# Aff Card Doc

## Democracy!

### Democracy Solves---1AR

#### Democracies are comparatively better at solving warming.

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Conversely, more democratic economies push for higher societal consumption. This results in smaller extractions from the society and lower deadweight losses. Therefore, democratic regimes possess more resources that are used for investment. This logic concerns both the emission-heavy investment and investment in renewables: compared to autocracies, democracies would invest more in both capital types. Considering the ratio of emissions to output, however, higher levels of democracy are characterised by a less emission-intensive production.

We also analyse the impact of democracy and climate shocks. Considering the former, a positive regime shock contributes to more emissions. However, the associated increase in brown investment is smaller than the increase in green investment. Thus, democratisation stimulates a slightly greener capital mix. Regarding the climate shock, we find that democratic economies are better equipped to limiting emissions (although, cumulatively, they still emit more). Specifically, they decrease brown investment to levels comparable with autocracies and increase investment in renewables significantly more. Therefore, democracies maintain higher economic growth while featuring a greener capital mix in the long run.

Lastly, we show that timing is essential to the effectiveness of limiting emissions. If policymakers are aware of more significant climate consequences early on, it becomes clear that democracies produce fewer cumulative emissions by switching to renewables more swiftly. Overall, because autocracies are inefficient in the deadweight loss sense, such governments prefer more productive (i.e. brown) investment. Moreover, democratic policymakers - by caring about their citizens’ future consumption - internalise prospective climate damages to a greater extent.

#### And, the stronger U.S. authoritarianism is, the more it spreads globally. If unmitigated, that sparks a global polycrisis culminating in extinction.

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Thomas Homer-Dixon, Luke Kemp, Michael Lawrence, and Megan Shipman, “How Donald Trump’s Reelection Could Amplify Global Inter-systemic Risk,” Cascade Institute, 10-03-2024, https://cascadeinstitute.org/wp-content/uploads/2024/10/Impact-2024-How-Donald-Trumps-Reelection-Could-Amplify-Inter-systemic-Risk-2.pdf

Expanded authoritarian practices at home (FL2) would likely bolster authoritarian governance elsewhere (FL3). Foreign authoritarianism could then reinforce domestic US authoritarianism, as Mr. Trump points to other countries’ “strongmen” as exemplars. Greater authoritarianism globally would also contribute to an increase in failed states, mass violence, and humanitarian crises, while simultaneously promoting formation of competing geopolitical blocs, as nations of similar ideology and governance choose to cooperate with each other and sanction others.

America’s reduced participation in NATO, other international security arrangements, the UN, and other multilateral institutions would have perilous knock-on effects. The world could suffer governance failures on everything from macro-economic stability and pandemic preparedness to conflict management—contributing to virtually all components of the polycrisis.

Multilateral exodus and the spread of authoritarian governments might combine with trade wars to reinforce the emergence of intensely competing—and mutually hostile— geopolitical blocs. This outcome would in turn encourage arms races and substantially raise the risk of great-power war (F7 and F8). Any major American advances on military applications of AI would supercharge these spirals (FL8).

For clarity, Figure 14 does not show potential feedbacks from elements of the global polycrisis back to the factors that exacerbate those elements. But the crises on the figure’s right interact with the stresses and feedbacks on its left in many complex ways.

For instance, climate change would place additional strains on geopolitical arrangements. More frequent and severe weather events are already disrupting economies and worsening conflicts around the world. Impacts will intensify in the years ahead, especially if a second Trump administration manages to derail climate action. Geopolitical competition would further inhibit global climate cooperation in ways that could increase the likelihood that 3+°C warming becomes locked in. A rapidly warming world with decreasing cooperation and increasing geopolitical tensions would raise the risk of intrastate war and state failure while hampering international responses to new pandemics and financial crises. It would also raise the risk of war between great powers.

Finally, major external shocks, which we call “macro-triggers” (see Box 8) could dramatically exacerbate the processes identified in Figure 14. While the probability of any one of these specific triggers occurring may be relatively low, it is virtually guaranteed that the coming years will bring major and largely unexpected global shocks of one form or another.

3.3 Conclusion: Historical parallels and uncertain futures

There are striking parallels between the crises of the early 20 century and the pathways to an escalating polycrisis that we depict in Figure 14. The decades before World War II were marked by rising inequality and authoritarianism, the influenza pandemic of 1918, and the Great Depression of 1929-1932. These events culminated in a global battle between coalitions of authoritarian and liberal empires. The difference today is that the world’s hardening blocs have nuclear weapons and reside on a warming planet with rapidly degrading ecosystems. And despite their mutual antagonisms, they remain tightly linked by flows of capital, energy, food, manufactured goods, information, and technology.

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### Autocracy Doesn’t---1AR

#### No warming solvency---Trumpist autocracy worse.

Richir 24 – Environmental journalist

Camille Richir, "Donald Trump’s election, an earthquake for climate policy", La croix international, 11-8-2024, https://international.la-croix.com/laudato-si/donald-trumps-election-an-earthquake-for-climate-policy /

“Drill everywhere,” Donald Trump repeatedly proclaimed during his campaign rallies. This pro-fossil fuel slogan epitomizes his platform: the Republican Party candidate, elected November 6, as the next President of the United States, intends to lift environmental restrictions on fossil fuel production. Openly calling climate change a “hoax,” he has made clear his intent to reverse the energy transition measures implemented by the Biden administration.

This has sparked significant concern at a time when atmospheric temperatures are at an all-time high. The United States, the world's largest producer of hydrocarbons, accounts for 11% of global greenhouse gas emissions despite having only 4.2% of the world’s population.

“The election of a climate change denier to the U.S. presidency is extremely dangerous for the world,” responded Bill Hare, physicist and former author of the IPCC report. “The weakening of U.S. domestic action will jeopardize efforts to limit warming to 1.5 °C,” one of the targets set by the Paris Agreement, which was already seen as almost out of reach.

Withdrawal from the Paris Agreement

The U.S. withdrawal from the Paris Agreement was one of the first measures Donald Trump adopted during his initial term in 2016. His Democratic successor, Joe Biden, rejoined the accord in 2021 and committed the country to reducing emissions by 52% by 2030, compared to 2005 levels. However, a Republican campaign spokesperson has already announced that the United States would again exit the treaty if Trump won, undermining those targets.

Trump is also intent on boosting hydrocarbon production, promising “cheap energy” to voters. His previous term was marked by reduced environmental regulations and expanded drilling on federal lands, leading to a substantial production increase.

He has also stated his intention to roll back regulations on methane emissions—a potent greenhouse gas—implemented by Joe Biden, as well as lift the moratorium on new liquefied natural gas (LNG) export terminals. Additionally, it is likely he will attempt to undo tighter emission standards for gas power plants and vehicles set by the outgoing administration.

Threat to investments in energy transition

Trump has also pledged to “cancel all unspent” funds from the Inflation Reduction Act (IRA), a major piece of legislation from his predecessor that involved massive investments in the energy transition. This could put funding for renewable energy projects and tax credits for electric vehicle purchases at risk, potentially deterring investors lacking policy stability.

## Localities!

### Disasters !---DROPPED---1AC

#### Strong localities prevent systemic disaster risks---extinction.

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Mami Mizutori, several dozen other authors, “Global Assessment Report on Disaster Risk Reduction,” United Nations Office for Disaster Risk Reduction, 2022, https://www.undrr.org/media/79595/download?startDownload=20250920

The central question for this Global Assessment Report on Disaster Risk Reduction 2022 (GAR2022) is how governance systems can evolve to better address the systemic risks of the future. In today’s crowded and interconnected world, disaster impacts increasingly cascade across geographies and sectors, as the coronavirus disease (COVID-19) pandemic and climate change are rapidly making clear. Despite progress, risk creation is outstripping risk reduction. Disasters, economic loss and the underlying vulnerabilities that drive risk, such as poverty and inequality, are increasing just as ecosystems and biospheres are at risk of collapse. Global systems are becoming more connected and therefore more vulnerable in an uncertain risk landscape. Such systems include ecologies, food systems, supply chains, economies and social services. COVID-19 spread quickly and relentlessly into every corner of the world, and global risks like climate change are having major impacts in every locality. Indirect, cascading impacts can also be significant. For example, many countries felt the negative economic impact of the COVID-19 pandemic months before ever registering a single case of the disease. Without increased action to build resilience to systemic risk, the United Nations Sustainable Development Goals cannot be achieved.

GAR2022 highlights that: ● The climate emergency and the systemic impacts of the COVID-19 pandemic point to a new reality. ● Understanding and reducing risk in a world of uncertainty is fundamental to achieving genuinely sustainable development. ● The best defence against future shocks is to transform systems now, to build resilience by addressing climate change and to reduce the vulnerability, exposure and inequality that drive disasters.

GAR2022 explores how, around the world, structures are evolving to better address systemic risks. In the face of accelerating climate change impacts, doing more of the same will not be enough. However, action is possible. This report shows how governance systems can evolve to reflect the interconnected value of people, the planet and prosperity. It outlines how actions such as changing what is measured to account for factors such as sustainability, the value of ecosystems and future climate change impacts can have a powerful effect, including unmasking dangerous imbalances in existing systems. Investment in understanding risk is the foundation for sustainable development. However, this needs to link to a reworking of financial and governance systems to account for the real costs of current actions. Without this, financial balance sheets and governance decision-making will remain fragmented, and will be rendered increasingly inaccurate and ineffective.

The report also explores how designing systems to work with, not against, the way human minds make decisions can support accelerated action. Innate biases and mental short cuts can make people’s thinking myopic, or prone to inertia, oversimplification or herding when making decisions around risk. This helps explain why people, and the institutions they work for, can resist making good decisions about risk, even in the face of clear scientific data. These biases are particularly likely to kick in when risks are newly felt, and therefore unfamiliar, as is the case with many systemic risks such as climate change or a pandemic.

Reframing risk information, policies and products to present expert risk understanding differently can help overcome this hurdle. Designing in consultation with affected populations, building on existing expertise and local knowledge, and leveraging technology to help support better communication and dialogue around risk can increase the effectiveness and acceptance of change.

Building on innovations in modelling systemic financial crises, GAR2022 outlines how similar methods are now being applied to better understand the cascading, cross-sectoral impacts of systemic risk on sustainable development. It shows how both developed and developing countries are innovating to improve analytics. Emerging methods better depict impacts in key systems like food, infrastructure and supply chains, which cascade across sectors and geographies. These further drive social impacts such as increased inequality, migration and conflict.

These technological advances are powerful tools in accelerating risk understanding. However, in a world of certain uncertainty, no model can accurately predict what is a fundamentally unpredictable future. Science can help identify positive pathways, test options and find weak points. But it cannot predict across the infinite variables of a complex world. GAR2022 therefore highlights examples where human experience and global models are coming together to apply data more effectively to support better decision-making around risk. Local food security projects in Kenya are using stateof-the-art climate information to discuss options for resilient agriculture with local partners. A “deep demonstration approach” is being applied in Viet Nam where innovators and governments are working together to co-design a green circular economy and better understand and address systemic risk. Examples given from around the world highlight how options exist to better leverage technology, enhance participation, and increase the use of local and indigenous knowledge to create the agile flexible systems necessary to build resilience in today’s complex world.

To accelerate essential risk reduction and resilience building, GAR2022 calls for action to: 1. Measure what we value. 2. Design systems to factor in how human minds make decisions about risk. 3. Reconfigure governance and financial systems to work across silos and design in consultation with affected people.

As climate change impacts gather pace, the baseline for how future generations will view inaction is clear. The time to act is now.

The GAR2022 call to action

1. Introduction: Rewiring systems for a resilient future

Disaster risk was increasing globally, even before the advent of the coronavirus disease (COVID-19) pandemic. More people were killed or affected by disasters in the last 5  years than in the previous 5  years. Intensive and extensive risks are growing at an unprecedented rate. Human action is creating greater and more dangerous risk. Disasters have increasing impacts on communities and whole systems as risk multiplies. Everyone is living downstream of something else. Global impacts become local, and vice versa. Impacts also cascade across sectors, creating new challenges.

Recent large-scale disasters – including the COVID-19 pandemic and major weather events that caused supply chain disruptions – have led many to conclude that something new is happening. Increasingly, people live in a world in which disaster risk manifests systemically, inflicting damage across the vital systems and infrastructure upon which human societies and economies depend. Despite commitments to build resilience, tackle climate change and create sustainable development pathways, current societal, political and economic choices are doing the reverse. Human actions continue to push the planet towards its existential and ecosystem limits. In the face of intensifying climate change impacts and increasing system threats, risk reduction efforts often seem too little and too late.

In the wake of the COVID-19 pandemic and the hottest decade on record, there is growing momentum to change how the global community manages risk, and a willingness to accelerate action on climate change. In the aftermath of disasters, psychologists note there is a moment when individuals are particularly open to change. The current phase of the COVID-19 crisis is perhaps such a moment that should not be wasted.

