resilience. Global indexes and ratings, which influence investor decisions, increasingly consider disaster, climate and conflict risk, indicators on the reliability of infrastructure, as well as more traditional considerations, such as market stability, labor costs and tax breaks.

There is thus a newly favorable political and economic imperative for national governments to strengthen prospective risk management. To the extent that countries can demonstrate strengthened governance to manage risk

and to ensure resilience and sustainability, this will strengthen their competitivity and their capacity to attract capital and investment. Countries that are able to demonstrate sound risk governance and which can offer more reliable and safe infrastructure systems are now likely to be more competitive in attracting new investment (see for example UNISDR, 2013; INFORM, 2019; World Risk Reports 2019, 2018, 2014), may have more attractive credit ratings and have greater access to appropriately priced risk financing. Given that attracting new investment will be a major political and economic priority for governments facing the economic consequences of the COVID-19, the pandemic may have provided an incentive to invest in strengthened systemic risk governance.

3.3 Elements for an Actionable Approach to the Governance of Systemic Risk

National policies, strategies, and plans

If governments identify a clear political and economic imperative to address systemic risk, a first element in a governance framework is the formulation of national sustainable development plans, policies, or strategies that integrate risk reduction and resilience building, and that clearly reflect an understanding of systemic risk as a social construct and the primordial importance of prospective risk management. As highlighted in Box 9, for example, Dominica aims to become the world's first climate resilient country.

Box 9: Dominica on the search to become the world's first climate resilient country

A parliamentary government, decentralized service provision, a small-island interrelated economy and society, strong social capital based on a history of collaboration and oneness, remittances from the diaspora, a foreigner investment program and international technical and financial assistance are all elements that configure the background for systemic risk management in Dominica.

Prior to the devastating impact of Hurricane Maria in 2017, Dominica's approach to disaster risk management, based on disaster preparedness and response, had changed little over the years despite repeated disasters. Low priority was given to prospective risk management, for example using land-use planning and building control to avoid the construction of risk in new social and economic infrastructure, housing, and business in general. The experience of Maria, however, following quickly on hurricane Erika in 2015, together with an increasing concern with climate change, opened a window of opportunity for a change of policy, leading the government to commit to transforming the island into the first climate resilient country in the world.

The Prime Minister in his address at the CARICOM-UNDP Conference in New York on 21st November,2017, post Maria stated: *"The unprecedented challenge we face has led us to take the unprecedented decision to build an execution agency outside of our standard public service systems. We are calling it CREAD- Climate Resilience Execution Agency of Dominica. The mission of the agency will be to coordinate all reconstruction work to avoid duplication, maximize economies of scale, spot and fill critical gaps, avoid bureaucratic infighting and ensure all reconstruction activities are focused on a single Climate Resilient Recovery Plan developed by Dominica and its partners"*. Reconstruction and green and blue recovery from Maria, became the corner stone in the search for a new resilient development paradigm.

The establishment of CREAD was accompanied by the adoption in 2018 of a National Resilient Development Strategy (NRDS) and in 2020 of the Dominica Climate Resilience and Recovery Plan 2020-2030, as well as a new environmental law. These plans and strategies built on Dominica's 2012 National Climate Change Adaptation Policy and the Low Carbon Climate Resilience Development Strategy. They integrated climate resilience and disaster risk management into the national growth and development planning framework, as presented in the four editions of the Growth and Social Protection Strategies (GSPS), produced between 2002 and 2014.

The NRDS explicitly incorporated the notion that systemic risk is socially constructed by stating that *"government is aware that climate change will affect many different economic sectors both directly and indirectly, and the characteristics of our social and economic systems will play an important role in determining their resilience, amidst other development challenges. Therefore, addressing climate impacts in isolation is unlikely to achieve the desired equitable, efficient or effective outcomes of small island developing states such as Dominica"*.