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To change course, new approaches are needed. It is possible to manage the risks of the future more effectively, but only if action is taken now to rework local, national and globalized systems to prevent and respond to systemic risk. This Global Assessment Report on Disaster Risk Reduction 2022 (GAR2022) focuses on how change is possible, and how governance systems can evolve to respond to an increasingly challenging planetary and socioeconomic environment. It highlights how tools and approaches already in place in the disaster risk reduction (DRR) community can be adjusted, enhanced and scaled up to help create a risk-resilient future. 1.1 Key concepts of this report Three key global agreements on DRR, climate change and sustainable development provide the foundation for multilateral action to manage risk and promote sustainable development towards 2030 (Box 1.1). Building on this foundation, addressing systemic risk requires working across systems and disciplines, but a common “risk language” or set of interoperable standards or definitions still remains elusive. This section therefore gives an introduction to key terms and concepts elaborated in GAR2022 from the perspective of DRR. 1 1.1.1 Disasters, hazards and vulnerability The United Nations Office for Disaster Risk Reduction (UNDRR) defines a disaster as a “serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts” (UNDRR, n.d.). Disasters stem from a combination of hazards with vulnerability and exposure of people and assets. In this context, a hazard is a “process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation” (UNDRR, n.d.). The origins of hazards can be natural or human-made, and span a wide range of environmental, technological and biological hazards, including meteorological, hydrological, extraterrestrial, geological, environmental, chemical, biological, technological and societal factors. UNDRR and the International Science Council recently convened a wide-reaching expert-driven exercise, the Hazard Definition and Classification Review, which outlined over 300 hazard types that can contribute to disasters (UNDRR, 2020a). They include common events such as storms and floods and also less-frequent events such as pandemics and chemical accidents. Vulnerability describes “the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards” (UNDRR, n.d.). Exposure is the “situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazardBox 1.1. Risk reduction in the global agreements The Sendai Framework on Disaster Risk Reduction 2015–2030 (Sendai Framework) focuses on the adoption of measures that address all dimensions of disaster risk – hazard, exposure, vulnerability and coping capacity – to prevent the creation of new risk, reduce existing risk and increase resilience. It incorporates a strong focus on inclusiveness “through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience” (United Nations, 2015a). Transforming our World: the 2030 Agenda for Sustainable Development (2030 Agenda) sets out 17 Sustainable Development Goals (SDGs) and provides a comprehensive global policy framework towards ending all forms of poverty, hunger, inequalities among and within countries (based on gender and other socioeconomic status), and tackling environmental degradation and climate change, while ensuring “no one is left behind” (United Nations, 2015b). Its suite of planned worldwide positive changes will help reduce most elements of disaster risk. The SDGs incorporate multiple Sendai Framework targets as well as climate change and sustainability targets. The Paris Agreement steers action towards global climate change adaptation and the mitigation goal of limiting global warming to well below 2°C above pre-industrial levels, and preferably to 1.5°C. Article 7 outlines the global adaptation goal, which includes the need to incorporate sustainable development in adaptation planning (United Nations, 2015c). The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts under the United Nations Framework Convention on Climate Change also recognizes the importance of averting, minimizing and addressing loss and damage due to climate change, including extreme weather and slow-onset hazards and changes (UNFCCC, 2013). Comprehensive risk assessment, risk insurance facilities and climate risk pooling are important tools that link climate action under the Paris Agreement with risk reduction under the Sendai Framework. 2 prone areas” (UNDRR, n.d.). When hazards combine with vulnerability and exposure, disasters are most likely to occur because exposure increases the impacts and vulnerability reduces coping capacity (UNDRR, n.d.). That vulnerability and exposure are core to causing disasters highlights the role of human decisions in creating disasters. Disasters are not “natural” events, but instead are a function of how humans interact with their environment. The root causes of disaster risk and disasters stem from structural conditions of a particular mode of development and growth. They are also shaped through social, economic, cultural and political processes, and conditions, practices, priorities, choices and values that unfold over time (Oliver-Smith et al., 2016, 2017). The drivers of disasters are in part defined in the context of limited access to power structures and resources, and attached to economic and political systems (Blaikie et al., 2004). Root or underlying causes are bound up with deep-rooted, fundamental or structural drivers relating to development ideologies, cultural factors, ingrained habits, social inequality and other processes that all have a role in the creation of risk and disasters. Disasters are traditionally divided into rapid-onset events (like typhoons, earthquakes or flash floods) or slow-onset events (like droughts, saltwater intrusion or desertification) where impacts manifest over months or years. While most hazards are natural, some, like air, pollution, are largely human made. Disasters are also usefully characterized as either extensive or intensive. Extensive disasters are high-frequency localized events that manifest over a dispersed area, causing recurrent smalland medium-scale impacts. Examples include small- or medium-sized seasonal storms, floods and droughts. Intensive disasters risk relates to large-scale events, typically affecting large cities or densely populated areas. They are caused by high-severity hazards such as major earthquakes or once-in-a-generation floods (UNISDR, 2015). 66,920 People affected Accounting for 93% of the Population 65 Confirmed fatalities 90-95% of Homes Damaged or Destroyed 1.3 billion in Damages and Losses All 53 health facilities sustained damage 90%+ of Crops Destroyed Accounting for 225% of 2016 GDP Water/Sanitation: 43 out of 44 water systems were not functioning Shelter: 90% of structures damaged; 62% of houses heavily damaged, o/w 15% were destroyed Power: 90% of population lacked access to electricity for over 4 months Roads/Bridges: 1-2m of floodwater; debris deposits of 1-4m in riverbeds, 6+ bridges severely damaged Emergency Services: 5 of 11 police stations & 4 of 8 fire and ambulance stations severely damaged Food: 24,000 people became severely or borderline food insecure, according to WFP Livestock: Country-wide losses included cattle (45% lost), pigs (65%), small ruminants (50%), broiler chickens (90%), layers (90%), rabbits (50%), and beehives (25%) Figure 1.1. Impact of Hurricane Maria on Dominica Source: Government of the Commonwealth of Dominica (2020) 3 As exemplified in Figure 1.1, the impacts of a single devastating storm can have major long-term impacts (Maskrey et al., 2022). Disaster impacts on national well-being can be particularly pronounced in small nations such as Dominica, where 90% of the island’s approximately 75,000 people live in coastal areas at high risk to storms and other disasters. Similar longterm impacts may be expected in other small island developing States (SIDS) such as Tonga, which are affected by hazards such as underwater volcanic eruptions, tsunamis and their cascading impacts. 1.1.2 Towards an understanding of systemic risk A key focus of this GAR2022 is how systemic risk is affecting sustainable development, and what can be done to better address and reduce losses from systemic impacts. The concept of systemic risk is based on the notion that the risk of an adverse outcome of a policy, action or hazard event can depend on how the elements of the affected systems interact with each other. This can either aggravate or reduce the overall effect of the constituent parts. Interactions occur through positive or negative feedback processes. Systemic risk creates the chance of system malfunction or even collapse (Sillmann et al., 2022). Even though the notion of “systemic risk” is at least a few decades old, the term is still used in different ways across disciplines (Faulhaber et al., 1990; Sillmann et al., 2022). Although systemic risk analysis is regularly applied in financial systems and in medicine, it is now increasingly being considered in Earth systems analysis, climate science and DRR. Triggered by the repercussions of the systemic global financial crisis of the late 2000s, the perception of systemic risk has often focused on global and catastrophic or even existential risks (Helbing, 2013; WEF, 2021a; Sillmann et al., 2022). However, systemic risk can occur at all spatial scales, from local to regional, national and global. Systemic risk can be endogenous to, or embedded in, a system that is not itself considered to be a risk and is therefore not generally tracked or managed. Systems can contain latent, or cumulative, risk potential to impede overall system performance when some characteristics of the system change (UNDRR, 2019). Systemic risk does not necessarily lead to a complete system failure. However, as outlined throughout this report, the design and evolution of modern human systems is creating new risks. Some of those risks, like climate change and biodiversity loss, are existential in nature. The impacts of systemic risk cascade across sectors, such as food– health–water–energy, and/or among communities, countries and continents. For example, in the pursuit of ever more efficient food systems, there is now far greater reliance on trade to fill or compensate for local or national production gaps or to absorb oversupply. This so-called “efficiency” of the system has led to reduced margins or buffers against unplanned interruptions such as local conflict, natural hazards or international crises that reduce trade. This increases the potential for cascading risk throughout and beyond food systems (see the Food systems and systemic risk case study after Chapter 12). In an increasingly connected world focused on efficiency, a central question for GAR2022 is how technical design, and socioeconomic and governance systems can be adjusted to reduce systemic risk and curtail potential systemic failures. Key characteristics of systemic risk can be broadly categorized under five themes: the scale of the system, the relationship of the elements within a system, the level of system understanding, the transboundary effects and the outcomes of systemic risk. Figure  1.2 builds on the work of several scholars (e.g. Schweizer and Renn, 2019; Renn et al., 2020) and a review of a wide range of definitions of systemic risk found across disciplines in scientific literature and reports (Sillmann et al., 2022). Recent publications such as the Global Assessment Report on Disaster Risk Reduction 2019 and the work of the International Risk Governance Council take a close look at the various drivers of systemic risk and future emergence of such risks (Centeno et al., 2015; IRGC, 2018; UNDRR, 2019; Sillmann et al., 2022). Global intergovernmental processes are also starting to recognize the importance of considering systemic risk. For example, the new research agenda of the Integrated Research on Disaster Risk 2021–2030 (ISC et al., 2021) focuses on complex impact and systemic risk from a multi-hazard and disaster risk 4 Scale Relationship • Unknown • Lack of knowledge • Unpredicted • Uncertainty • Ambiguity • Underestimated • Tipping points/events • Stochastic effects Outcomes System • Feedback loops understanding • Interactions • Interconnections • Interdependencies • Interlinkages • Intertwined • Global • National • Regional • Local • Breakdowns • Collapse • Critical services to society • Disruption of systems and essential services • Failure of economic, financial or social systems • Impacting/affecting an entire system • Serious negative consequences • Threats to system survival • Unbound damage • Cascading effects • Complexity (Complex causal structures) • Contagion • Indirect impacts • Knock-on effects • Nonlinearity (Nonlinear cause–effect relationships) • Ripple effects • Spillover effects • Wider effects Transboundary effects Figure 1.2. Terminology for key attributes of systemic risk Source: Based on Sillmann et al. (2022) perspective. Similarly, the Intergovernmental Panel on Climate Change (IPCC) is moving from what could be characterized as a static framing of risk as a function of hazard, exposure and vulnerability to a more dynamic framing where responses to the risks with potential side effects and interactions among risks are more strongly considered (Reisinger et al., 2020; Simpson et al., 2021). Figure 1.3 provides a snapshot of how an extended risk framework is important to addressing the systemic risk of climate change, and how factors such as transition decision and governance need to be taken into account (Zscheischler et al., 2018). A related “impact web” analysis of the COVID-19 crisis is included in the case study following this chapter. Figure  1.3 shows that multiple climatic drivers cause one or multiple hazards, leading to societal and environmental risk. The climate drivers (which may vary from local-scale weather to large-scale climate modes, represented by yellow circles) and/ or hazards may be mutually dependent. Non-climatic drivers related to vulnerability and exposure may also contribute to risk (Zscheischler et al., 2018). 1.1.3 Measuring and valuing the wrong things GAR2022 also explores pitfalls in economic and governance systems that hold back the essential resilience building needed to underpin stability and development that is truly sustainable. The first pitfall is the tendency to exclude key values, such as the value of human life and biodiversity, from economic balance sheets and governance decisionmaking. For example, most risk assessments in the private sector usually cover a 12 month period, and place value only on economic goods and services, not fundamental assets such as ecosystem health. The second pitfall is that they do not often take into 5 account potential medium- or longer-terms impacts of climate change. Public sector accounting, especially for areas such as infrastructure, is usually longer term but again focuses on measuring value in economic terms only. This narrow definition of value limits the facts on the table when decisions are made. The myopic approach to scope and time frame means there are insufficient incentives for investment in reducing the negative impacts of consumption and exploitation of natural resources and increasing socioeconomic inequality. Little attention is paid to recovering undervalued “assets” when their value is depleted. For governments, this means that so-called “cost–benefit analysis” often excludes the value of many assets and benefits that their populations prize most highly, such as health, clean air and water, and a safe future for their children. The third pitfall in measurement systems is myopia in being able to see how risks cross geographic or sectoral boundaries. Economic systems and governance structures are constrained by their alignment with political and geopolitical borders, but risks are not. The COVID-19 pandemic provides a stark reminder that neither a virus nor its impacts can be contained within a single country’s borders. In 2020, people in Fiji were already suffering reduced access to health care and massive economic damage, due to border closures and impacts on wider global systems, long before it recorded its first case of COVID-19 (UNDRR and UNU-EHS, 2022). Similarly, climate change impacts and factors such as ecosystem and biodiversity loss do not respect human territorial boundaries. 1.1.4 How human minds simplify complexity and what this means for disaster decision-making GAR2022 also looks at how a better understanding of the cognitive biases people bring to understanding and acting on risk information can help illuminate the gap between will and action in reducing risk and averting disasters. Cognitive scientists highlight that people order the world based on simple, ruleVulnerability Hazards RISK Exposure CLIMATIC DRIVERS NON-CLIMATIC DRIVERS EMISSIONS AND LAND-USE CHANGE IMPACTS NON-CLIMATIC DRIVERS CLIMATE SOCIOECONOMIC PROCESSES Governance Socioeconomic pathways Adaption and migration actions Natural variability Anthropogenic climate change Figure 1.3. Extended risk framework Source: Zscheischler et al. (2018), adapted from IPCC (2014a) 6 of-thumb decisions (heuristics) that reinforce their basic psychological motives and expectations, even though they are not aware this is happening. These individual decision-making processes interact with the social environment, and cultural and governance norms. Although humans often believe the decisions they make about how to manage risk are driven by reasoning and data, scientists now understand more about how human minds are configured to make decisions, and how this often distorts the use of risk information in decision-making. Human thinking can be divided into two main types: decisions that require “thinking slow” and those that rely on “thinking fast” (Kahneman, 2013). Thinking slow mode is the deliberate thinking that most people have in mind when speaking of human reasoning, and is focused on expectation maximization. This is the kind of decision-making associated with sound long-term development and well-reasoned personal choices and good governance. There is also another form of thinking that is equally important, although more often associated with the kinds of quick decisions needed in “fight or flight” situations. Human minds are configured to consider disasters as thinking fast events that require quick and binary decision-making. However, risk reduction and resilience building, as well as planned or anticipatory humanitarian action, also require deliberate or slow thinking at the individual and organizational levels. In addition to thinking fast and slow, human minds have developed other short cuts to cope with complexity, which may negatively affect their ability to make decisions on disaster risk. Under most conditions, people use heuristics, or mental short cuts, to help find solutions to the problems faced. These tend to simplify decision-making, rather than making a full and complete calculation of a best overall answer. People are almost never aware of their use of those mental short cuts, as they mostly originate in the part of the brain that processes automatic behaviours. One of the most commonly used short cuts is to simplify complexity by attempting to determine a linear cause and effect (Kahneman, 2013). However, as the discussion on systemic risk above outlines, this tendency to oversimplify may not be serving human societies well in coping with the complexity of global challenges. Issues such as addressing climate change or reducing the impacts of a global pandemic cannot be reduced to a simple linear decision-making process. There are other heuristics that may also be hindering people’s ability to make sound decisions when it comes to managing disaster risk, such as a tendency to focus only on what is in front of them (myopia) and the human belief that bad things will not happen to them (optimism). This understanding of human decision-making may point to how to rework systems to accelerate risk reduction. If incentives in the social environment can be aligned with these heuristics or biases, and governance systems are reconfigured to be conducive towards fostering risk-informed behaviour and decision-making, the possibility of significant behaviour change is real. For example, studies show decision makers are much more likely to undertake loss reduction measures if they are told there is more than a one in five chance of having at least one severe wildfire, flood or other disaster causing damage to their property over the next 25  years, rather than being told there is a 1 in 100 annual probability of such a disaster (Slovic et al., 1978). This suggests greater attention to the design of products, services and communications methods can increase the efficacy of risk reduction efforts. It also means governance systems need to improve consultative and “reality check” processes, to enable more considered and agile decision-making in the face of systemic risk. 1.1.5 Why risk communication is essential Failing to communicate effectively about risk – indeed, failing to communicate at all – can fuel rumour, erode trust, hamper solutions and increase risk. Communication strategies that reflect the systemic nature of risk and that are rooted in ongoing dialogue can improve understanding of exposure, vulnerability and hazards. Such processes can also acknowledge and respect local priorities, indigenous knowledge and world-views. They can spark innovation, work across generations, build trust 7 and increase transparency. This can boost people’s confidence and motivation to make informed decisions and to act, ultimately contributing to a shift in how societies relate to risk. Societies have more data about risk than ever before. However, it remains rare to have productive conversations about it with the right people, at the right times and at the right scale. If there is to be a shift in how people understand, deliberate and act on risk, radical advances are required in how this is done. This requires mutual communication and cross-boundary and cross-disciplinary collaborations that bring expertise, multiple perspectives, strategic vision and creativity. There is also a need for greater emphasis on recognizing the biases that lead key private and public sector decision makers, as well as the general public, to deny or ignore disasters and other extreme events. 1.1.6 Why data is essential for understanding systemic risk In the information age, experts can enable the development of tools and provide services, but the “last mile” is up to decision makers and local stakeholders. An entire ecosystem is required to generate risk understanding and engage communities at risk. Doing this means acknowledging and exploring the degree to which algorithms are a product of the perspectives, priorities and biases of their developers. It also requires considering the ethics and human rights implications of risk analytics and technologydriven solutions such as artificial intelligence. Without data, disaster decision-making is blind. Without the infrastructure to interpret the data and instrumentalize the decisions, risk governance is paralysed. Data-driven DRR systems can help to manage disaster risks and prevent unnecessary suffering, but only if risk management becomes part of a common DNA of stakeholders at different levels, and if policymakers understand there is a need to accept uncertainty. Otherwise, even the most advanced big data strategy cannot reduce risk. Exploiting the added value of data-driven risk management systems requires the development of a “hive mind”, where different disciplines and perspectives come together to better understand options and inform decisions. This requires fostering a risk culture based on mutual trust among generalists, specialists and communities at risk. Such an approach requires common terminologies or jargon, the collaborative identification of bottlenecks and a direct link to governance decision-making. Reducing, managing and avoiding creating risk require an in-depth understanding of spatially and temporally complex processes at different scales. The gaps between remote sensing, modelled, official data sources and what is happening on the ground are often too big for the data to be successfully used for local analysis or projects. However, participatory processes and crowdsourcing approaches can typically close this gap, particularly given advances in communications technologies. To help contextualize existing data and highlight critical data gaps, it is important to capture realistically how to minimize uncertainty within translated risk data, and how to break down the barriers of co-production by recognizing and embracing local needs and concerns. These same approaches are equally important in helping to understand potential future vulnerability and exposure through prospective disaster risk management (DRM) (IPCC, 2021a; Birkmann et al., 2015; Jurgilevich, 2021). 1.2 Transforming risk governance in the era of systemic risk Effective risk reduction requires awareness, the formation of an intent to act, the identification and selection of a plan of action, and the execution of that plan. Biases and influences can distort effective action at each stage. For example, a focus on achieving economic growth under current development models is creating unstable and unsustainable human systems, thus increasing systemic risk in the form of climate change and biodiversity loss. A myopic focus on growth as the main signal of well-being has led to a failure to invest a small percentage of global gross domestic product (GDP) in preventing the existential threat of climate change. This means that governments fail to invest in risk reduction measures or to recognize the exponential growth potential of crises (as witnessed during the COVID-19 pandemic). This leads to the 8 social vulnerabilities of individuals and groups being ignored, and failure in addressing structural inequalities that drive hazards to become disasters. Immediate actions that can help catalyse the required transformations necessary to address systemic risk include: 1. Measure what we value. 2. Design systems to factor in how human minds make decisions about risk. 3. Reconfigure governance and financial systems to work across silos and design in consultation with affected people. The challenges and potential solutions available to help better address systemic risk for a sustainable future are explored throughout this report. GAR2022 aims to take a fresh look at what can be done to get global risk reduction efforts back on track, to help governments and policymakers consider their options and to inspire action to accelerate risk reduction. These goals and concerns are also shared by stakeholders in all regions (Box 1.2). 1.3 Overview of the structure of this report Part  I lays out the challenge that the global community is not on track to reducing risk. The case study following this introductory chapter explores how the COVID-19 pandemic highlights the need to better understand and act in the face of systemic risk (COVID-19 and systemic risk case study). Chapter 2 documents how the combination of preexisting hazards and human actions are creating greater, more dangerous and more systemic risk, pushing societies and the planet towards their limits. Chapter  3 outlines how recurring disasters and the ecological consequences of climate change and other development choices undermine the SDGs and global targets for climate change and risk reduction. It also highlights where opportunities exist to leverage synergies between reducing risk and achieving sustainable development to accelerate results. Chapter  4 sets out how addressing the root causes of vulnerability and the drivers of risk can have positive impacts on avoiding and reducing risk and increasing sustainability if governance and knowledge systems are able to use transdisciplinary and collaborative approaches. Chapter  5 outlines how current systems are not collecting the right data, key assets are undervalued in decision-making and learning opportunities are missed. Chapter  6 then looks at how systemic thinking requires working across traditional sectors and disciplines and developing new ways of working that incorporate different world-views, including indigenous and traditional knowledges, to enhance decision-making. Part  II looks at why decision-making around risk reduction and addressing systemic risks is so suboptimal. Chapter  7 describes how a better understanding of human decision-making about risk can be used to accelerate effective action. It also identifies ways that systems can transform or adapt to better manage risk. Chapter 8 looks at how it is possible to reconfigure incentive systems and to market risk reduction products and services to work with, not against, the way human minds work. Chapter  9 highlights how changing communication around risk reduction is essential, especially how moving from top-down approaches to co-design and data-driven consultative decision-making can accelerate resilience building. Part  III focuses on what needs to happen to accelerate risk reduction. Chapters  10 and 11 explore recent advances in modelling and learning approaches that are improving how to understand systemic risk, and how they are helping people to learn faster and address risk in an uncertain world. Chapter  10 focuses on recent advances in modelling systemic risk. Chapter  11 looks deeper into how such tools are being applied around the world. Chapter  12 outlines how, in the face of global systemic risks, governance systems must quickly evolve and recognize that the challenges of economy, environment and equality can no longer be separated. Nowhere is the need for action more obvious than in food systems, which is explored as a final case study in the report (Food systems and systemic risk case study). The report’s Chapter 13 concludes with a call to action to accelerate risk reduction, to better address systemic risk and to build a safer and more resilient world for today and for future generations. 9 Box 1.2. Regional perspectives on risk governance challenges and opportunities Regional assessment reports, regional platforms, action plans and evolving DRR agendas in Africa, the Americas, the Arab States, Asia and the Pacific, and Europe and Central Asia, highlight the challenges and opportunities that shape regional, national and local implementation. All regional platforms met during November 2021, although the formal Asia-Pacific Ministerial Conference on Disaster Risk Reduction was deferred due to the pandemic. Risk as a social construct, and new risk governance approaches ● Applying a systems-based approach and inclusive, transdisciplinary and accountable disaster risk governance mechanisms is a means to overcome related underlying risk factors. ● The COVID-19 pandemic has exacerbated the systemic impacts of risk, including loss of lives and livelihoods, damage to infrastructure and displacement. Even before the pandemic, disasters had become a major cause of forced displacement, requiring concerted action to reduce risk at the local, national and regional levels. ● Strengthened transboundary collaborative mechanisms to understand risks, enhanced governance and reduction of existing, emerging and future risks are crucial to address the impacts. ● Ecosystem management and use of traditional wisdom and practices were highlighted in the Africa region and the Pacific region. ● Financial and social disclosure of climate risk and green and disaster-resilient economic recovery is crucial to enhance collective responsibility for leaving no one behind, a focus in all regions. Gender equality and women as key agents of change ● There is great emphasis in the regions on the key role of women as leaders and agents of change to build resilient development pathways, actively participating in the creation and implementation of DRR strategies, policies, plans and programmes. ● The negative impacts of the COVID-19 pandemic on social and economic development have created disproportionate vulnerability and exposure for women and girls, all of which undermine efforts to achieve the 2030 Agenda as well as regional agendas. The various regional forums have called for the adoption of a gender-based approach that accounts for the needs of women, the elderly, children, youth and persons with disabilities, as well as for a new social contract for inclusive all-of-society approaches to build resilience. New collaborations and partnerships ● All the regional gatherings identified collaboration and alliance building across critical sectors as vital to tackling complex and compounding risk. Opportunities for collaboration include strengthening data sharing at country and regional levels and increased provision of evidence-based scientific research and analysis for decision-making. ● Stronger partnerships among institutions responsible for DRR, environmental management, climate change action, planning and finance and other sectors can ensure a coherent, integrated and all-ofsociety approach to DRR and climate change adaptation at all levels. ● Indigenous, local knowledge systems and practices can foster the integration of age and cultural perspectives into the design and implementation of DRR and climate change adaptation strategies and plans, while recognizing the importance to protect cultural heritage from disaster risks. Sources: AfRPDRR (2021a, 2021b); Amach (2021); APP-DRR (2021); ARPDRR (2021a, 2021b); EFDRR (2021a, 2021b); PRP (2021); RPDRR-AC (2021a, 2021b); UNDRR (2021a, 2021b) 10 Case study COVID-19 and systemic risk The COVID-19 pandemic has affected all dimensions of human security, including economic, food, health, environmental, personal, community and political systems (Robles, 2022). Although a global pandemic was a known risk, the world was not prepared for its direct or wider systemic impacts. Diseases had previously spread from animals to humans, including acquired immune deficiency syndrome (AIDS), Ebola virus disease, Middle East respiratory syndrome (MERS), severe acute respiratory syndrome (SARS) and Zika virus disease. However, pandemic preparedness measures were myopic, focusing on health system responses, not on prevention, coordination and leadership, or the likely wider effects of a global pandemic (Independent Panel for Pandemic Preparedness and Response, 2021a). A combination of pre-existing vulnerabilities and exposure amplified risk and led to cascading, systemic impacts, as outlined in the conceptual model in the figure that illustrates a systemic impact web. Pre-existing vulnerabilities of COVID-19- related-at-risk groups and health systems Pre-existing vulnerabilities of the general population, sectors and systems Direct risks and impacts Interconnected, cascading risks and impacts, across systems, borders and scales Interventions COVID-19 Concurring hazards Exposure to the virus (and other hazards) Reinforcing vulnerabilities Reinforcing impacts Reinforcing vulnerabilities Globally networked risks Globally networked risks Social systems Education systems Economic systems ... Interconnectivity, feedbacks Health Health systems Feedbacks Tipping point Reduce Globally networked risks Global dependencies Triggers Adjustment of interventions Cascading adverse effects Reinforcing the pandemic (endogenous) Hazards Exposure Vulnerabilities Risks and impacts Interventions Effects Feedback Systems Reinforcing vulnerabilities Source: UNDRR and UNU-EHS (2022) Conceptual model of the systemic nature of COVID-19 risk and impacts 11 CASE STUDY: COVID-19 AND SYSTEMIC RISK INTRODUCTION – REWIRING SYSTEMS FOR A RESILIENT FUTURE: Myopic thinking meant that, despite warnings and data that a pandemic was overdue, preparedness was inadequate and governance systems across the world struggled to pivot to a new reality. 1 OUR WORLD AT RISK: Human choices and demographic trends increase the likelihood that hazards like COVID-19 can spread from animals to humans and impact all continents rapidly. Exposure to underlying risk factors, such as high levels of air pollution, unsafe housing or limited access to health services, were found to significantly affect fatality rates. 2 TRANSITIONS TO SYSTEMIC RISK GOVERNANCE: At the start of the COVID-19 pandemic, assessment of preparedness measures was focused on the capacity of health systems and not on coordination and leadership, yet these turned out to be crucial in effective response and management of a protracted crisis. 12 FROM BIG DATA TO BETTER DECISIONS: Basic data collection at national and local levels has faced challenges of missing information and errors, but the pandemic has also triggered innovations in the generation, function and use of dynamic disaggregated data. 11 EMERGING APPROACHES TO ASSESSING SYSTEMIC RISK: The pandemic has exposed weaknesses in the foundations of data and analytics to understand the connections between health systems and socioeconomic vulnerability, at national and international levels. 10 ADVANCING RISK COMMUNICATION Misinformationand antivaccination campaigns reduced trust in public health measures, but there were also many effective scientific communicators in the media and successful collaborations focusing on specific communities. 9 : 12 SYSTEMIC RISK AS A CHALLENGE TO SUSTAINABLE DEVELOPMENT: The systemic impacts of the pandemic have derailed SDG achievements across almost all indicators. For example, using the Lifeyears Index, the economic and social costs of the pandemic in 2020, measured in lifeyears lost, far outweighed the average annual costs of other disasters, and the summed cost of all epidemics from 2000 to 2019. 3 HOW HUMAN CHOICES DRIVE VULNERABILITY, EXPOSURE AND DISASTER RISK: Although the pandemic has affected all countries and regions, vaccine inequity has seen lower-income countries left behind. The cascading health and economic impacts have been worse for poorer and marginalized communities, women exposed to violence and small economies dependent on tourism. 4 HOW SYSTEMS UNDERVALUE KEY ASSETS AND OPPORTUNITIES FOR LEARNING: The pandemic has caused fierce debates over what governments and societies should value most (e.g. health or economic activity; restricted movement/mask wearing or “freedom”), and what are acceptable risks (e.g. social protection, mental health, food and income versus infection, illness and overwhelmed health systems). 5 SHIFTING PERCEPTIONS ON RISK: The pandemic has highlighted the need to recognize that planetary and human systems are interdependent, and that risk knowledge systems need to become more flexible and open to different world-views, including indigenous and traditional perspectives. 6 HOW HUMAN BIASES AND DECISION PROCESSES AFFECT RISK REDUCTION OUTCOMES: The pandemic saw initial optimism bias (“we will be OK”), impacts of experience/availability bias (“our hospitals are overflowing”), pessimism (“there is nothing we can do”), political polarization (“our group does not wear masks”) and ”protect my country” versus promoting the global public good of vaccine sharing. 7 ADDRESSING BIASES TO INCREASE INVESTMENT IN RISK REDUCTION: To encourage social distancing and vaccination, health authorities used regulation and enforcement, appeals to a sense of social coherence (“we are in this together”), fear of loss (“do it for your loved ones”) and rewards such as promising to open entertainment venues when a certain percentage vaccination rate was reached. 8 13 The challenge The COVID-19 pandemic has heightened existing vulnerabilities in health systems. Rapid development of vaccines has been accompanied by inequality of access, with distribution favouring wealthier countries (Global Dashboard for Vaccine Equity; UNDP (n.d.a)) despite international commitments such as the COVAX Facility (Gavi et al., n.d.) and the World Health Organization (WHO) global COVID-19 vaccination strategy (WHO, 2021a). As health systems were overwhelmed by COVID-19 patients, many people with chronic conditions had to delay treatment, thus affecting the quality of care and longer-term health outcomes (Independent Panel for Pandemic Preparedness and Response, 2021a). Mental health has deteriorated globally, and many countries are also reporting a “shadow pandemic” of gender-based violence (Sri et al., 2021). The pandemic has had wide-ranging impacts across systems. Using the Lifeyears Index, the economic and social costs of the pandemic in 2020, measured in Lifeyears lost, far outweighed the average annual costs of all other disasters and the summed cost of all epidemics from 2000 to 2019 (Doan and Noy, 2022). As of June 2021, the World Bank estimated the direct and indirect effects of COVID-19 had pushed 97 million more people into poverty (Mahler et al., 2021). Sectors that could not move online and small countries reliant on tourism were particularly affected by restricted movement and travel (e.g. in the Caribbean and the Pacific). A survey in six Latin American cities found the greatest reduction in well-being was associated with the loss of work or income, although social cohesion provided a significant level of protection, highlighting the role of social capital in resilience building (Castro et al., forthcoming). Global financial and budgeting systems were also not prepared to cope with a major systemic risk arising from outside their sector. The pandemic has exacerbated inequality. Unemployment rose in the United States of America during 2020, by 3.6% for men and 4.0% for women on average, with a greater increase for Black / African American women at 4.9% and the highest for Hispanic / Latina women, at 6.2%. This reflects a concentration of marginalized communities and women overall in lower-paid, less-secure work (WEF, 2021b). Surveys in urban and rural areas in three African countries (Burkina Faso, Ethiopia and Nigeria) identified serious consequences for SDG achievements, including in education, nutrition and food security (Hamer, 2021). Schooling became impossible for half of the Asia and the Pacific regions, where families already lacked access to the Internet, and the loss of household income made education unaffordable for many families, especially affecting girls’ education (Nguyen, 2021) (Chapter 4). A study of systemic impacts of the pandemic in the old city of Ahmedabad, India, showed this pattern in detail (Kanji et al., 2022a) (Chapter 12). Measuring what we value During the pandemic, basic data collection at national and local levels has faced challenges (Dean, 2021), but the crisis also triggered innovations in the generation, function and use of dynamic disaggregated data to understand vulnerability in systems and their cascading effects. After a slow start, the global response included rapid sharing and constant analysis of real-time data on COVID-19 symptoms and physiological impacts, successes or failures in experimental treatments, epidemiological data on where and how fast it spread, rates of death and acute illness, and also the research into, and trials of, vaccines (Ellenberg and Morris, 2021). Freely available human mobility data, collected by a Google platform and other opentechnology platforms and devices, has been used to evaluate community mitigation strategies aimed at restricting the movement of people. In some cases, it was possible to model the spread of the virus based on actual movements (Ilin et al., 2021). 14 Designing systems to factor in how human minds make decisions about risk The pandemic response illustrated positive and negative extremes in how people make decisions about risk, and what prompts governments and individuals to act. A multi-country study found that the best predictor of adherence to COVID-19 restrictions is a sense of “we are all in it together and we all need to come out of it together” (Jetten et al., 2020). A successful example in Viet Nam also saw the Government adopt a strategy that evoked patriotism and bravery for compliance (Independent Panel for Pandemic Preparedness and Response, 2021b). Public compliance with mask wearing and social distancing were initially a challenge in Italy, but personal experiences soon led to a perception that COVID-19 was a serious and relevant threat. Residents became more active in undertaking preventive actions compared with their European neighbours who had not yet experienced these impacts (Meier et al., 2020). Compliance with mask-wearing orders or other COVID-19 mitigation measures in the United Kingdom of Great Britain and Northern Ireland and in the United States quickly became polarized. For many, it was less a question of rational risk reduction than public display of political identities (Choma et al., 2021; Kahane, 2021). WHO referred to an “infodemic” of too much information overall and too much false or misleading information (WHO and PAHO, 2022). In some cases, the infodemic caused confusion, mistrust and risk-taking behaviours and an undermining of the public health response. In Myanmar, where Internet access had surged only recently, unreliable information about COVID-19 abounded online, with people sharing posts about how various common foods and beverages could cure the disease (BBC Media Action, 2020). To counter this, a national communication campaign, Let’s Beat COVID Together, included a popular Facebook page that facilitated two-way communication so people could ask questions and share experiences (Partnership for Healthy Cities, 2020). Reconfiguring governance and financial systems to work across silos and design in consultation with affected people Countries with prior experience of SARS, including China, the Republic of Korea and Thailand, responded more quickly and effectively than other countries to contain the spread of the disease. Their populations were sensitized to the threat of pandemics due to prior experience, and they had already reconfigured institutions that were better able to work across silos to address pandemic spread (Thompson, 2020). In an effort to extend the reach of “collaborative intelligence” in future pandemic response, WHO has also launched a global hub for pandemic and epidemic intelligence (WHO, 2021b). 