The NRDS stipulates that, at the highest level, the Climate Resilience and Recovery Plan (CRRP) should reflect three pillars of resilience, namely: (1) Climate Resilient Systems, (2) Prudent Disaster Risk Management Systems, and (3) Effective Disaster Response and Recovery" The CRRP expands these three pillars into six results areas for a climate-resilient Dominica, namely: strong communities, robust economy, well-planned and durable infrastructure, enhanced collective consciousness, strengthened institutional systems and protected and sustainably leveraged natural and other unique assets. Based on these six (6) results areas, the Government of Dominica is committed to achieving 20 Climate Resilience Targets by 2030.

The impact of Maria, following on the experience of Hurricane Erika and the global financial crisis clearly opened a policy window for a new approach to managing systemic risk in Dominica. CREAD, under the authority of the Prime Minister's Office, has a cross sector and territorial mandate and works closely with the planning and finance authorities, highlights an approach to leveraging recovery and reconstruction in a way that strengthens the governance of systemic risk, that could provide an example for other small countries.

In organizational and administrative terms this does not require the creation of a new *general directorate of systemic risk* or similar (which, on the contrary, would be an indicator that the social construction of risk has not been understood or internalized). The adoption of national plans, policies, or strategies that feature risk reduction and prevention and resilience building objectives would need to be adopted as an *all of government* approach that requires sectors to responsibly fulfil their mandate and functions. For example, it would require the health sector to invest to ensure accessible, resistant and resilient public health services and the transport sector to build resilient roads and bridges and strengthen capacities for operation and maintenance in a way that local infrastructure systems can provide essential services to individuals, households, communities and businesses. This is commensurate with the idea of risk management as something in the DNA of sectors and that defines them in programming and planning terms. Risk control and prevention should be part of the normal, ongoing, obligatory concerns and functions of institutions and professionals, not something that has to be sold to them as a concern or add-on under the dictates of others.

Legal instruments and norms would need to be put in place to ensure that the planning and evaluation of public investment, in all sectors, is risk informed, with the objective of achieving resistant and resilient infrastructure, including social infrastructure such as public health services.

The experience of national risk management systems to date, as discussed in Chapter 2, highlights that for this approach to work, responsibility for ensuring that such national policies, strategies and plans are formulated, adopted and implemented needs to be vested at the highest level of government, either in the cabinet office or similar or else in a central ministry such as finance and planning. This can be justified amongst other things given the argument that risk (the combination of everyday, conventional and systemic risk and their extensive and intensive manifestations) and eventual loss and damage are clear indications, perhaps the clearest of all, of overall lack of efficacy, efficiency and equality of the development pathways being pursued.

At the same time, in order to be effective, national policies, strategies and plans should include clear and measurable resilience targets. For example, countries could set quantitative targets in the context of the Global Targets and Indicators adopted as part of the Sendai Framework for Disaster Risk Reduction, for example to reduce their Average Annual Loss (AAL) as a proportion of Gross Domestic Product- GDP- by a few percentage points over the next ten-years. Target setting can provide focus for efforts to manage risk and strengthen resilience across all sectors and can allow results to be clearly identified and monitored.

Risk identification and estimation

The second element in the governance framework would be strengthened capacities for risk identification and estimation. In most countries, risk data is dispersed in multiple institutions and organizations, making it challenging for other sectors of

government to have access to the risk information they require, for example to inform prospective risk management: for example, land-use planning, standards for infrastructure, risk informed public investment etc.

Examples do exist of countries that have consolidated data and information in a single framework. The National System for Territorial Studies (SNET) in El Salvador when created in the early 1990s was one such example. The proposed National Information system for Disaster Risk Management (SINIGERD) in Peru and the UK's National Risk Register are other examples[44]. While still imperfect, such examples, show that it is possible to consolidate hydrological, geological, meteorological, environmental, social, and economic data in a single framework.

At another level it is well known that much information managed by the private sector is considered strategic and private and is not easily available to planning and governance organizations.