15 Part I The challenge 2. Our world at risk At no other point in modern history has humankind faced such an array of familiar and unfamiliar risks and hazards, interacting in a hyperconnected and rapidly changing world. The increasing number of reported medium- and large-scale disasters reflects a complex interaction of factors. Population growth and expanded settlements put more people and infrastructure in the path of existing hazards, and there is an increase in frequency and intensity of climatic hazards due to climate change (Van Aalst, 2006; IPCC, 2012, 2014a, 2018a; Otto et al., 2018). Climate change exacerbates disaster risk in a variety of ways. It increases the likelihood, frequency and intensity of climatic hazard events, affecting vulnerability to all hazards due to longterm socioeconomic stresses and impacts such as displacement, and altering exposure patterns as climatic conditions change and hazards emerge in new localities. Disaster events reported per year have increased significantly in the last two decades. While there were relatively more disaster peak years in the decade 2000–2009 compared to 2010–2019, overall frequency remains at an all-time high. Between 1970 and 2000, reports of medium- and large-scale disasters averaged around 90–100 per year, but between 2001 and 2020, the reported number of such events increased to 350–500 per year. These included geophysical disasters such as earthquakes, tsunamis and volcanoes, climate- and weather-related disasters, and outbreaks of biological hazards including crop pests and epidemics (UNDRR analysis based on the International Disaster Database (EM-DAT; CRED, 2021). If current trends continue, the number of disasters per year globally may increase from around 400 in 2015 to 560 per year by 2030 – a projected increase of 40% during the lifetime of the Sendai Framework (Figure  2.1). For droughts, there is a large year-onyear variation, but current trends indicate a likely increase of more than 30% between 2001 and 2030 (from an average of 16 drought events per year during 2001–2010 to 21 per year by 2030) (Figure  2.2). The number of extreme temperature events per year is also increasing; based on current trends, it will almost triple between 2001 and 2030 (Figure 2.3). This is further substantiated by climate projections, including the scientific evidence provided by the IPCC Sixth Assessment Report that points to increases in heatwaves, more intense floods and droughts, and a 7% increase in extreme daily precipitation events to 2030 (IPCC, 2021a). Based on current trends, the world is set to exceed the Paris Agreement’s target of 1.5°C global average maximum temperature increase by the early 2030s, further accelerating the pace and severity of hazard events (IPCC, 2021a). Figures  2.1, 2.2 and 2.3 are underestimates in that data systems are still not sufficient to capture the large proportion of slow-onset hazards and subnational, localized or small-scale extensive disasters. A staggering 99.7% of all disaster events between 1990 and 2013 were smaller disasters involving fewer than 30 deaths or fewer than 5,000 houses destroyed (UNISDR, 2015). Thousands of these smaller-scale events are unreported every year because they do not generate high impacts at the national or international levels; however, they do bring a constant stream of local losses (UNDRR, 2021a). 2.1 Reality check – risk versus perceived risk 2.1.1 Risk perceptions The data is clear that risk is increasing. However, this is not reflected in surveys of individual risk perception. The prevailing perception of risk – in particular long-term threats – is one of optimism, underestimation and invincibility. For example, the findings of a 2020 World Risk Poll suggest that, while the risks from climate change are 17 generally understood and acknowledged, a significant proportion of people underestimate, remain sceptical or have no opinion on the issue (Lloyd’s Register Foundation, 2020a) (Figure 2.4). However, opinions may be changing, particularly in areas that have recently experienced significant disasters. For example, in the United States, there is evidence that, following a recent spate of wildfires, tornadoes, record heatwaves and hurricanes, over 75% of the public now feel climate change is happening (Leiserowitz et al., 2021). Figure 2.4. Perceptions of climate change globally, 2020 Source: Lloyd’s Register Foundation (2020a) The average “risk perception gap” between worrying about and having experienced hazards varies from 30% in Latin America and the Caribbean to 13% in Australia and New Zealand. This seems to indicate personal experience is only one of many factors that affect people’s risk perception (Lloyd’s Register Foundation, 2020b) (Figure  2.5). A range of cognitive, behavioural and sociocultural factors 0 300 1970 1980 1990 2000 2010 2020 2030 100 200 400 500 600 Number of total disaster events Future trend Data Overall trend Projected increase of disaster events of 40% by 2030 Figure 2.1. Number of disaster events 1970–2020 and projected increase 2021–2030 Source: UNDRR analysis based on EM-DAT (CRED, 2021) Future trend 0 15 1970 1980 1990 2000 2010 2020 2030 5 10 20 25 30 Number of drought events Data Overall trend Projected increase of drought events of over 30% by 2030 Figure 2.2. Number of drought events 1970–2020 and projected increase 2021–2030 Source: UNDRR analysis based on EM-DAT (CRED, 2021) 0 30 1970 1980 1990 2000 2010 2020 2030 10 20 40 50 60 Number of extreme temperature events Data Overall trend Future trend Extreme temperature events likely to almost triple by 2030 Figure 2.3. Number of extreme temperature events 1970–2020 and projected increase 2021–2030 Source: UNDRR analysis based on EM-DAT (CRED, 2021) How much of a threat is climate change? Very serious 41% threat Somewhat 28% serious Not a threat at all 13% 18% Don’t know 18 come into play when considering disaster risk, yet risk perception is a crucial factor in how people prepare, reduce and respond to hazards. 2.1.2 Disaster loss and poverty Poverty is a cause and a consequence of disaster risk, particularly extensive risk. Hazards like drought are the most closely associated with poverty, but all hazards that lead to disasters curtail sustainable development. The poorest and the most vulnerable people endure the worst of disaster losses. The poor are more likely to be exposed and therefore affected by hazards and are more likely to depend on fragile infrastructure and housing. They also lose a much greater proportion of their income and assets than non-poor people when disasters strike. 1 The latest year with official global poverty rates is 2017. The World Bank COVID-19 projections use June 2020 Global Economic Prospects growth forecasts for 2018–2021 and country-specific historical (2008–2018) annual growth rates thereafter (World Bank, 2017). Over the course of one generation, 1.2 billion people have moved out of extreme poverty. The share of the world’s population below the extreme poverty line of $1.90 per day has steadily declined over the past 20 years (World Bank, 2017) (Figure 2.6).1 However, even before the onset of COVID-19, progress towards poverty alleviation had decelerated and was not on track to end extreme poverty by 2030 (SDG 1 on zero poverty). The share of the world’s population living in extreme poverty declined from 15.7% to 10.0% between 2010 and 2015, but had decreased only by a further 1.8  percentage points to 8.2% in 2019 (World Bank, 2017). The most optimistic poverty headcount scenarios predict that, compared with 2020, an additional 37.6  million people will be living in conditions of 52 22 48 18 29 16 Latin America & Caribbean Southeastern Asia Southern Europe Eastern Europe Eastern Asia Southern Africa Northern Africa Central/Western Africa Southern Asia Central Asia Northern/ Western Europe Middle East Eastern Africa Northern America Australia & New Zealand Gap: ‘Very worried’ minus ‘Experienced’ Have experienced Very worried 44 15 35 8 33 7 58 32 42 18 47 24 43 20 29 7 34 13 41 21 45 30 34 20 +30 +13 +15 +20 +21 +22 +23 +23 +24 +26 +26 +27 +29 +30 +14 The Worry and Experience Index shown by region. The indices measure worry and experience across seven everyday hazards. (region index scores out of 100) Figure 2.5. Risk perception gap by region, 2020 Source: Lloyd’s Register Foundation (2020b) 19 Figure 2.6. Proportion of the world’s population living below the international extreme poverty line of $1.90 a day, 2002–2015 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database, SDG indicator 1.1.1 (UN DESA, 2021) 2002 10 5 15 20 25 30 2005 2008 2010 2011 2012 2013 2015 Percentage 21 18 16 14 13 11 10 26 extreme poverty due to the impacts of climate change by 2030. Under the “worst-case” or no action scenario, climate change will push an additional 100.7  million into poverty by 2030 (Jafino et al., 2020) (Figure 2.7). The systemic impacts of the COVID-19 pandemic are bringing about the first rise in global poverty since 1998. By October  2020 the World Bank estimated that the pandemic had set back poverty eradication targets by 6–7  years, as poverty levels had already risen close to those seen in 2017 (World Bank, 2020a; Yonzan et al., 2020) (Figure  2.8). The pandemic led to 97  million more people living in poverty in 2020 – an historically unprecedented increase. Southern Asia and sub-Saharan Africa experienced the largest increases, with an additional 32 million and 26 million people, respectively, falling below the international poverty line due to the pandemic in 2020 (Jafino et al., 2020). According to the INFORM Natural Hazard Risk Index, most of the countries that face high disaster risk are also those with a high share of population living under the national poverty line. Among the top 20 countries with an average INFORM Natural Hazard Risk Index of 6.6 or above, 90% are middle- and lower-income countries with an average national poverty rate of 34% (European Commission, 2021) (Figure  2.9). This compares to less than 0.5% for the countries at the opposite end of the risk scale. For such high-risk and high-poverty countries – which generally fall into the low-income category – disaster impacts can lead to income and consumption shortfalls, negatively affect welfare and cause major setbacks in human and economic development, with long-term consequences. Within high-risk countries, a higher percentage of poor households are exposed to disasters compared with non-poor households (Figure  2.10). For example, after Cyclone Aila hit Bangladesh in 2009, 25% of poor households were exposed to its impacts, compared to only 14% of non-poor households (Akter and Mallick, 2013). In Viet Nam, the higher share of poor households exposed to floods is concentrated in urban areas, as land scarcity is pushing poor populations to settle in higher-risk areas (Nguyen and Winters, 2011; Nguyen et al., 2013). The lack of access to social 20 60 0 110 120 160 180 Additional people living in extreme poverty by 2030 due to disasters and climate change (millions) 20 40 80 140 100.7 37.6 Optimistic scenario Pessimistic scenario 9.2 3 6.7 7 2015 4 2 6 8 10 Percentage 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 6.1 COVID-19 - DOWNSIDE PROJECTION COVID-19 - BASELINE PROJECTION PRE-COVID-19 PROJECTION 3% 2030 TARGET Figure 2.7. Number of additional people (in millions) being pushed into poverty due to climate change, 2020 projections through to 2030 Source: Jafino et al. (2020) Figure 2.8. Projected global extreme poverty by 2030: COVID-19 impacts on poverty alleviation Sources: Lakner et al. (2020); World Bank (2020a); Yonzan et al. (2020) 21 0 10 20 30 40 50 60 70 80 Philippines (8.4) Bangladesh (8.2) Myanmar (7.8) India (7.7) Indonesia (7.7) Pakistan (7.4) Viet Nam (7.4) Haiti (7) Somalia (6.9) Ecuador (6.9) Afghanistan (6.7) Iran (Islamic Republic of) (6.7) Guatemala (6.7) Dominican Republic (6.7) Papua New Guinea (6.7) El Salvador (6.6) Nicaragua (6.6) Honduras (6.5) Share of people living under the national poverty line (%) INFORM Natural Hazard Risk Index score Figure 2.9. Top countries with highest levels of the INFORM Natural Hazard Risk Index and their shares of population under the national poverty line, 2021 Source: UNDRR analysis based on INFORM Natural Hazard Risk Index (European Commission, 2021) and Global Sustainable Development Goal Indicators Database (UN DESA, 2021) protection measures and risk-sharing tools like insurance means people in poverty are often forced to use their already limited assets to buffer disaster losses, which drives them into further poverty. 2.1.3 Disaster loss and hunger Disasters and food security are linked in numerous ways. At the local level, disasters directly damage crops, livestock and livelihoods. Nationally or internationally, they have systemic impacts on supply chains and international trade. There is a positive correlation between years of high disaster loss and global peaks in the food price index (Figure 2.11). This is further illustrated by the impacts of COVID-19. The pandemic has escalated a previously rising trend of global food prices, making nutritious food unaffordable for millions of families already struggling to cope with income losses. Hunger and malnutrition are significantly worse in countries with agrifood systems highly sensitive to rainfall, temperature variability and severe drought, and where the livelihood of a high proportion of the population depends on agriculture. For example, in 2020, the average level of undernourishment in countries with high exposure to climate shocks was 3 percentage points higher than countries with low or no exposure (Figure 2.12). 22 Figure 2.10. Share of poor and non-poor households exposed to disasters (selected examples 1997–2014) COUNTRIES CITIES REGIONS KENYA 99% 95% MIDDLE EAST & NORTH AFRICA 46% 35% VIET NAM 38% 29% NEPAL 56% 50% Non-poor Poor GUYANA 40% 30% HAITI 75% 45% GUATEMALA 35% 29% SAN SALVADOR 9% 8% MUMBAI 41% 23% The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations TEGUCIGALPA 17% 11% BANGLADESH 25% 14% Note: Given the lack of international data on this issue, the region, country and city examples were selected based on a review of literature to identify where specific studies had been done and to use the data available from them. Each source has a different definition of “poor” and “non-poor” people. The definition of exposure differs based on the type of hazard and context in which it occurs. Source: UNDRR analysis, based on literature for: Bangladesh (Akter and Mallick, 2013); Guatemala (Tesliuc and Lindert, 2002); Guyana (Pelling, 1997); Haiti (Fuchs, 2014); Kenya (Opondo, 2013); Middle East and North Africa (World Bank, 2014); Mumbai (Baker et al., 2005; Ranger et al., 2011); Nepal (Gentle et al., 2014); San Salvador and Tegucigalpa (Fay, 2005); and Viet Nam (Nguyen et al., 2013) 23 50 100 150 200 300 350 400 250 1900 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 Disaster loss (billion $) Food price index 364.10 b 67.1 118.8 27.09 b Figure 2.11. Risk and hunger: relationship between disaster impact and food price index, 1990–2020 Source: UNDRR analysis based on EM-DAT (CRED, 2021), Food Price Index (FAO, 2021a) and Sendai Framework Monitor (SFM) (UNDRR, 2021c) Countries with low exposure to climate extremes Countries with high exposure to climate extremes Number of undernourished Prevalence of undernourishment (2020) 83% 11% 7% 24% Figure 2.12. Number of undernourished people and prevalence of undernourishment in countries, 2020 Source: UNDRR analysis based on EM-DAT (CRED, 2021) and FAOSTAT (FAO, 2021a) 2.1.4 Disaster loss and gender inequality Reducing poverty positively increases disaster resilience and also has strong positive associations with removing gender-based inequalities. Women’s reduced access to economic resources and roles in work, family and public life translate into a gender difference in resilience to disasters and climate change. Women as a group are not innately more vulnerable than men, but gender inequalities contribute to their disproportionate risk (Neumayer and Plümper, 2007). While gender-disaggregated data reporting on disaster impacts remains insufficient, gender differences in access to the economic and financial means for recovery are telling. The gender pay gap remains a key global challenge. Women receive on average 15% lower pay than men, and thereby have fewer economic resources to build resilience and recover from shocks (UNDP, n.d.b; WEF, 2019). This is compounded by women’s reduced personal access to ready finances in emergencies, which is on average 10% lower than that of men (Figure 2.13). Although the gender gap in access to finance in emergencies is greater in middleand lower-income countries (Figure  2.13), the global average for high-income countries also shows a difference, with 72% of men and 66% of women having individual access to finance in emergencies (World Bank, 2021a). Gender-differentiated impacts of disasters and the social responses to them can exacerbate gender inequality, especially in access to economic resources, leading to greater impoverishment and less resilience to future disasters. A recent study in Bangladesh on the economic dimension of women’s vulnerability during cyclones identified seven common challenges or issues: increased unemployment, decreased livelihood options and increased 24 poverty; increased food insecurity; loss of property; girls dropping out of education; early marriage; migration; and long-term displacement (Sultana, 2022). Among these impacts, the first four are immediate, while the last three are indirect and long lasting. Other studies have found gender disparities in disaster recovery support in areas such as employment and livelihoods, where, for example, formal programmes may focus on jobs mainly done by men and fail to recognize women’s livelihoods in the informal sector or the uninsured losses they sustain from food gardens, fishing and farming (ILO, 2020). Increases in gender-based violence during emergencies, disaster displacement and slow-onset disasters is also a key concern. Multiple studies have highlighted this challenge at the global level, in regions such as Asia and the Pacific (Bhalla, 2018), as well as in various countries and disaster settings such as wildfires in Australia (Parkinson and Zara, 2011), cyclones in Bangladesh (Rezwana and Pain, 2020) and floods and hurricanes in the United States (Gearhart et al., 2018). Monitoring during the COVID-19 pandemic has highlighted the “shadow pandemic” of genderbased violence globally (UNFPA, 2020; Emandi et al., 2021; WHO, 2021c). For example, a recent study on the impact of COVID-19 lockdowns and associated economic losses on urban populations in four Latin American cities found a high correlation between these stresses and violence within the home, as well as depression and anxiety, affecting women and people of diverse sexual orientations and gender identities (in Coquimbo and Santiago in Chile, Lima in Peru and Santo Domingo in the Dominican Republic) (Castro et al., forthcoming). 0% 10% 20% 30% 40% 50% 70% 60% South Asia Middle East and North Africa Latin America and Caribbean East Asia and Pacific Europe and Central Asia Sub-Saharan Africa 60% 53% 64% 58% 50% 33% 53% 39% 54% 41% 49% 38% Male Female Excluding high income Figure 2.13. Gender-differentiated access to finance in emergencies (excluding high-income countries) Note: Percentages indicate the share of people (male and female) who report that in case of an emergency it is possible for them to come up with 1/20 of the gross national income per capita in local currency within the next month (e.g. through savings, supplementary income, access to loans and credit). Source: UNDRR analysis based on World Bank (2021a) 25 Using SDG data, it is also now possible to observe statistically significant correlations between genderbased violence and being affected by disasters. An analysis of SDG data (Figure  2.14) shows a strong relationship between the number of people affected by disaster and the number of female victims of intentional homicide (the SDG statistics are based on numbers of victims per 100,000 population). Building on the above research on increased genderbased violence in disasters, this suggests that the additional socioeconomic and psychological stresses of disasters on affected people exacerbate vulnerability through indirect social impacts. These further undermine coping capacity, social cohesion and well-being, which in this example has a disproportionate impact on women and girls. Figure 2.14. Relationship between disaster affectedness and intentional homicides of women, 2015–2022 Source: United Nations Department of Economic and Social Affairs (UN DESA) analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) Human trafficking is another recognized secondary impact of disasters, which has a significant gender dimension. An analysis of available SDG data demonstrates a strong relationship between disaster affectedness and the number of detected female victims of human trafficking (Figure  2.15) in all regions except Northern Africa, Western Asia and Oceania. While data availability on this issue, particularly in data-scarce regions, remains a concern, it points to a need to better understand the cascading and systemic impacts of disasters on well-being (IOM, 2017). Figure 2.15. Relationship between disaster affectedness and trafficking of women and girls, 2015–2021 Source: UN DESA analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) In summary, pre-existing gender inequalities and different gender roles in societies affect exposure, vulnerability, coping capacity and preparedness in relation to disasters (Figure 2.16). SDG indicator 16.2.2 Detected victims of human trafficking (number) SDG indicator 1.5.1 Number of people affected by disaster (number) SDG indicator 16.1.1 Detected victims of intentional homicide, by sex (women) SDG indicator 1.5.1 Number of people affected by disaster (number) 26 Figure 2.16. DRR and risk factors shaped by gender Research also shows women play a crucial role in scaling up disaster preparedness, bringing a wealth of knowledge, capacities and needs-based approaches to decision-making. However, there is a need for women’s participation in these roles to be institutionalized in DRM (Picard, 2021). 2.1.5 Risk and urbanization The relationship between poverty and risk is compounded by rapid urbanization globally. By 2017, over half of the world’s population (56%) was living in urban areas – increasingly in highly dense cities (United Nations Population Division, 2018; World Bank, 2022) (Figure 2.17). Figure 2.17. Urban population as a share of total global population, 1960–2017 Source: UNDRR analysis based on World Bank (2022) and United Nations Population Division (2018) Moreover, a quarter of the world’s urban population lives in informal settlements in conditions of poverty (Figure  2.18). About 1  billion people in developing countries are vulnerable to disasters because they live in congested, poorly built houses with high levels of exposure and without adequate emergency services or coping capacities (United Nations Population Division, 2018; World Bank, 2022). Figure 2.18. Share of urban population living in informal settlements, by region, 2018 Source: UNDRR analysis based on World Bank (2021b) Rapid urbanization is making people more vulnerable to the impacts of climate change, in part due to the concentration of large cities in coastal areas subject to the impacts of sea-level rise. Sea levels rose on average 1.3  mm per year between 1901 and 1971, but since 2006, that rate has increased to 3.7  mm per year (IPCC, 2021a). It is projected that by 2100, 200  million people in the world will be affected by sea-level rise, with most of those in Asia, in particular China (43 million), Bangladesh (32 million) and India (27 million) (Kulp and Strauss, 2019). DRR Society RISK FACTORS SHAPED BY GENDER DYNAMICS: Exposure Vulnerability Coping Capacity Preparedness Disasters Disaster impact Gender inequality 0 10 20 30 40 50 60 1960 1970 1980 1990 2000 2010 Percent 2020 55.71 33.61 World Sub-Saharan Africa South Asia Arab States Southeast Asia Northeast Asia Latin America and the Caribbean Europe and Central Asia Pacific 10% 20% 30% 40% 50% 60% 29% 55% 45% 44% 33% 31% 24% 14% 11% Share of urban population living in informal settlements 0% North America 0.01% 27 SUBSTANTIAL REDUCTIONS SUBSTANTIAL INCREASES PRIORITY 1 Understanding disaster risk PRIORITY 4 Enhancing disaster preparedness for effective response and to ‘Build Back Better’ in recovery, rehabilitation and reconstruction PRIORITY 2 Strengthening disaster risk governance to manage disaster risk PRIORITY 3 Investing in disaster risk reduction for resilience A. Global disaster mortality B. Number of affected people globally C. Direct economic loss D. Disaster damage and disruption E. Countries with national and local disaster risk reduction strategies F. International cooperation to developing countries G. Multi-hazard early warning systems risk information and assessment The Sendai Framework outlines seven global targets to be achieved: Figure 2.19. Sendai Framework targets and priorities 28 2.2 The Sendai Framework at the halfway point: Getting it right towards 2030 The Sendai Framework includes four priorities and seven targets intended to define and measure progress towards its overall goal to increase resilience by reducing risk (Figure  2.19). The year 2022 is the halfway point of the agreement’s 15 year life. Member States and their partners have made significant achievements in its implementation and monitoring since 2015. The Sendai Framework targets are the basis for States’ voluntary reporting to SFM (Box  2.1). The first four targets are to substantially reduce disaster impacts: mortality, people affected, economic loss, and damage to critical infrastructure and disruption of basic services (Targets  A–D). The other three targets are to substantially increase the adoption of national and local DRR strategies, international cooperation to developing countries and access to multi-hazard early wanting systems (Targets  E–G). There are now 155 countries reporting on at least one of the seven targets, and new trends are emerging across the various indicators.2 2 All data from SFM used throughout this chapter up to and including 2019 is from the 31 March 2021 reporting milestone; all data from SFM for 2020 is from the 31 October 2021 reporting milestone. United Nations resolution 69/283, adopting the Sendai Framework, also called on all stakeholders to make specific and time-bound voluntary commitments (United Nations, 2015a). By February 2022, UNDRR had published 100 such voluntary commitments involving almost 650 organizations working in partnership at local, national, regional and global levels on wide-ranging projects, for example, supporting small business resilience, building youth capacity and exploring frontier technologies to understand risk. 2.2.1 Fragile progress in reducing the human cost of disasters A large year-on-year variability exists in mortality trends (Figure  2.20), highlighting that largescale events and mega disasters can overwhelm countries’ capacities to prepare, respond and recover. While global disaster-related mortality, in the long term, has seen an overall increasing trend (Figure  2.20), there has been a perceptible decline from over 104,000 deaths per year in the 2000s to an average of 81,000 per year in the 2010s. Yet, significant challenges remain in reducing global disaster mortality by 2030 (Sendai Framework Target A), especially in light of the COVID-19 impact, which pushed up the overall mortality from 2020 onwards. Box 2.1. The Sendai Framework Monitor (SFM) Figure 2.20. Global disaster-related mortality, 1989–2020 The Sendai Framework is supported by 38 indicators to track progress in implementing the seven targets of the Sendai Framework, as well as related dimensions in SDGs  1, 11 and 13. The Open-ended Intergovernmental Expert Working Group recommended the indicators, and the United Nations General Assembly endorsed them. SFM is the online reporting tool where countries enter, track and submit official data under a reporting framework. It supports countries to develop DRR strategies, make risk-informed policy decisions and allocate resources to prevent new disaster risk. Source: UNDRR (2021c) 1990 1995 2000 2005 2010 2015 2020 50,000 100,000 150,000 200,000 250,000 Number of people 300,000 350,000 Note: The mortality rate for 2020 includes deaths related to COVID-19; however, due to incomplete reporting, this figure does not reflect the complete impact of COVID-19 in terms of mortality. Source: UNDRR analysis based on DesInventar (UNDRR, 2021d), EM-DAT (CRED, 2021) and SFM (UNDRR, 2021c) 29 Evidence points to the benefits of disaster preparedness actions by countries, such as the preparation of DRR strategies as a means of saving lives and alleviating disaster impacts. The number of countries with local governments that adopt tailored national DRR strategies is strongly and positively correlated with a reducing disaster mortality rate over time (SDG indicator  13.1.3 / Sendai Framework Target E and SDG indicator 1.5.1 / Sendai Framework Target  A) (Figure  2.21). While this does not establish direct causality between local strategies and reduced disaster mortality, the development of such strategies is the type of investment in local risk reduction that, among other things, results in reduced mortality. The overall number of people affected by disasters (Sendai Framework Target  B) is on a moderate downward trend (Figure  2.22). Over the past 20  years, the average number of people affected has decreased from 228 million in the 2000s to just under 200 million in the 2010s. This uses the Sendai Framework reporting definition of people affected by disasters as people ill or injured, with damaged or destroyed dwellings, or whose livelihoods were disrupted or destroyed by disasters. Figure 2.22. Number of people affected by disasters globally, 1989–2020 Source: UNDRR analysis based on DesInventar (UNDRR, 2021d), EM-DAT (CRED, 2021) and SFM (UNDRR, 2021c) 100,000 200,000 300,000 400,000 500,000 Number of people 600,000 700,000 1990 1995 2000 2005 2010 2015 2020 SDG indicator 13.1.3 Local governments that adopt and implement local DRR strategies in line with national strategies SDG indicator 1.5.1 Deaths due to disaster Number of people affected by disaster Number of local governments that adopt and implement local DRR strategies 20,000 in line with national strategies 40,000 60,000 80,000 100,000 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 120,000 140,000 160,000 180,000 180,000 200,000 5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000 45,000 0 Figure 2.21. Relationship between disaster-related deaths and adoption of local DRR strategies, 2005–2019 Source: UNDRR analysis based on SFM (UNDRR, 2021c) 30 3 As with other hazards, under the Sendai Framework terminology for Target B, “people affected” by COVID-19 are those who have suffered injury, illness or other health effects, as well as people evacuated, displaced or relocated, or suffering direct damage to their livelihoods, economic, physical, social, cultural or environmental assets. The systemic impacts of the COVID-19 pandemic are increasingly putting achievement of the Sendai Framework goal at risk. Low-income countries were the hardest hit in 2020 by disasters including the pandemic and other hazards, with one in four people being directly affected (Figure  2.23).3 Ensuring post-pandemic recovery and building back and forward better will be essential to future resilience. Over the past decade, disasters have also forced over a quarter of a billion people into internal displacement, resulting in three times more internal displacements than those due to conflict and war each year on average (Figure 2.24). Number of people 5,000 10,000 15,000 20,000 25,000 30,000 2015 2016 2017 2018 2019 2020 High income Upper middle income Lower middle income Low income Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) Figure 2.23. Number of people affected by disasters per 100,000 population by country income group (Sendai Framework Target B), 2015–2020 Number of people 5,000,000 10,000,000 15,000,000 20,000,000 25,000,000 30,000,000 35,000,000 40,000,000 45,000,000 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 Conflict Disasters 30, 688,349 42,350,850 2,892,200 11,768,022 Figure 2.24. Number of displaced people due to conflict and disasters, 2010–2020 Source: UNDRR analysis based on Global Internal Displacement Database (IDMC, 2021) 31 Some regions were hit hard by climatic disasters during 2020, which caused large-scale displacement. In Central and South America, the 2020 Atlantic hurricane season was the most active on record, with 30 major storms forcing millions of people to leave their homes. In November  2020, Hurricanes Eta and Iota caused chaos and flooding in 12 Central American and Caribbean countries. Four  million people were internally displaced in Honduras alone. South and East Asia and the Pacific countries faced intense cyclone seasons. Cyclone Amphan triggered nearly 5  million evacuations across Bangladesh, Bhutan, India and Myanmar. Across the Middle East and sub-Saharan Africa, extended rainy seasons also uprooted millions of people (WMO, 2021). Many internally displaced people – including those fleeing from conflict and war – are also living in climate change “hotspots” subject to increased drought, extreme temperatures, floods and sea-level rise that exacerbate their vulnerability and exposure, adding systemic disaster risk for groups already in vulnerable situations. 2.2.2 Alarming trends – growing economic cost of disasters While disasters are claiming fewer lives annually, they are also costing more and increasing poverty. On a global level, the dollar value economic loss associated with all disasters –geophysical, climateand weather-related – has averaged approximately $170  billion per year over the past decade, with peaks in 2011 and 2017 when losses soared to over $300  billion (Figure  2.25). In 2011, the high losses were mainly due to the Tōhoku earthquake in Japan and floods in Thailand, both of which became complex and systemic disasters with cascading impacts across national, regional and international economies. In 2017, the losses were from intense hurricane/cyclone seasons in the North Atlantic and East Asia. Such economic loss figures are likely underestimated, given the gaps in data for many countries, and the medium- and long-term economic losses that are not tracked. For example, a recent study of the losses to the tourism sector due to the Sunda Strait tsunami and COVID-19 in Indonesia highlighted that only by calculating indirect losses can disaster impact be assessed comprehensively and ultimately managed (Sagala et al., 2022). Figure 2.25. Direct economic loss from disasters (billion $), 1989–2020 Source: UNDRR analysis based on EM-DAT (CRED, 2021) While the economic impact of geophysical disasters has remained stable over recent decades, annual economic loss from climate- and weather-related events has risen significantly since the 2000s, in line with their amplified intensity and frequency. This is presenting a new challenge for meeting Sendai Framework Target  C to reduce economic loss in relation to GDP. While dollar value losses are often greater in highincome countries, it is the poorest countries that sustain the highest relative loss. Low-income and lower middle-income countries lose on average 0.8–1% of their national GDP to disasters per year, compared to 0.1% and 0.3% in high-income and upper middle-income countries, respectively (Figure 2.26). At regional level, the highest share of economic loss is borne within Asia and the Pacific, where countries lose on average 1.6% of GDP to disasters. Africa is the second most affected region, with an average disaster-related economic loss of 0.6% of GDP (Figure 2.27). According to SwissRe’s Sigma Research, less than half of disaster-related losses at a global level in 2020 were insured (approximately $89  billion of an estimated $202  billion). This was above the previous 10  year annual average of $71  billion of insured loss (Swiss Re Institute, 2021) (Figure 2.28). Between 1980 and 2018, on average, about 40% of all disaster-related losses were insured (Munich Re, n.d.). However, insurance is overwhelmingly concentrated in richer countries. The insurance 50 100 150 200 350 400 250 300 Direct economic loss (billion $) 1990 1995 2000 2005 2010 2015 2020 32 Europe and Central Asia Americas and the Caribbean Arab States Africa Asia and the Pacific 0.2% 0.6% 0.8% 1.0% 1.2% 1.4% 1.6% High income Upper middle income Low income Lower middle income 0.2% 0.4% 0.6% 0.8% 1.0% 1.2% Figure 2.26. Average economic loss from disasters as share of GDP by country income group (Sendai Framework Target C), 2010–2020 Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) Figure 2.27. Average economic loss from disasters as share of GDP by region (Sendai Framework Target C), 2005–2020 Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 100 200 300 400 500 0 Insured losses Uninsured losses 10-year moving average insured losses 10-year moving average economic losses Economic losses = insured + uninsured losses Figure 2.28. Insured and uninsured losses ($ billion at 2020 prices), 1970–2020 Source: Swiss Re Institute (2021) 33 coverage rate in most developing and emerging economies is well below 10% and sometimes almost zero (Munich Re, n.d.). Private insurance products are often not available or affordable for people with low-value assets and low incomes. In the aftermath of a disaster, uninsured losses will typically be paid through the labour and personal financial reserves of affected people, government funds and international humanitarian assistance. This uncertainty and drain on State budgets poses an ongoing challenge for poorer countries to afford to compensate affected people and also undertake resilient reconstruction and rebuild social services. Economic loss of such proportions – especially when uninsured – can have serious future implications for poverty alleviation. It can undo years of progress, reverse development trajectories and divert State resources that might otherwise have gone to social protection, poverty reduction and hunger alleviation. 2.2.3 Beyond direct loss Direct disaster loss calculations do not capture the full human, social and economic implications of disasters. Another way to describe the extent of the indirect costs brought about by disasters is in terms of life years lost, a metric developed for the Global Assessment Report on Disaster Risk Reduction 2015 (UNISDR, 2015). Rather than using only the four dimensions of fatalities, injuries, dislocations and the financial damage that they wreak, life years lost is a way to describe the time required to produce economic development and social progress. It provides a way of measuring setbacks to social and economic development across countries and regions (Doan and Noy, 2022). This measure shows that the costs of the pandemic in terms of life years lost, measured for 2020, far outweigh the annual average costs associated with other disasters and/or the summed cost associated with all other epidemics combined in the past two 0 40 80 120 104.374 39.585 25.803 32.512 1.127 3.540 1.160 0.652 0.004 20.771 3.048 6.771 0.716 0.078 0.028 Asia Americas Europe Africa Oceania Total life years lost (millions) COVID-19 total in 2020 Disasters 2000–2019 annualized average All epidemics in 2000–2019 sum total Source: Adapted from Doan and Noy (2022) Figure 2.29. Total life years lost by region due to COVID-19 in 2020 in comparison to the annualized average life years lost for other disasters (2000–2019) and the sum total for all other epidemics (2000–2019) 34 decades, and that this is the case across all regions (Figure  2.29). The life years lost from COVID-19 in 2020 were more than three times the annual average from other disasters in Asia, and also much higher than the average in the Americas, Africa, Europe and Oceania, although in the Pacific, the numbers appear small due to smaller populations. The COVID-19 pandemic has had severe economic and health impacts in many small but highly exposed and vulnerable countries such as SIDS in the Pacific, Indian Ocean and Caribbean (Doan and Noy, 2022). 2.2.4 The Sendai Framework’s “substantially reduce” targets Early analysis of the data reported by Member States through SFM indicates the global community is off target to reach the goal of the Sendai Framework by 2030. None of the Sendai Framework’s “substantially reduce” targets are on track to be achieved by 2030: disaster-related morbidity (Target  A), affected persons (Target B), direct economic loss relative to GDP (Target C) and damage to critical infrastructure and disruption to basic services (Target  D). On the contrary, direct economic loss and damage to critical infrastructure have increased substantially over the past decade (Figure 2.30). The climate emergency, the far-reaching repercussions of the COVID-19 pandemic and multiple other risk drivers further threaten progress towards the achievement of global DRR commitments. Projection scenarios for reducing disaster-related mortality and people affected by disasters reveal just how much the Sendai Framework goal has been reversed by the pandemic. Before COVID-19, global disaster-related mortality was on track to decline, with 2030 levels likely to be around 94% of 2010 levels. In the scenario that 0.0% 0.2% 0.4% 0.6% 0.8% 1.0% 1.2% 1.4% 1.6% 1.8% 2.0% 0 1000 2000 3000 4000 5000 6000 7000 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 C1 Direct economic loss attributed to disasters in A1 Number of people relation to GDP (%) B2 Hundreds of people D1 Index of critical infrastructure damaged = number of infrastructure units and facilities damaged/population × 100, 000 A1 Number of deaths and missing persons attributed to disasters, per 100,000 population B1 Hundreds of directly affected people attributed to disasters, per 100,000 population C1 Direct economic loss attributed to disasters in relation to GDP (%) D1 Damage to critical infrastructure attributed to disasters Figure 2.30. Progress to substantially reduce mortality, persons affected, economic loss, damage to infrastructure (Sendai Framework Targets A–D), 2010–2020 Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) 35 considers the short-term effects of the COVID-19 pandemic, slow vaccination rates in the Global South and various indirect impacts on human health, the global mortality rate may increase by 2030 (Figure 2.31). In addition, as noted above, there is not yet sufficient data on smaller localized events in the national and international data. To have a complete picture of the risks considered in the Sendai Framework, there is a need to incorporate intensive and extensive risks, and address future hazard scenarios that include viruses, other biological hazards and the effects of climate change. The DesInventar tool and database has supported countries to monitor and analyse the impact of all hazard events. It is being scaled up and enhanced by UNDRR in collaboration with the United Nations Development Programme (UNDP) and other partners. 