Probabilistic calculations on asset risk and the production of risk metrics such as Average Annual Loss (AAL) and Probable Maximum Loss (PML) should be a core function of national information systems. Few countries have national level, multi-hazard probabilistic risk assessments, and cases where these have been fully institutionalized are rarer still.

As already discussed above, risk information systems, should enable countries to identify the different risk factors and underlying drivers, and thus generate a greater understanding of how risk is *systemically* constructed in the face of a wide variety of hazard triggers, from pathogens to hurricanes and from earthquakes to conflict. While regular horizon scanning for early signs and future casting[45], to identify potential or imminent triggering events, is important, the function of a national risk information system should be to monitor the evolution of risk, the hazard, exposure and vulnerability factors and underlying drivers that configure systemic risk. In other words, for example, while timely identification of a new pathogen is important and useful, the risk information system should be able to identify areas with deficient public health coverage in the face of any pathogen that could emerge.

By clearly identifying risk patterns and trends, such a risk information system would underpin both national policy and strategy formulation and target setting, as well as specific sector-based norms and standards.

In order to address systemic risk, the risk information system would require additional layers of analysis to measure for example, the resilience of infrastructure networks and to be able to estimate indirect impacts and wider effects. Given the importance of extensive risk with respect to systemic risk at the local level, a core function of the information system would be to monitor local loss and damage patterns to identify and estimate patterns of extensive risk.

The application of methodologies such as Forensic Investigations of Disasters (FORIN) to investigate risk causality should also be formalized in order to identify the policy changes required to address specific underlying risk drivers (Oliver-Smith, Alcántara-Ayala, Burton, & Lavell, 2016). For example, a FORIN of the COVID-19 pandemic would likely highlight a historical underinvestment in public healthcare services and unequal access to these as an underlying risk driver that would need to be addressed. Locally organized participatory methods that include intermunicipal and civil society should be promoted to gain greater knowledge and understanding and awareness at local levels of the interdependencies that exist and the need for cooperation across sectors and territories at the local and subnational level.

Strengthened accountability and compliance

National level prospective and resilience policies, strategies, plans and targets are unlikely to generate their expected outcomes, unless they are backed up by greatly strengthened mechanisms for compliance and accountability.

These mechanisms may range from clearly defined and applied sanctions for activities and behavior that *socialize risk*[46], through to periodic reviews of progress by parliament or by the offices of national controllers. Examples include the role of the National Controller's Office in Colombia in undertaking periodic reviews of the implementation of national policies on disaster risk management and climate change adaptation, through to the review of White Papers on risk management, which

are produced by the Cabinet Office of Japan for debate and review by Parliament. The creation of a risk ombudsman to attribute responsibility and liability for risk transfer is another potential mechanism that could be discussed.

Transparency portals, which enable the public to review all proposed public and private investment projects, for example, and the use of social media to identify potential transgressions are all examples of mechanisms that can be explored.

Financial mechanisms and incentives

A national framework for the governance of systemic risk would also need to include financial mechanisms to encourage the allocation of capital to investments that reduce risk and strengthen resilience.

This could include a more intensive use of ESG (Environmental, Social and Governance) rankings in company reporting, the development of certification mechanisms (analogous to the LEED rating system for green building) to strengthen resilience standards in infrastructure or the development of new asset classes (for example a resilient infrastructure asset class) into which investment could flow.

To the extent that international rating agencies and indexes are now increasingly including risks associated with physical hazards, climate change and conflict into their overall country risk assessments the implementation of resistance and resilience standards backed up in independent certification could enable countries to compete more effectively for foreign direct investment (FDI) and to obtain more positive credit ratings.

At the same time, standards and certification may provide a vehicle for reducing the cost of risk financing. This could greatly increase the availability of affordable risk financing in LMIC.