2.2.5 The Sendai Framework’s “substantially increase” targets In the first 6 years of implementation of the Sendai Framework, there was a 1.5-fold increase in the number of countries with national and/or local DRR strategies (Target E), to 120 countries in 2020 (Figure 2.32; Table 2.1). Furthermore, the national strategies adopted by countries show an increasing level of comprehensive alignment with the Sendai Framework according to country self-assessment against the criteria provided in SFM (Table  2.1). This means they include a stronger focus than previous strategies on preventing the creation and accumulation of new risk, reducing existing risk, building the resilience of sectors, recovery, building back better and promoting policy coherence with the 2030 Agenda and the Paris Agreement. The COVID-19 crisis further underscores the urgency to adopt multi-hazard DRR strategies that address all risks, including biological and health emergencies (Christel et al., 2020). Strengthening resilience, supporting ex ante risk prevention, restoring livelihoods, and rebuilding economic and social infrastructure requires substantial financial resources. The Sendai Framework aims to substantially enhance international cooperation to developing countries, recognizing that official development assistance (ODA) plays a key role, particularly for the poorest and most vulnerable countries (Target  F). Disasterrelated funding forms a relatively small portion of overall ODA. From a total of $1.17 trillion of overall ODA provided over the past decade (2010–2019), 11% ($133  billion) was disaster related. A smaller fraction still – $5.5 billion – was the share allocated Figure 2.31. Number of deaths and missing persons attributed to disasters, actual data 2010–2020 and outlook 2021–2030 (Sendai Framework Target A) Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) 2010 500 1,000 1,500 2,000 2,500 0 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 Number of deaths and missing persons attributed to disasters per 100,000 population Projections with COVID-19 Projections without COVID-19 36 Table 2.1. Number of national strategies and alignment with Sendai Framework, 2015–2020 Year Total number of countries with national and/ or local DRR strategies Average score of Sendai Framework alignment (for national strategies) 2020 120 0.68 2019 103 0.66 2018 88 0.55 2017 75 0.47 2016 54 0.43 2015 48 0.41 Source: UNDRR analysis based on SFM (UNDRR, 2021c) Both Only local Only national 10 0 30 20 50 40 70 60 80 100 90 2015 2016 2017 2018 2019 2020 3 4 5 3 2 2 8 10 14 18 27 29 37 40 56 67 74 89 Source: UNDRR analysis based on SFM (UNDRR, 2021c) TOTAL ODA 2010–2019 $1.17 trillion DISASTER FINANCING $133 billion DISASTER PREVENTION AND PREPAREDNESS $5.5 billion 4.1% 5.8% RECONSTRUCTION, RELIEF AND REHABILITATION $7.7 billion EMERGENCY RESPONSE $119.8 billion 90.1% Figure 2.33. Disaster-related financing as share of total ODA Source: UNDRR analysis based on OECD.Stat (OECD, 2021a) Figure 2.32. Number of countries with national and/or local DRR strategies, 2015–2020 37 for disaster prevention and preparedness, compared to $119.8 billion earmarked for emergency/disaster response and $7.7  billion for reconstruction, relief and rehabilitation. Thus, of overall aid financing between 2010 and 2019, only 0.5% of the total amount was spent on risk reduction measures in advance of disaster (Figure 2.33). The Organisation for Economic Co-operation and Development DRR policy marker introduced in 2017 provides figures for DRR-related ODA (OECD, 2018a). Figure  2.33 is based on analysis of the humanitarian aid portion of ODA. While disaster-related financing has increased since 2010, most of the resources have supported activities to respond to and recover from disasters (Figure 2.34). Countries with the highest disaster-related mortality receive only a negligible share of funding for DRR per capita (Figure  2.35). Some of the countries with the highest Natural Hazard Risk Index do receive commensurate levels of prevention and preparedness funding, while most do not (Figure 2.36). ODA for prevention and preparedness does not adequately reflect the needs. The world is therefore not on track to deliver on its commitment of substantially increased international development assistance for DRR, disaster preparedness and prevention (Target F). The adoption of multi-hazard early warning systems is another critical element of DRR, as reflected under Sendai Framework Target G. However, efforts should be scaled up. In 2020, 36 countries reported Figure 2.34. Disaster-related financing: ODA for prevention and preparedness, funding for reconstruction relief and rehabilitation, and emergency response ($ million), 2010–2019 Source: UNDRR analysis based on OECD.Stat (OECD, 2021a) 4,000 6,000 8,000 12,000 14,000 16,000 18,000 20,000 10,000 2,000 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 Disaster prevention and preparedness Reconstruction relief and rehabilitation Emergency response 38 Figure 2.35. ODA for prevention and preparedness received by countries with the highest mortality levels, 2010–2019 average 0 5 10 15 20 25 30 35 Haiti (232) Bhutan (176.94) Micronesia (Federated States of) (46.97) Iraq (37.9) Somalia (17.5) Dominica (15.28) Bahamas (12.24) Armenia (11.46) Democratic Republic of the Congo… Kiribati (8.2) Liberia (8.09) Malawi (7.67) Libya (7.6) Mongolia (6.99) Egypt (5.83) Turks and Caicos Islands (5.18) Nepal (5.15) Samoa (4.89) Djibouti (4.48) Sierra Leone (4.01) Saint Martin (French Part) (3.28) Cameroon (3.11) British Virgin Islands (3.04) Burkina Faso (2.69) United Republic of Tanzania (2.67) Togo (2.61) Mauritius (2.6) Gambia (2.53) Antigua and Barbuda (1.99) Guinea (1.98) Japan (1.91) Niger (1.82) Saint Lucia (1.7) Guatemala (1.53) Angola (1.51) Curaçao (1.5) Kyrgyzstan (1.45) ODA in $ per capita (2010–2019 average) Countries by rank of mortality in deaths/missing persons per 100,000 population Source: UNDRR analysis based on OECD.Stat (OECD, 2021a) and SFM (UNDRR, 2021c) 39 0 0.5 1 1.5 2 2.5 Philippines (8.4) Bangladesh (8.2) Myanmar (7.8) India (7.7) Indonesia (7.7) China (7.5) Pakistan (7.4) Viet Nam (7.4) Peru (7.1) Haiti (7) Somalia (6.9) Ecuador (6.9) Afghanistan (6.7) Mexico (6.7) Colombia (6.7) Iran (Islamic Republic of) (6.7) Guatemala (6.7) Dominican Republic (6.7) Papua New Guinea (6.7) El Salvador (6.6) Nicaragua (6.6) Honduras (6.5) Albania (6.3) Venezuela (Bolivarian Republic of) (6.2) Madagascar (6.2) Rank of INFORM Natural Hazard Risk Index (average 2013–2019) ODA in $ per capita (2010–2019 average) Figure 2.36. ODA for prevention and preparedness received by countries with the highest level of Natural Hazard Risk Index, 2010–2019 average Source: UNDRR analysis based on INFORM Natural Hazard Risk Index (European Commission, 2021) and OECD.Stat (OECD, 2021a) 40 having a multi-hazard early warning system in place. According to countries’ self-scoring against the SFM reporting criteria, around 30% of the reported early warning systems have moderate to low coverage and effectiveness. Some 50% have moderate and substantial levels of coverage and effectiveness, and 20% are considered as fully effective (Figure 2.37). 2.3 Ways forward Member States and their partners have made significant achievements in risk reduction since the adoption of the Sendai Framework in 2015. However, despite discernible progress, the world is off track to reach the goal of the Sendai Framework by 2030. This is further complicated by the significant gap between reported risk, perceived risk and action to reduce risk, as evidenced by perception surveys, policy prioritization and funding. Risk aggravates and is aggravated by multiple socioeconomic factors such as poverty, economic inequality, gender inequality, urbanization, conflict and fragility, and human development choices that are pushing planetary boundaries further. Ecosystem degradation is a major driver of disaster risk and a key component of vulnerability to disasters. Information on the trends and costs of disasters do not reveal the full picture of how disasters affect people’s lives, livelihoods and well-being, although it is useful for stocktaking and future planning. One dollar in losses does not mean the same thing to a rich person as to a poor person, and the severity of a $170 billion loss depends on who experiences it and in which country. The same loss affects people below the poverty line far more because they rely on fewer assets, their consumption is at subsistence level, they cannot rely on savings to smooth the impacts, their health and education are at greater risk, and they may need more time and resources to recover and rebuild. They are also less likely to be adequately covered by social assistance or insurance programmes that can reimburse at least part of their losses. The climate emergency, the COVID-19 pandemic and other systemic risks further threaten global progress towards achievement of the key global commitments to 2030. Transformative action is therefore required to accelerate investment in risk reduction and sustainable development. 0 2 4 6 8 10 12 14 Comprehensive achievement (up to 1) Substantial achievement (up to 0.75) Moderate achievement (up to 0.50) Limited achievement (up to 0.25) No hazard information available (0) 7 13 5 6 5 Number of countries Figure 2.37. Countries with available multi-hazard early warning systems, by score Source: UNDRR analysis based on DesInventar (UNDRR, 2021d) and SFM (UNDRR, 2021c) 41 3. Systemic risk as a challenge to sustainable development Disasters, climate change and their systemic impacts can undermine all three pillars of sustainable development: social, environmental and economic. As evidenced by the COVID-19 pandemic, this is occurring more rapidly and more unpredictably than anticipated, across multiple sectors, dimensions and scales. With only 8  years left to achieve the 2030 Agenda and the Sendai Framework targets, progress is not occurring at the pace and scale required. Progress to achieve the Paris Agreement goal to limit global warming to well below 2°C, and preferably to 1.5°C above preindustrial levels, is also not on track. A failure to meet the Paris Agreement goal will lead to further increases in the intensity and frequency of climatic hazard events, and the compounding and cascading disasters they cause. Managing risk in all its dimensions – hazard, exposure and vulnerability – and strengthening resilience to shocks and systemic crises is an end in itself and also a critical means of achieving sustainable development. This chapter highlights how investing in risk reduction can accelerate progress towards achieving global climate and sustainable development targets, and also how unsustainable development pathways lead to greater systemic risk. Development is not merely set back by disasters, it is also an essential factor in the creation of risk. Development that is not sustainable exacerbates existing risk and creates conditions for the emergence of new risk. This includes overexploitation of the environment and the building of cities and critical infrastructure that are not resilient. It is estimated that $94  trillion will be invested in infrastructure globally in the next 25  years to sustain economic growth (Global Infrastructure Hub, 2021). This enormous collective effort to improve human development outcomes must be risk informed, as must wider development efforts. Newly developed physical and social infrastructure that is unsafe or risk blind may be exposed to natural hazards, shocks and stresses that cause severe consequences for people and economic activity. Likewise, degraded physical infrastructure, such as communications, electricity and train systems, can also create direct and systemic risk because these are essential networks. Disruptions to such infrastructure can lead to wider system failures and cascading impacts if they fail during a disaster. This chapter examines statistical data on the interactions among SDGs from the perspective of risk reduction. Many SDGs and their domains are mutually reinforcing, leading to synergies and complementarities in policy outcomes. Truly sustainable development occurs when a combination of systems come together to increase well-being across the domains of people, planet and prosperity. When this is not the case, systemic risk occurs, and the likelihood of disasters increases. Global progress towards the 2030 Agenda crucially depends on nations and the international 42 community’s ability to recognize key interlinkages, maximize the synergies and address tensions to avoid trade-offs across the systems that underpin sustainable development. 3.1 Risky business – the intersection of risk and sustainable development There are significant interactions among SDGs that have positive synergies. For example, targets related to DRR under SDG  1 can have mutually reinforcing effects on public health (SDG  3), infrastructure (SDG  9), sustainable communities (SDG 11) and climate action (SDG 13). Policymakers and development practitioners are increasingly taking action to create pathways to reinforce these synergies. For example, the emerging WHO Health Emergency and Disaster Risk Management Framework emphasizes interdisciplinary, cross-sectoral, comprehensive and systematic management of health-related disaster risks. It also highlights the synergy between development and risk reduction goals (Chan et al., 2022). A number of the figures below look at SDG data series and indicators to point to functional relations that underpin progress towards achievement of the SDGs. Interactions can be either positive, where progress in one area is associated with progress in another (classified as synergies) or negative, where progress in one goal is accompanied by deterioration in another (referred to as trade-offs). The analysis was performed using the official Global Sustainable Development Goal Indicators Database (UN DESA, 2021), which collates reported country data for the 2000–2020 period, and examines SDG interactions over multiple dimensions of disaggregation: gender, geography, country income group and others. Only statistically significant correlations are presented. The data set is not complete across all countries (as discussed in Chapter  4). The figures below are therefore presented as indicative correlations, suggesting the need for further discussion, but also for greater investment in data quality and accessibility to further refine results. 3.1.1 Disaster risk reduction as a means to sustainable development Risk reduction and disaster preparedness and planning can lead to positive outcomes for poverty reduction and vice versa. High levels of vulnerability and large numbers of persons directly affected by disasters may be causes and consequences of poverty. If disaster risk and poverty reduction strategies go hand in hand, positive outcomes can be accelerated on both fronts. Statistical analysis of SDG data shows a strong relationship between poverty (proportion of population below the international poverty line) and the number of people affected by disasters. This is illustrated most clearly when comparing a high-income and a low-income region. Figure 3.1 highlights the disparities between the region of Europe and North America and the subregion of sub-Saharan Africa in terms of the relationship between poverty and direct economic loss attributed to disasters. Figure 3.1. Relationship between persons affected by disasters and poverty, Europe and North America compared with sub-Saharan Africa, 2021 Source: UN DESA analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) SDG indicator 1.5.1 Number of people affected by disaster (number) SDG indicator 1.1.1 Proportion of people below international poverty line (%) Region Europe and North America Sub-Saharan Africa 43 The data demonstrates that in sub-Saharan Africa higher rates of poverty are correlated with higher levels of economic loss from disasters; the converse is true in Europe and North America (although it has a weaker correlation).4 Statistical analysis of available SDG data also highlights a significant and positive statistical association between the number of countries that adopt local DRR strategies (SDG indicator  13.1.3 / Sendai Framework Target  E) and the share of people living below the international poverty line (SDG indicator  1.1.1). While not suggesting a direct causal relationship between the existence of the strategies and reduced poverty, adoption of DRR strategies may be considered a proxy for a country’s wider investment in risk reduction. In this sense, the correlation observed between success in these two policy objectives (Figure  3.2) highlights the likelihood that DRR and poverty alleviation are mutually reinforcing approaches. 4 Analysis of SDG data in this chapter uses data sourced from the Global Sustainable Development Goal Indicators Database (UN DESA, 2021); this data also includes data on the corresponding Sendai Framework Targets A–E, which are reported as indicators under SDGs 1, 11 and 13, as part of the common reporting framework between the 2030 Agenda and the Sendai Framework. It is not only economic wealth that is vulnerable to disasters, but the overall economic growth rate. Disasters cause direct losses but can also bring about major economic slowdowns. There is a statistically significant correlation between direct economic loss from disasters (SDG indicator 1.5.2 / Sendai Framework Target C) and the annual growth rate of real GDP per capita (SDG indicator  8.1.1) in least developed countries. As economic loss increases, GDP growth slows (Figure  3.3). In a context of growing disaster occurrence and impact, global economic growth is at risk. At the same time as people are lifted out of poverty and the global middle class grows, the volume of accumulated wealth that is at risk of being lost to disasters increases. Figure  3.4 shows this relationship based on global SDG data analysis. As poverty is reduced and more people have more to lose, the economic value of disaster losses increases, so economic development remains highly vulnerable to disaster risk (Figure 3.4). Number of local governments that adopt and implement local DRR strategies in line with national strategies Proportion of population below international poverty line (%) 0 10 20 30 40 50 60 70 2005 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2006 80 90 0 5 10 15 20 25 SDG indicator 13.1.3 Local governments that adopt and implement local DRR strategies in line with national strategies SDG indicator 1.1.1 Proportion of population below international poverty line (%) Figure 3.2. Relationship between poverty and adoption of local DRR strategies, 2005–2019 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) 44 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 SDG indicator 1.5.2 Direct economic loss attributed to disasters (current $ in million) SDG indicator 8.1.1 Annual growth rate of real GDP per capita (%), least developed countries only Direct economic loss attributed to disasters (current $ in million) Annual growth rate of real GDP per capita (%), least developed countries only 0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000 0 1 2 3 4 5 6 7 8 9 10 Figure 3.3. Relationship between direct economic loss, and annual growth rate in least developed countries, 2005–2019 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 SDG indicator 1.5.2 Direct economic loss attributed to disasters (current $ in million) SDG indicator 1.1.1 Proportion of population below international poverty line (%) Direct economic loss attributed to disasters (current $ in million) Proportion of population below international poverty line (%) 0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000 0 5 10 15 20 25 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) Figure 3.4. Relationship between poverty and direct economic loss attributed to disasters at the global level, 2005–2019 45 Figure 3.4 captures the global trend from 2005 to 2019 in poverty decreasing, while economic loss from disasters is increasing. But this trend is not true for all countries. Figure 3.5 shows that if only global averages are used, enormous variation among countries can become invisible. It is therefore important to look at the global, regional and country levels to understand the relationship between economic losses from disasters and poverty in each context. Figure 3.5. Relationship between poverty and economic loss from disasters over time, 2000–2010 and 2011–2020 Note: Each point on the graph represents a data point for a single country. Blue points plot each country’s average direct economic losses attributable to disasters over the decade 2000–2010, plotted against the country’s average proportion of people living below the international poverty line in the same period. Orange points show the same data for each country from 2011 to 2020. The straight lines show the correlations between the global averages for the same two decades. These level out rather than reflect the enormous variation among countries. Source: UN DESA analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) Economic growth can also have a negative impact on risk reduction and climate change adaptation efforts. Although there are synergies between development and risk reduction, tensions can arise from the unintended consequences or unevenly distributed impacts of a particular development pathway. Such tensions may impede long-term adaptation or lead to maladaptation, which refers to “action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups” (Barnett and O’Neill, 2010). Planned changes that do not address structural vulnerabilities may improve resilience in one area, but increase susceptibility in another, or produce results with uneven benefits (Lo, 2022). Poverty reduction has historically been associated with increasing demand for fossil fuel energy as economies developed around the world. It is now understood this created a negative feedback loop that led to global warming. A continued reliance on fossil fuels undermines achievement of the Paris Agreement and increases risk from climate change. Transforming energy consumption into reliance on renewable energy sources is central to the sustainability of future economic growth, development and ecosystem stabilization. A proxy for use of fossil fuel energy is the share of renewable energy as a proportion of all energy used (SDG indicator 7.2.1). Figure 3.6 shows that as countries consume more fossil fuels, the percentage of total energy consumption provided from renewable sources is also decreasing in many contexts. A rapid scale-up of targeted investment in smart solutions for energy supply is imperative to meet higher demands without environmental costs that put pressure on planetary boundaries. As some of the poorest parts of the world have some of the highest renewable energy potential, using this potential could also help reduce poverty, hence turning this tension into a synergy. 3.1.2 Reconciling poverty alleviation and sustainable consumption While poverty reduction is the aim of the first SDG and a fundamental principle of sustainable development, natural resources must be used and managed in a way that maintains economic productivity and production of goods and services. However, SDG data shows the progress made in lifting millions of people out of poverty through development has also come with increasing demands for consumption. Time period 2000–2010 2011–2020 SDG indicator 1.5.2 Direct economic loss attributed to disasters (current United States $) SDG indicator 1.1.1 Proportion of people below international poverty line (%) 46 For example, progress towards poverty eradication (SDG  1) has also seen those same development processes increase the global material consumption footprint per capita (Figure  3.7). The relationship between poverty alleviation and responsible consumption and production (SDG  12) is therefore an important one, especially on a global scale in relation to reducing inequalities within and among countries (SDG 10). The environmental consequences of developmentinduced change include the modification of the physio-chemical composition of the atmosphere (leading to climate change and climate variability), soil degradation, ecosystem decline, biodiversity loss, pollution and global dissemination of invasive species. These changes are exacerbating disaster risk and climate change and generating new risks for human societies and systems. For example, deforested slopes can reduce water retention in 15.6 2005 2010 2015 2019 SDG indicator 7.2.1 Renewable energy share in the total final energy consumption (%) SDG indicator 1.1.1 Proportion of population below international poverty line (%) 15.8 16.0 16.2 16.4 16.6 16.8 16.8 17.0 17.2 15.4 0 25 20 15 10 5 Renewable energy share in the total final energy consumption (%) Proportion of population below international poverty line (%) Figure 3.6. Relationship between poverty reduction and share of renewable energy at the global level, 2005–2019 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) Figure 3.7. Relationship between poverty and material footprint per capita at the global level, 2000–2017 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) 2000 2001 2002 2004 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 SDG indicator 8.4.1 Material footprint per capita, by type of raw material (tonnes) SDG indicator 1.1.1 Proportion of population below international poverty line (%) Material footprint per capita, by type of raw material (tonnes) Proportion of population below international poverty line (%) 0 2 4 6 8 10 12 14 0 5 10 15 20 25 30 47 catchments, and can cause more landslides, silting and flooding, while destruction or reclaiming of wetlands can worsen flooding. The degradation of ecosystems such as forests, wetlands, and coastal and marine systems, and drylands is also a specific driver of vulnerability to disasters. It can severely compromise the wellbeing, income and food security of the farmers, fishers, forest users and pastoralists whose livelihoods depend directly on these ecosystems. However, improved ecosystem management can prevent and reduce the impacts of disasters on vulnerable communities and countries. Ecosystem-based or nature-based solutions can reduce disaster risk and provide co-benefits from ecosystem services, which contribute to livelihoods and also build local resilience to disasters and climate change. For example, “sponge cities” in China aim to design urban development to allow for seasonal flooding of wetlands and to encourage nature-based flood reduction solutions (Wong, 2021). If developed and developing economies continue to grow based on unsustainable consumption patterns and non-renewable energy sources, increases in economic prosperity that support poverty alleviation will be in tension with other systems, including those for reducing disaster risk, halting global warming and staying within environmental and biodiversity planetary boundaries. 3.1.3 Disaster risk reduction and sustainable development within planetary boundaries Most SDGs and the Paris Agreement, in some way, return to questions of sustainable consumption (Figure 3.8). Yet, world consumption of material per capita is steadily increasing with industrialization and development. The human material and ecological footprint is accelerating the rate of change. A potential impact when systemic risks become cascading disasters is that systems are at risk of collapse. tonne 2 12 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 1 8 10 6 4 0 Figure 3.8. Global consumption – material footprint per capita (tonnes), 2000–2017 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database, SDG indicator 12.2.1 (UN DESA, 2021) 48 In addition to the direct human costs, disasters can also have environmental impacts on a massive scale. Biodiversity and ecosystems are highly vulnerable to the impacts of natural hazards, industrial pollution, failures in infrastructure such as dams and levees, introduced plants and animals, and climate change. Tropical storms can greatly upset the natural ecosystem, disrupting coastal fish, insect, bird and mammal habitats, particularly when water quality is affected when sewage facilities flood or debris enters reservoirs and waterways. Wildfires, floods and drought can completely defoliate forests and cause structural changes to ecosystems. Wildlife and endangered species can be killed by the force of hazards or affected indirectly through changes in habitat and food availability. Beaches move and change shape due to storm surges. River banks erode during flash-flood events. The list of potential impacts is long. The degradation of forest ecosystems due to overexploitation and deforestation, and their exposure to destructive forces such as wildfires and invasive species, are further exacerbating vulnerabilities around the world. This is particularly bad news for climate change. Deforestation accounts for nearly 20% of global carbon emissions through clearing, overuse or degradation of trees. However, healthy forests act as carbon sinks, absorbing and storing about 1/10 of the projected annual global carbon emissions into their biomass, soils and products. The combined absorption capacity of the world’s forests is estimated at 2.4 billion tonnes of carbon dioxide per year, which is equivalent to a third of the carbon dioxide released from burning fossil fuels (FAO, 2021b). Forests are also essential as water catchments and natural water purifiers, for water security and biodiversity, especially in the face of longer droughts and rising average temperatures. SDG data demonstrates the positive association between growing disaster occurrence and the ensuing rise in economic impact (SDG indicator  1.5.2 / Sendai Framework Target  C) with the observed steady decrease in global forest coverage (SDG indicator 15.1.1) (Figure 3.9). Figure 3.9. Relationship between direct economic loss attributed to disasters and global forest cover, 2015–2019 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) - 20,000 30,000 40,000 50,000 60,000 70,000 2015 2016 2017 2018 2019 4,050,000 4,055,000 4,090,000 4,060,000 4,065,000 4,070,000 4,085,000 4,080,000 4,075,000 10,000 80,000 90,000 100,000 SDG indicator 1.5.2 Direct economic loss attributed to disasters (current $ in million) SDG indicator 15.1.1 Forest area (thousands of hectares) Direct economic loss attributed to disasters (current $ in million) Forest area (thousands of hectares) 49 Human well-being depends on ecosystems that provide multiple livelihood benefits and, ultimately, all human life-support systems. Maintaining healthy ecosystems also plays an important direct role in reducing the overall vulnerability of communities to disasters, in terms of limiting their physical exposure to natural hazards and in providing them with the livelihood resources to withstand and recover from crises. The degradation of ecosystems and their exposure to destructive forces, such as wildfires, floods, drought and invasive species, are exacerbating vulnerabilities around the world. Disasters have a strong negative association with biodiversity. Direct economic loss from disasters is increasing (SDG indicator  1.5.2 / Sendai Framework Target  C) as the rate of biodiversity loss is accelerating and species extinction is intensifying, as captured by the Red List Index (SDG indicator  15.5.1) (IUCN, 2021). The International Union for Conservation of Nature Red List of Threatened Species is an indicator of the changing state of global biodiversity (Figure 3.10). One way to envision the long-term and systemic impacts and limits of the current model of economic growth and development is the concept of “planetary boundaries”, developed through the Stockholm Resilience Centre in 2009. It provides a “sciencebased analysis of the risk that human perturbations will destabilize the Earth system at the planetary scale” (Steffen et al., 2015). Figure 3.11 illustrates how far existing development has moved across and beyond certain tipping points (Cernev, 2022; Stockholm Resilience Centre, 2022). Figure 3.11 indicates that land system change and climate change have exceeded the “safe operating space” for the Earth system and are in the zone of uncertainty with increasing risk. Biochemical flows and “novel entities” (new engineered chemicals, materials or organisms and natural elements mobilized by human activity such as heavy metals) have far exceeded the safe operating space (Steffen et al., 2015). Recent analysis concludes that humanity is currently operating outside the planetary boundary for novel entities (Persson et al., Figure 3.10. Relationship between direct economic loss attributed to disasters and threatened species, 2005–2019 Source: UNDRR analysis based on Global Sustainable Development Goal Indicators Database (UN DESA, 2021) - 20,000 30,000 40,000 50,000 60,000 70,000 0.70 0.71 0.78 0.72 0.73 0.74 0.77 0.76 0.75 10,000 80,000 90,000 100,000 0.79 2005 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2006 SDG indicator 1.5.2 Direct economic loss attributed to disasters (current $ in million) SDG indicator 15.5.1 Red List of Threatened Species Direct economic loss attributed to disasters (current $ in million) Red List Index 50 2022). Some areas remain within the safe operating space: freshwater use, ozone depletion and ocean acidification. Some are not yet quantified, such as atmospheric aerosol loading and biosphere integrity overall, although species extinction is already close to the planetary boundary. When global collapse risk is analysed according to the nine planetary boundaries, scenarios that consider achievement of the SDGs and the Sendai Framework goal within the concept of planetary boundaries show a dangerous tendency for the world to move towards a global collapse scenario (Cernev, 2022) (Figure 3.12). At a local level, development planning is made up of many small and large decisions in particular circumstances, and the challenge is to engage with those decisions in the context of known planetary boundaries as well as with a risk reduction frame of mind (e.g. Box 3.1 and Figure 3.13). LAND-SYSTEM CHANGE FRESHWATER USE OCEAN ACIDIFICATION STRATOSPHERIC OZONE DEPLETION ATMOSPHERIC AEROSL LOADING (Not yet quantified) CLIMATE CHANGE BIOSPHERE INTEGRITY BII (Not yet quantified) BIOGEOCHEMICAL FLOWS P N E/MSY NOVEL ENTITIES Increasing risk Safe operating space Figure 3.11. Planetary boundaries Note: BII = biosphere integrity; E/MSY = extinctions per million species per year; N = nitrogen; P = phosphorous. Source: Designed by Azote for Stockholm Resilience Centre (2022), based on analysis in Persson et al. (2022) and Steffen et al. (2015) 51 Sustainable and risk-aware development pathways can prevent the creation of risk, but the challenge is how to make that happen in the everyday decisions of communities and policymakers. Information such as the dynamic modelling used in Zambia is a valuable tool (Box 3.1). But modelling tools need decision makers who understand their uses and their limitations; the decision-making process itself also needs to be investigated critically. There are also significant regional variations in how the relationship between disaster risk and development is understood and governed, and key risk drivers such as inequality may fall between the two, as illustrated during the COVID-19 pandemic in Latin America and the Caribbean (Lucatello and Alcántara-Ayala, 2022). 3.2 Ways forward Sustainable development requires a risk-informed approach that considers SDG interdependencies, synergies and tensions to devise effective, efficient and coherent development pathways to guide policy Figure 3.12. Planetary boundaries and global collapse risk scenarios Note: GCR = global collapse risk. Source: Cernev (2022) HIGH-RISK WORLD LOW RISK WORLD WITHIN LIMITS THE TIP EARTH UNDER UNCERTAINTY Planetary boundaries have not been extensively crossed High risk of GCR events GCR events have potentially occurred/are occurring Global targets are in danger STABLE EARTH Planetary boundaries have not been extensively crossed Successful policy implementation Low risk of GCR events Need for implementation of preventative policy EARTH UNDER THREAT Planetary boundaries have been extensively crossed Low risk of GCR events; however, increasing due to planetary boundaries being crossed Global target achievement in danger GLOBAL COLLAPSE Planetary boundaries have been extensively crossed High risk of GCR events GCR events have potentially occurred/are occurring Global targets have not been achieved implementation. While disasters can hold back progress in achieving SDGs by 2030, targeted and evidence-based risk reduction can also bring the world closer to achieving them, along with the Sendai Framework and Paris Agreement commitments. Overall, risk reduction should be recognized as a central dimension of sustainable development. Riskproofing development policy can ensure disasters do not derail development progress and development does not inadvertently create new risks. Although, historically, economic development has been highly beneficial to human health, life expectancy and living standards, the pressures of population growth, increased consumption of natural resources and industrialization are producing ever greater negative impacts on environmental systems. Current development pathways need to be adjusted. If progress towards poverty reduction is to be sustainable, the global material footprint per capita needs to reduce. To foster sustainable development for all, there is a need for countries to consider how energy and products are produced and consumed, so that sustainable development and climate change targets can be achieved at a global scale. The current negative trends in environmental health are closely associated with disaster risk. Sustainable development pathways need to be premised on more sustainable consumption patterns that guarantee the provision of basic needs for the poor, while avoiding those unsustainable actions that are hazardous to the environment, and which are inefficient and contribute to systemic risk. While it can be difficult to garner public support for DRR investment in the face of other competing development priorities, techniques to model and evaluate policies and their wider systemic impacts are emerging. Later chapters therefore focus on moving towards a greater understanding of what needs to be valued, and how this can be done to better manage systemic risk. 52 Box 3.1. Using dynamic macroeconomic modelling projection techniques to make the case for DRR investment, Zambia In Zambia, a flood exposure reduction project was planned, involving land-use restriction and planned relocation from an area of land that was highly productive but very exposed to floods. Implementation of the DRR policy assumed that annually 8% of capital stock located in the exposed area would be relocated to a safer area, in addition to the restriction of all future development in the exposed area. The plan was evaluated using a framework to model macroeconomic co-benefits of the DRR investment over time – a Dynamic Model of Multi-hazard Mitigation CoBenefits. This indicated that, under the planned scenario, the annual average GDP growth would remain nearly constant at approximately 3%; an initial decline would be followed by an increase, and the loss would be cancelled out over 30 years. Further analysis showed that, over time, improved protection against floods through land-use restriction would foster investment in the safer area. Figure 3.13. Predicted total growth effect of restricting use of exposed land over 30 years (Zambia) Note: CPEE = co-benefit production expansion effect; figure shows Decomposition of Total Growth Effect (TGE) of exposure management (TGE = PDME + ARRE + CPEE) Source: Yokomatsu et al. (2022) 0.00 Indirect benefit effect ($ billion) 0.01 0.02 0 10 20 30 Years Ex-ante Risk Reduction Effect (ARRE) Ex-post Damage Mitigation Effect (PDME) Type of effect Total Growth Effect (TGE) ZAMBIA 53 4. How human choices drive vulnerability, exposure and disaster risk Disasters are not natural. They occur due to human choices and a lack of risk reduction. When disaster impacts cascade from one system or sector to another, as with systemic risks, pre-existing inequality and vulnerabilities amplify negative impacts. Even though experts cannot be certain about the exact timing, location and magnitude of a hazard event, they can be certain that those most affected will be communities living in unsafe conditions, such as in poorly built housing or in areas with substandard infrastructure. Disaster risk develops over time, due to complex interactions between the human and natural spheres. A disaster is not something that should be thought of as an isolated event in a particular moment (Cutter et al., 2015; Hagenlocher et al., 2020). Risk from hazards is being amplified by human interventions in nature. However, these changes tend to be confused with, or misinterpreted as, natural extreme events (IPCC, 2012, 2021a). For example, variability in rainfall is increasingly leading to drought in areas where human water-use practices are unsustainable. And human action is also creating some hazards such as air pollution (Lavell and Maskrey, 2014). To explore why current risk reduction efforts are insufficient, this chapter looks at the human actions that lead to increased disaster vulnerability and exposure. It highlights how social inequality and the decision-making processes of individuals and institutions create and amplify vulnerability and exposure, and therefore disaster and climate risk. It goes on to suggest actions such as stepping up “forensic” analysis of disasters, working across sectoral silos to identify weak points in system resilience and engaging communities to determine solutions, to help accelerate risk reduction action. 4.1 Systemic risk is increasing due to human actions Fuego Volcano in Guatemala erupted on 3  June  2018, causing 461 deaths and affecting over 1.7  million people (CRED, 2021). This event heightened international, regional and national awareness of advances in predicting volcanic hazards. Population growth and demographic shifts in the urban and peri-urban areas around the volcano heightened exposure to the eruption. Many of those who lost their lives were people from lower-income households who had recently moved into the area, and who were living in informal settlements in unsafe locations (World Bank, 2018a). Although government authorities in Guatemala had responsibility for scientific evidence and the communication and management of volcanic risk, private businesses and local communities played an essential role in early warning. For example, 54 owing to good information access and prior awareness, staff in a local resort and farm helped evacuate guests, personnel and local residents to safe locations (World Bank, 2018a, 2018b). This demonstrated there was sufficient advance warning for those who had access to information, and also the understanding and means to act on upon it. However, this was not the case for a significant portion of the area’s population. The exposure of populations and infrastructure to hazards has increased significantly over recent decades, most notably due to urbanization and unsustainable development in hazard-prone areas. Globalization, urbanization and an increasingly interconnected world are also increasing the likelihood of disaster impacts cascading across systems (Gousse-Lessard et al., 2022). Pre-existing risk and resilience factors affect the initial impacts of disasters and the way these impacts cascade (Figure 4.1). Hazard events that once might have caused localized impacts can now have cascading and even global impacts. For example, when severe flooding affected 66 of the 77 provinces of Thailand in 2011, the flooded area around Bangkok included industrial estates where production plants were highly concentrated (World Bank, 2012). Although this delta is naturally susceptible to flooding, government incentives encouraged industrial development, as the area had infrastructure and easy access to consumers and suppliers (Chongvilaivan, 2012). In this case, the higher level of exposure of private sector assets was one reason that 70% of the total damage and loss from the floods was in manufacturing. This then had cascading impacts on the wider economy, as manufacturing accounted for almost 40% of the country’s GDP at that time (World Bank, 2012). The Bangkok floods had a global ripple effect, significantly affecting supply chains as far away as Japan and the United States. This local flood ended up having systemic impacts across countries, regions and economic sectors. Key manufacturing sectors such as the automobile, electronics and electrical appliances industries experienced abrupt declines in production and exports (Chongvilaivan, 2012). Components manufactured in Thailand were essential for products finalized in other countries. Failure in any stage of production caused disruption or collapse of the entire production chain. Systems were not designed to be resilient to shocks. The root causes of what caused this flood hazard to become a disaster stemmed from human choices and the structural conditions implicit in a chosen mode of development and growth. These were amplified by political, management and technical choices in how disaster risk is addressed (Figure 4.2). A street is coated in ash after a volcanic eruption, Antigua, Guatemala Credit: © Shutterstock/Zahirul Alwan 55 Figure 4.1. Disaster impact and aftermath cascades are inherently affected by risk and resilience factors Source: Gousse-Lessard et al. (2022), adapted from Shultz et al. (2017) Individual / family context RISK FACTORS Hazards (climate change and variability) Vulnerability (health, social and psychosocial) Exposure (community and individual) Institutional / organizational context Societal / structural context DISASTER INTENSITY AFFECTED POPULATION DISASTER IMPACT RISK FACTORS RESILIENCE FACTORS Community context RESILIENCE FACTORS Support (social, community, financial) Stress management (self-care, coping strategies, proactivity and learning) Meaning (communication, engagement and a sense of community) HAZ A RD(S) VULNE R A BIL TI Y & RISK D VI ERS EXP OSURE DISAST E R RISK ROOT CAUSES Less More Uncertainty Political Technical Management Figure 4.2. Levels of uncertainty in disaster risk and its management Credit: Mandira Shrestha / International Centre for Integrated Mountain Development, Kathmandu Focus group discussion on an early warning system in Kathmandu, Nepal Source: Wisner and Alcántara-Ayala (forthcoming) 56 4.1.1 Inequality, poverty, discrimination and environmental degradation drive risk An individual’s gender role or identity, race, disability, age, migration status and health conditions contribute to their unique vulnerability. All people play multiple roles in society, for example as parents, workers and members of social or demographic groups. Each of these roles brings with it capacities and vulnerabilities, and these identities intersect. This creates challenges for disaster risk policy formulation, which therefore cannot be based on a “one size fits all” approach (Chaplin et al., 2019). Factors such as socioeconomic disadvantages, differences in language and culture, and geographical isolation increase disaster risk (e.g. Box  4.1). Pre-existing mental or physical illness, lack of coping capacity, poor social networks, urban density, socioeconomic status, marginalization and gender inequality are among the risk factors that often intersect and increase vulnerability in disasters (NCCMH, 2005; Few, 2007; Neumayer and Plümper, 2007; Cutter and Finch, 2008; Haskett et al., 2008). The longest-lasting detrimental impacts of a disaster may be from indirect consequences. For example, school closures have been an indirect consequence of the COVID-19 pandemic. Schooling became impossible for half of the Asia and Pacific regions during 2020 who lacked access to the Internet, and the loss of household income made education unaffordable for many families. This especially affected girls’ education as one in five girls reported having increased domestic responsibilities in 2020 (Nguyen, 2021). Examples of other cascading impacts associated with disasters include increases in drug addiction, domestic violence and suicide (Cuthbertson et al., 2022). Vulnerability cannot be fully eliminated, so understanding it is essential for effective policymaking. Vulnerability should not be seen as a stigma or personal deficit of some people, but instead as an unevenly distributed and societally co-created characteristic present in all people. Policymaking can therefore be seen as granting a fairer distribution of vulnerability as part of more equitable governance (Gabel et al., 2022). 