Impact based early warning systems

An improved understanding, identification and estimation of risk can also underpin the development of a new generation of more effective early warning systems: systems that not only warn of an impending hazard, but those that monitor key exposure and vulnerability indicators enabling real-time calculation of the potential loss and impacts, informing early action in the form of preparedness and reduction activities to be implemented in order to reduce risks.

Impact based early warning systems use hazard data and forecasts, for example of upcoming dry or wet climate episodes, to assess likely impacts in sectors such as water and agriculture. Based on these impact-based forecasts, decision makers can then adjust the timing of planting or cropping, recommend alternative crops or take decisions on water storage and use, in a way that minimizes risks ahead of the episode.

For example, in Sri Lanka, a forecast for below annual rainfall between November 2017 and January 2018, allowed water management measures to be anticipated that enabled 100% of potable water requirement, 85% of irrigation water requirement for agriculture, and sufficient water for environment, wildlife, and inland agriculture to be guaranteed in most Districts. Similarly, it informed a decision to boost thermal power generation in this period to compensate for declining hydropower generation. Impact based forecasting therefore not only protects livelihoods but can minimize systemic impacts on productivity and welfare[47.]

Strengthening territorial governance

None of the governance enhancements described at the national level will have a significant impact unless territorial governance is strengthened at the local and sub-national levels. As already discussed in Chapter 2, weak territorial governance has historically led to the failure of many national risk management strategies, plans and policies. While national governments have normative responsibilities, these are unlikely to lead to implementation on the ground unless backed up by well-resourced territorial governments with the necessary capacities.

Strengthening territorial governance at the local level is critical to the prospective and corrective management of extensive risk. In turn, addressing extensive risk is essential to reduce systemic risk in local infrastructure systems, supply chains and ecosystem services. As highlighted throughout this document, strengthening the resilience of local infrastructure systems, ecosystems, and supply chains in the face of extensive risk, or better still, avoiding risk in the first place, is the area where the governance of systemic risk can achieve greatest traction in the achievement of the 2030 Agenda for Sustainable Development.

Strengthened territorial governance will be most effective when it is supportive of community initiative and builds on the implicit governance of risk, that characterize most localities. By doing so and through guaranteeing reliable services that meet basic needs governments will also create a strong political imperative to manage and avoid risk and strengthen resilience. As Box 5 highlights in the case of Zimbabwe, it is difficult, if not impossible to address systemic risks such as food insecurity, without strengthened territorial governance at the local level, building on community initiative and participation.

Box10: Implicit risk governance in Zimbabwe

Food insecurity as a function of availability, accessibility, and utilization is caused by a variety of factors. In Zimbabwe, production has not increased substantially, for instance, due to widespread landlessness and dependence on traditional rain-fed agricultural practices affected by changing climate. Food insecurity is common after floods or droughts. However, even after bumper harvests, multiple pricing systems drive farmers to sell at low prices disincentivizing food production even in productive areas. Accessibility to markets is impacted by poor transport and road infrastructure. However, risk management responses have largely focused on food provision or grants, rather than addressing some of these underlying drivers.

While there is an active civil society and a strong presence of international development agencies, these tend to pursue a 'project' based approach led by donors. Once the project is over, it is rare that the local organizations and communities can sustain the momentum or the outcomes. In addition, most funding sources are specifically earmarked for 'food-related' activities, making it difficult for institutions to employ the funds to address the underlying risk drivers, for example, rebuilding roads. There is also a strong push towards technology centric approaches, which have limited uptake at community-levels.

After experiencing years of food insecurity, some asset accumulation approaches were employed by the state, although they are yet to fully achieve their set-out objectives. Both for moral and economic reasons, the government introduced the Land Reform and Redistribution Programmes (LRRP) starting in the 1980s. Under this, families were either provided small plots of around 6–7 hectares to cultivate (along with some grazing land as shared commons), or as collective co-operatives. While the purpose of this resettlement program was to alleviate land poverty, it was also designed to ensure that aggregate food production would improve (Thomas, 2003). However, it was heavily regulated in terms of what could be produced and by what methods, which resulted in these becoming mere homesteads for household level subsistence during crisis, rather than as productive assets which generate economic benefits.

At the same time, land distribution is inequitable, with ownership structures permeated by ethnic and racial factors. Large land holders include multinational firms and large domestic conglomerates which, specializing in mainly non-agricultural activities, have few incentives to mobilize resources to ensure the optimal use of land and natural resources. Land redistribution, therefore, has not helped Zimbabwe to realize its agricultural potential and maximize food production. Similarly, input support schemes or the provision of direct assets for those living in poor agro-ecological zones were proposed to address income inequality. However, these did not create incentives for people to invest their own resources, questioning the schemes' long-term sustainability and scalar impact. Instead, there is a critical need felt to invest in extension services at the local level, such as markets, healthcare facilities and schools, that can create conditions for people to build more assets on their own and invest in their own development.

The Civil Protection Act of 1989 was established to safeguard the people of Zimbabwe from risks associated with hydro-metrological, biological, and technological hazards (Mavhura, 2016). It provided the regulatory backdrop for risk management in Zimbabwe at the national, state, and district levels, and established a National Civil Protection Fund to support these activities (*Civil Protection Act Zimbabwe*, n.d.). However, the Act is seen to have fallen short in providing an all-encompassing governance mechanism for risk management and strengthening resilience. The limited funds available are used almost exclusively for reactive risk management. Power and resources remain centralized (Mavhura, 2016), and while local level councilors can request context specific funds, these

require ministerial approval, meaning that they are only considered in the context of broader political priorities. For the Civil Protection Act to function effectively, governance, power and resource distribution would need to be decentralized, active community engagement encouraged and the guidelines for fund allocation at both national and local levels reappraised (Mavhura, 2016).

Meanwhile, it is women, children and the poor, especially in the rural and resettlement areas that have the least ability to cope or respond to the risk of food insecurity and its systemic impacts. The country lacks a broader social protection policy framework to assist those in urgent need and provide impetus to those with some capacities to become more self-sustaining. Traditional forms of implicit risk governance, such as "Zunde raMambo" (King's granary), existed, where communities collected resources in a common pool, and distributed them amongst everyone, especially to the most vulnerable, during the times of crises. Designated areas and pastures were kept protected, and local knowledge and tools were shared amongst community members. However, the practice has been largely abandoned over the years, as community structures and capacities of different households has distorted with increase in poverty, migration and greater dependence on remittances. But most critically, as the ownership of these Zunde raMambos shifted from communities to centralized top-down control by the government, it dissuaded local ownership and participation and eroded people's agency in resilience building (Ringson, 2017).

Over the years, rural women's groups have emerged, to collectively strengthen income self-reliance and reduce conflict (Nyathi, 2016). A number of civil society organizations work to build resilience within rural communities. For example, the Zimbabwe Development Democracy Trust (ZDDT) conducts capacity building and agro-business training programmes, to empower local people through self-help investments (Tuso, 2014). However, although high-density urban areas remained relatively neglected in these programmes.

3.4 UNDP Support for the Governance of Systemic Risk

To move towards such a new framework for the governance of systemic risk, based on an understanding of its social construction and the importance of prospective risk management will require substantive support and technical advice from international organizations like UNDP. For example, while, in the aftermath of the COVID-19 pandemic many countries are questioning their existing development pathways and the effectiveness of their governance mechanisms, considerations on risk in general, and systemic risk in particular may be absent from the debate.

As has been emphasized throughout this document, systemic risk manifests at different temporal and spatial scales, levels of complexity and is triggered by single, multiple or compound hazards. However, because it is the process of its social construction that is *systemic* and not just the cascading impacts in different systems, systemic risk manifests considerable self-similarity irrespective of the nature of each individual hazard trigger. In other words, as described in Chapter 1 the same individuals, households, communities, and businesses tend to be *screwed by the system*, irrespective of whether they are faced with a pathogen, a conflict or flood.

If systemic risk is understood in this way, a hazard driven approach is inappropriate to assist countries to strengthen their governance of risk. Countries need to strengthen their governance frameworks in a way that manages their exposure and vulnerability, reduces their risk, and strengthens their resilience in the face of different kinds and typologies of hazard. As described above, the governance of systemic risk is essentially a bet on real, inclusive, just, and equitable development.

From the perspective of UNDP, therefore, the governance of systemic risk, should be not considered as a new and specialized sub-area of risk governance, but rather as a characteristic of strengthened and enhanced governance designed to reduce and avoid risk and enhance resilience and sustainability at the national and local levels. Risk governance and systemic risk governance should be considered as attributes of strengthened national and local governance, rather than as specialized sectors.

This implies that increased support for strong territorial governance and place based integral actions in its programme countries, could become a vehicle through which UNDP addresses the management and reduction of systemic risk.

Experiences in *area-based development*, provide a foundation on which the governance of systemic risk can be built. As an example of actionable opportunities, UNDP could prioritize programs to address the deficit of climate and disaster resistant and resilient local infrastructure systems in LMIC in a way that maximizes traction towards the achievement of the SDG while at the same time defusing the accumulation of systemic risk.

The challenge for UNDP is that its existing Global Practices are largely organized around specific expressions of hazard and risk, for example disaster risk management, climate change adaptation and conflict prevention, none of which can address risk in a more holistic way, even though each may think and understand risk in holistic ways. To conclude, therefore, UNDP should approach the governance of systemic risk, not from a hazard specific practice, but from an integrated approach to strengthened national and local governance. A cross-cutting approach is required that could and should be central to the new Strategic Plan of the organization.

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ENDNOTES

[1] By "condenses" we wish to express the way that risk, realized or 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.

[2] 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.

[3] 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.

[4] For example, the Pandemic Playbook at the White House that was created under the Obama Administration, well before the 2020 global pandemic, however, dismantled by the successive government.

[5] Extensive risk manifests as frequently occurring, low severity loss while intensive risk manifests as infrequent but severe loss. See UN Terminology on Disaster Risk Reduction, 2017 for definitions (UNISDR, 2017).

[6] https://time.com/5460027/worst-year-history/ accessed on 20 Feb 2021.

[7] 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, i.e., more intensive interaction across wider space and in shorter time than before,

[8] See for example "systemic risk" on https://agris.fao.org/

[9] The term "governance of systemic risk or systemic risk governance", as is also the case with risk governance in general, may not be the most appropriate or comprehensive term. As risk must exist if it is to be governed, the term suggests governance for existing risk, as opposed to governance in favor of sustainability and resilience that could avoid the construction, or support the reduction of risk, in the first place. Shorthand nomenclatures for key concepts do not always allow an accurate understanding of their real meaning. In this case governance for response to, reduction and prevention of systemic risk would be a more accurate and fuller description. The significance of such unintentional short-hand inaccuracies or distractions can be seen in cases such as that of "natural disasters" where many lay persons and even students of risk will in fact be guided by the suggestion as to the naturalness of disaster, while others will interpret the term less literally as referring to disasters that have a significant natural component or are triggered by natural events.

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

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

[12] UNDP in the Europe and the Commonwealth of Independent States (ECIS) conducted a study on the role of NDMAs in COVID. One of the outcomes of this study is that the systemic nature of the risk is articulated in the COVID times by transferring additional capacities to COVID response, therefore, reducing the capacities directed to the risks associated for example with natural hazards, and therefore, reducing the provision of public services in this domain and increasing the risk.

[13] Green recovery refers to the promotion of a basis for development in carbon low or free economies and through other environmentally friendly approaches that guarantee sustainability in the long term. Transformational development refers to development based on more sustainable, just and equitable principles, and which will require an important change in values and paradigms for action. The new normal is a post impact nomenclature referring to the fact that a return to the prior type of economic functioning and social wealth distribution processes, with their negative impacts on a good part of society, must be avoided and new conditions of existence and interrelationship forged. The crisis becomes an opportunity for change.

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

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

[16] 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 debate on the ripple effects was the basis of

the discussion started 40 years ago on disasters and development, but this has not been taken up on or resolved satisfactorily even to date.

[17] 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.

[18] See Von Humboldt, Alexander, 1807, Views of Nature. Recently republished by University of Chicago Press in 2016.

[19] Largest as measured by the diameter of the hurricane

[20] 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.

[21] https://www.sciencemag.org/news/2021/06/rise-and-fall-world-s-largest-lake?utm_source=Nature+Briefing&utm_campaign=6b35e184ca-briefing-dy-20210607&utm_medium=email&utm_term=0_c9dfd39373-6b35e184ca-45089938

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

[23] Changes in the frequency of hazard recognizes that some hazards may become less frequent.

[24] This implies that the primary function of the infrastructure is to sustain economic growth and not necessarily societal welfare.

[25] 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 centers.

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

[27] 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.

[28] 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.

[29] Also referred to as chronic or quotidian risk

[30] 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) and 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). This idea 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.

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

[32] The Economist, 17th February, 2021

[33] See UNISDR GAR15 (2015a) for a broad review of the challenges faced at the end of the Hyogo Framework for Action.

[34] 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.

[35] See for example CCRIF, ARC and PCRIC to provide sovereign parametric insurance to developing countries, in particular countries with small and vulnerable economies.

[36] For example, the United Nations now puts increasing emphasis on the promotion of "preventative strategies" which can be understood as a shift towards prospective risk management.

[37] With regards to flow information, it is important to note that detailed studies do exist related to economic, environmental, service access and other flows between different spatial units as a basis for planning in metropolitan areas and elsewhere, however, often these

do not consider the possible impacts by hazard events. They are risk agnostic. One good example of this is the excellent and well-developed analysis of flows between municipal units in the Bogota metropolis, developed with support from the IDB but with no mention of the possible interruptions to such flows when disaster occurs. (López G.; Ramiro, R.; Mauricini, J; Rojas, F.; Salazar Echavarría, C.; Bateman, 2018)

[38] The Cyclone Preparedness Programme (CPP), a globally renowned volunteer organization of Bangladesh, was established in 1972 after the devastating Bhola cyclone combining volunteerism and communication technology. CPP was the lead organization dealing with disaster response prior to 1991.

[39] www.desinventar.net indicates that only a small number of national disaster loss and damage databases are up to date

[40] For example, the introduction of Environmental, Social and Governance (ESG) scores enables the identification of investment risks.

[41] See for example, the Coalition for Disaster Resilient Infrastructure (CDRI) and the Coalition for Climate Resilient Investment (CCRI) and the Task Force for Climate-related Financial Disclosures (TFCD)

[42] For example, in Peru and later in Costa Rica, Guatemala and Panama following and modifying the Peruvian example, promoted initially with GIZ German support. Within this context calls have been made for analysis based on infrastructural systems as opposed to point analysis of individual assets.

[43] Initiatives that can be mentioned include the National System for Territorial Studies (SNET) in El Salvador, audits of disaster risk management and climate change adaptation by the National Controllers Office in Colombia

[44] https://www.gov.uk/government/publications/national-risk-register-2020

[45] For example, the Pandemic Playbook at the White House that was created under the Obama Administration, well before the 2020 global pandemic, however, dismantled by the successive government.

[46] The effectiveness of legal sanctions is questionable in many LMIC contexts, which then undermines the usefulness of regulation as a risk management strategy.

[47] Progress report from UNESCAP Tsunami Trust Fund. https://www.unescap.org/sites/default/files/TTF-27-RIMES-Progress-Report-Jan-Jun-2018.pdf

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