4.1.2 Human choices affect the severity of both intensive and extensive risk Small, recurring extensive disasters far outnumber intensive disasters, and their cumulative impact can be much higher (IFRC, 2020). Hazards such as seasonal flooding tend to recur in the same localities repeatedly, often amplifying existing situations of vulnerability, particularly among impoverished Box 4.1. Reaching vulnerable populations in Nepal with flood risk communication Nepal has implemented flood early warning systems and made significant progress in monitoring and forecasting floods. This has resulted in a reduction in the annual number of deaths due to flooding. The Department of Hydrology and Meteorology issues flood warnings based on real-time rainfall and water-level monitoring, including flood forecast information from various models. However, recent research has highlighted the need to tailor flood risk communication to take account of different social, economic and political factors. For example, consultation with the stakeholders of Ratu River indicated women and marginalized people in the area were less likely to receive information and be engaged in preparedness and evacuation activities. The research suggested warning messages and communication materials need to be co-designed with communities and tailored to meet the diverse needs of different users. Source: Shrestha et al. (2021) 57 or disadvantaged communities. Consultations undertaken by the Global Network of Civil Society Organisations for Disaster Reduction with 750 atrisk communities across 50 countries highlighted localized flooding as the single most damaging phenomenon (Chavda et al., 2022) (e.g. Box 4.2). It was also identified as one of the most complex risks to reduce and manage at local level. This is because its impacts are deeply shaped by development decisions, ecosystem exploitation/adaptation, and the different vulnerabilities and exposure within and among communities (Chavda et al., 2022). Skewed development priorities, climate change, fragile governance and environmental degradation are extending the footprint of extensive disaster risk. Factors such as loss of species and habitats, and trade in wildlife (legal and illegal), have even shaped emergent hazards such as zoonotic diseases that transfer from animals to humans, causing epidemics and pandemics such as COVID-19 (Alcántara-Ayala et al., 2021). 4.2 Understanding the root causes of vulnerability is essential Social science provides critical insights into the root causes and drivers of vulnerability that can help policymakers make decisions about how to manage systemic disaster risk. Taking a forensic approach to look at the root causes and drivers of risk can help identify and understand how best it can be addressed. For example, the Fuego Volcano disaster outlined in section  4.1 above was analysed from a forensic investigations of disasters perspective to examine what proportion of the damage and human loss was avoidable and what were the inherent consequences of this sudden and explosive eruption. About 54,000 people lived within a 10  km radius of Fuego Volcano, and more than 1  million within a 30  km radius. Analysis of the disaster unveiled a series of factors and processes that led to the materialization of a socially constructed disaster. Human choices resulted in increased vulnerability Box 4.2. Extensive risk for remote communities in the Lao People’s Democratic Republic In the Lao People’s Democratic Republic, the most remote rural communities are the poorest, many are minority ethnic groups, and they have difficulty accessing health services and education, thus limiting their opportunities in work and livelihoods. They also have higher rates of disability than national averages, due to injuries from war and unexploded ordnance (mainly men) and the effects of disease (mainly women), which is highly stigmatized and severely affects their ability to access education and work, especially women and girls with a disability (Holzaepfel et al., 2018; Government of the Lao People’s Democratic Republic, 2020). These social and economic disadvantages underpin the further impoverishment of many of these communities caused by frequent seasonal flooding, which has worsened in recent decades due to changes in rainfall patterns and to increased exposure with new settlements. Government and non-governmental organization efforts to enhance the prospects of these communities focus on the underlying socioeconomic vulnerabilities of their situation, aiming to increase their opportunities to exercise resilience through improved livelihoods as well as to address the physical aspects of flood management (Government of the Lao People’s Democratic Republic, 2018, 2021). 58 and exposure to the volcanic hazard, and the impacts were systemic. Governance systems and socioeconomically driven settlement patterns led to impacts being felt across systems and communities. In addition to the significance of the dense and fastmoving pyroclastic lava flow that occurred in Las Lajas ravine, four key elements were identified that contributed to the severity of the impact related to the social construction of risk: 1. The socioeconomic reasons why people had continued to settle in the area of high exposure to the volcanic hazard since the large eruption of 1974. 2. Poor risk communication strategies and lack of coordination between the early warning, response and evacuation procedures among localities. 3. Lack of volcanic hazard knowledge, including sustained volcanic monitoring and support to scientific institutions. 4. Deficient and fragmented information and communication among relevant DRR institutions, local authorities, leaders and the population (World Bank, 2018a). The substantial exposure of a population that had moved into the area due to socioeconomic pressures, despite the threat of the volcano, was a key factor in the Fuego eruption becoming a disaster. Further investment in volcanic instrumentation and monitoring systems and scientific and technological human resources was also needed, but this was not the main factor. Low participation of diverse stakeholders affected the effectiveness of early warning systems. Some early warning, evacuation and response systems did not operate in practice, and risk communication strategies had not been tested (World Bank, 2018a). Understanding vulnerability requires looking across sectors The Fuego Volcano example also highlights that risk management is more efficient if, instead of working from single disciplines and separate perspectives, transdisciplinary approaches are adopted that strengthen the co-production of knowledge and co-management of disaster risk. Such approaches aim to integrate knowledge from different disciplines (including natural and social sciences and humanities) and non-academic stakeholder communities. They allow for a better understanding of the social dimension of the systemic nature of risk (Sandoval et al., 2022). They require working in partnership with multiple actors, including the people affected by DRR and DRM decisions, and engaging in problem-solving, perspective sharing, negotiation, deliberation, knowledge generation, and joint learning and communication (Berkes, 2009). This represents a paradigm shift in research practice, requiring mutual learning, collaboration and exchange within academia, and also effective engagement of non-academic stakeholders (OECD, 2020). Some countries such as Mozambique have already begun to apply transdisciplinary, participatory mechanisms in planning processes (Box 4.3). In addition to transdisciplinary approaches, the forensic investigations of disasters method has been used to identify the underlying risk drivers behind the 2015 flood damage in Artigas, Uruguay (Box 4.4). One of the families displaced by Hurricane Idai in 2019 in Mozambique Credit: United Nations/Eskinder Debebe 59 Box 4.3. Multisectoral and transdisciplinary strategy on internal displacement in Mozambique The National Policy and Strategy for Internal Displacement Management in Mozambique addresses Sendai Framework Target B, to substantially reduce the number of people affected by disasters. The policy covers all forms of displacement within Mozambique, as the country is greatly exposed to climate hazards and has recently faced conflict leading to displacement. Under the policy, the National Institute for Disaster Risk Reduction and Management is responsible for addressing displacement and tasked with ensuring all government ministries and agencies coordinate their actions. The relevant ministries (e.g. education, health and social services) must each fulfil assigned tasks to ensure services to and protection of displaced people. They are required to include these in their yearly programming and budget plans. Mozambique ensured ownership across the government by creating a national-level multisectoral transdisciplinary team to develop the policy. Members of the team visited the resettlement camps, listening to displaced people’s needs and meeting with local-level DRR managers. The media were invited to report on these visits, bringing national attention to the plight of the thousands of displaced people, and resulting in highlevel political commitment to drafting and approving the policy in record time. The policy mandates action once displacement has occurred and, crucially, focuses on prevention, resilience building and finding durable solutions for displaced people. Mozambique is now strengthening capacity to ensure the policy is put into action at the local level. Sources: B. Gualandi, S. Llosa and N. Tivane, personal communications (2021) Box 4.4. Using forensic analysis in 2015 floods in Artigas, Uruguay In northern Uruguay, the cities of Artigas and Bella Union are highly dependent on two rivers for their daily activities, the Cuareim and Uruguay. The economic, social and cultural aspects of development of Artigas Department lie in a fragile balance and coexistence between these cities and the rivers. Furthermore, the river basins cross international borders with Argentina and Brazil. Recent evidence indicates some changes may be occurring in the relationship between the cities and the rivers, some of which are induced by changes in El Niño–Southern Oscillation patterns. One indicator is the increasing trend of flood events such as the 2015 floods. The 2015 floods were so serious that they drew the attention of national media and governmental authorities, changing the debate about how climate change could affect known disaster risks in Uruguay (Verde et al., 2017). A consortium of the National System for Emergencies and international organizations embarked on a forensic analysis. They applied the forensic investigation of flood disasters method (Ramírez and Herrera-Lozano, 2015) to identify the underlying risk drivers behind the disaster, to enhance the analytical capacities of the local government and to define an action plan for reducing future flood impacts. The critical areas for discussion were the following. (a)  How unusual were the 2015 floods? (b)  Which socioeconomic features could explain the concentration and distribution of impacts? (c)  What kind of evidence is available for identifying changes in climate features in the area? 60 4.3 Improving data supports a better understanding of vulnerability and exposure Understanding the diverse dimensions of vulnerability and exposure, and the interdependency across systems, can accelerate the effectiveness of risk reduction. However, doing this requires access to data and analysis. Local vulnerability information is often not available, or coverage is inconsistent. Information on disasters is also often siloed from information on vulnerability. National statistical offices have traditionally produced geospatially enabled population, environmental and economic information at national and subnational scales. However, they have not been involved in producing data related to disasters or disaster risk. Disaster information is usually provided by the institutions devoted to disaster response or civil protection at the national level. At the global level, initiatives undertaken through EM-DAT, DesInventar, SFM, the World Bank and the INFORM Natural Hazard Risk Index provide information or evaluations on the impacts of disasters. Global disaster reporting systems tend to undercount small-scale extensive disasters such as localized flooding. These “silent disasters” are often missed due to under-reporting at national level and thresholds applied in global databases (e.g. economic loss and numbers affected) (IFRC, 2021). For example, looking at historical records of flooding in Uganda, far fewer flooding events were reported in the national DesInventar records compared with in the local media. A much smaller (d)  Which institutional mechanisms are in place for regulating the human influence (urban and agriculture expansion) in the vicinities of the rivers? These questions led the local consultation and resulted in findings and conclusions to inform the department’s planning document: ● Better data and modelling are needed for multinational basin analysis. Although insufficient, the scientific evidence shows changes in the climate features of the river basins, which require further analysis to foresee the new average values in the Cuareim and Uruguay River basins. Argentina, Brazil and Uruguay share the basins; however, cooperation efforts for joint analysis remain unexplored, despite the significant potential this initiative could have for the three countries. ● The socioeconomic context highlighted the relevance of comprehensive social interventions. Impacts and losses were concentrated in low-income areas. Most of the families affected by the 2015 flood lacked stable income sources and did not have options for reallocation without governmental support. Many affected families returned to their homes after the flood, increasing the risk of being affected during the next El Niño–Southern Oscillation episode. Relocation efforts developed in the past failed to install families in a new context with access to labour markets. As a result, most of the families left their new houses and returned to the margins of the rivers. ● Local regulation requires enhanced risk zoning. Governance is at the core of risk reduction initiatives in Artigas. Normative instruments such as the urban plan can issue mandatory zoning to avoid further occupation of areas close to the river margins. Although it is well known that these areas contain most of the flood risk, the urban plan does not restrict occupation in all the areas. Moreover, the local capacity to enforce the plan is low, and families keep moving to the flood-plains. Source: A. Brenes Torres, personal communication (2021) 61 number again was recorded in the global EM-DAT, which uses a threshold that reflects mostly mediumto large-scale intensive events (van den Homberg et al., 2022). The need to involve national statistical offices in the production of geographic and temporally comparable disaster-related statistical series and indicators is increasingly being recognized. Achieving this requires: (a)  inter-agency training and technical assistance capacity; (b)  institutionbuilding expressed through political will; and (c)  sufficient resources for the development of a national system of statistics related to the environment, climate change and disasters (Bello et al., 2021). The wealth of vulnerability data collected as part of tracking the SDGs represents an often untapped resource for accelerating development, and also for increasing disaster risk understanding, with geography being a key foundation to integrate other forms of data (UN-GGIM, 2022). Reporting under the 2030 Agenda (including the Sendai Framework targets) is key to the measurement and monitoring of progress on reducing risk and social vulnerability. The 17 SDGs of the 2030 Agenda are supported by 169 targets and 231 unique indicators that aim to show national and global progress. However, at the midpoint of the race to 2030, there is a significant challenge in the availability of timely, reliable and actionable SDG data (Figure 4.3). There are date gaps in reporting on key SDGs for disaster resilience. For the SDG target on zero hunger (SDG  2), there is approximately 77% of the full reporting data available, and for affordable and clean energy (SDG  7), 89% of data has been provided. However, in areas such as sustainable cities and communities (SDG 11), there is only 20% data available, and for climate action (SDG 13), only 19% of the data. For the goal of no poverty (SDG 1), there is 36% of the nationally reported data, while for gender equality (SDG  5), there is only 20% of the data needed (UNSD, 2021). Equally concerning is that available data is heavily skewed towards developed countries with mature national statistical systems. Furthermore, despite recommendations that SDG indicators be disaggregated where possible, by income, sex, age, ethnicity, migratory status, disability, geographic location or other characteristics, this is often not the case. As outlined in Chapters  10 and 11, new strategies, tools, integrated sampling frames and platforms are also required to enable enhanced risk understanding and analytics. These need to reflect the characteristics and socioeconomic processes in the local context. In particular, national policies need to draw on specific information on marginalized and excluded groups, and on data on communities most affected by conflict and insecurity, disabilities and intrahousehold disparities. They should avoid using prevalence estimates and national averages, which do not give sufficient granularity (OECD, 2018b). Where data is available, forensic analysis of risk can also be helpful in supporting policymakers and communities to consider potential future pathways for risk reduction. For example, in northern Uganda, projects are under way that aim to combine disaster risk and downscaled climate risk data to enable local pastoralists and other stakeholders to access localized, timely and easily understood seasonal forecasting and water reserves data to plan optimum grazing routes and to take preventive action in case of forecast drought (Lwasa et al., 2017). Drawing on past trajectories of root causes that were disaster risk drivers, forensic forecasting methods also can help project future dynamics including patterns of demographic and economic change, infrastructure development and vulnerabilities. Although forensic disaster scenariobuilding is a qualitative method that has subjective elements, it can be valuable in shaping adaptation and risk reduction strategies (Oliver-Smith et al., 2016) (Box  4.4). It is also increasingly being used to help evaluate the social vulnerability conditions that aggravate or amplify disaster risk in other areas, such as urban planning and socioeconomic development (Cardona et al., 2018). Finland and Norway use foresight processes to investigate and provide information about future land use and impacts of decision-making on society, the economy and the environment. The development of digital stakeholder engagement platforms of open, comparable and consistent spatial data has enhanced participation of diverse actors, including the public in planning-related processes. These processes involve participatory planning goals that also respond to the fundamental principles of sustainable local development (Weber et al., 2017). 62 Figure 4.3. Percentage availability of SDG indicator data with at least 2 years of data since 2015 Source: UNSD (2021) 1 No poverty 1.1.1 57.77% 1.2.1 35.23% 1.2.2 9.64% 1.3.1 57.94% 1.4.1 99.48% 1.4.2 10.02% 1.5.1 55.13% 1.5.2 37.68% 1.5.3 67.88% 1.5.4 55.27% 1.a.1 44.82% 1.a.2 71.50% 1.b. 1 0% 2 Zero hunger 2.1.1 100.00% 2.1.2 100.00% 2.2.1 63.73% 2.2.2 55.44% 2.2.3 98.45% 2.3.1 100.00% 2.3.2 100.00% 2.4.1 0% 2.5.1 100.00% 2.5.2 100.00% 2.a.1 100.00% 2.a.2 90.91% 2.b.1 9.84% 2.c.1 100.00% 3 Good health and well-being 3.1.1 94.82% 3.1.2 81.87% 3.2.1 99.48% 3.2.2 99.48% 3.3.1 61.14% 3.3.2 99.48% 3.3.3 73.29% 3.3.4 99.48% 3.3.5 99.48% 3.4.1 94.82% 3.4.2 94.82% 3.5.1 56.22% 3.5.2 96.37% 3.6.1 94.82% 3.7.1 44.04% 3.7.2 81.35% 3.8.1 94.82% 3.8.2 19.69% 3.9.1 93.78% 3.9.2 94.82% 3.9.3 94.82% 3.a.1 81.35% 3.b.1 85.75% 3.b.2 90.91% 3.b.3 8.81% 3.c.1 85.75% 3.d.1 100.00% 3.d.2 32.90% 4 Quality education 4.1.1 68.91% 4.1.2 38.86% 4.2.1 29.02% 4.2.2 78.24% 4.3.1 36.79% 4.4.1 50.78% 4.5.1 38.45% 4.6.1 7.77% 4.7.1 100.00% 4.a.1 51.22% 4.b.1 90.91% 4.c.1 60.10% 5 Gender equality 5.1.1 48.70% 5.2.1 79.79% 5.2.2 0% 5.3.1 43.78% 5.3.2 27.78% 5.4.1 15.72% 5.5.1 94.30% 5.5.2 56.99% 5.6.1 19.69% 5.6.2 50.43% 5.a.1 97.41% 5.a.2 100.00% 5.b.1 49.22% 5.c.1 33.68% 6 Clean water and sanitation 6.1.1 66.84% 6.2.1 73.06% 6.3.1 34.72% 6.3.2 41.71% 6.4.1 100.00% 6.4.2 100.00% 6.5.1 96.37% 6.5.2 100.00% 6.6.1 68.37% 6.a.1 90.91% 6.b.1 62.18% 7 Affordable and clean energy 7.1.1 100.00% 7.1.2 97.41% 7.2.1 98.96% 7.3.1 98.96% 7.a.1 67.88% 7.b.1 74.09% 8 Decent work and economic growth 8.1.1 100.00% 8.10.1 88.86% 8.10.2 72.54% 8.2.1 92.23% 8.3.1 36.27% 8.4.1 0% 8.4.2 95.85% 8.5.1 43.01% 8.5.2 47.15% 8.6.1 65.80% 8.7.1 28.50% 8.8.1 34.97% 8.8.2 70.47% 8.9.1 31.61% 8.a.1 43.26% 8.b.1 54.92% 9 Industry, innovation and infrastructure 9.1.1 9.84% 9.1.2 92.57% 9.2.1 98.96% 9.2.2 72.54% 9.3.1 30.57% 9.3.2 47.67% 9.4.1 72.54% 9.5.1 59.59% 9.5.2 52.33% 9.a.1 90.91% 9.b.1 76.17% 9.c.1 99.31% 10 Reduced inequalities 10.1.1 45.60% 10.2.1 53.37% 10.3.1 20.73% 10.4.1 92.23% 10.4.2 32.64% 10.5.1 66.32% 10.6.1 100.00% 10.7.1 0% 10.7.2 57.51% 10.7.3 100.00% 10.7.4 100.00% 10.a.1 99.48% 10.b.1 48.19% 10.c.1 34.37% 11 Sustainable cities and communities 11.1.1 63.21% 11.2.1 0% 11.3.1 0% 11.3.2 0% 11.4.1 5.60% 11.5.1 55.13% 11.5.2 31.16% 11.6.1 22.28% 11.6.2 99.48% 11.7.1 0% 11.7.2 0% 11.a.1 100.00% 11.b.1 67.88% 11.b.2 55.27% 12 Responsible consumption and productin 12.1.1 28.70% 12.2.1 0% 12.2.2 95.85% 12.3.1 100.00% 12.4.1 86.01% 12.4.2 18.94% 12.5.1 17.62% 12.6.1 100.00% 12.7.1 7.25% 12.8.1 100.00% 12.a.1 74.09% 12.b.1 72.02% 12.c.1 65.11% 13 Climate action 13.1.1 55.13% 13.1.2 67.88% 13.1.3 55.27% 13.2.1 0% 13.2.2 14.77% 13.3.1 100.00% 13.a.1 0% 13.b.1 0% 14 Life below water 14.1.1 70.64% 14.2.1 0% 14.3.1 13.47% 14.4.1 100.00% 14.5.1 88.61% 14.6.1 100.00% 14.7.1 100.00% 14.a.1 18.63% 14.b.1 100.00% 14.c.1 23.32% 15 Life on land 15.1.1 100.00% 15.1.2 88.86% 15.2.1 100.00% 15.3.1 100.00% 15.4.1 83.42% 15.4.2 100.00% 15.5.1 100.00% 15.6.1 61.45% 15.7.1 0% 15.8.1 88.60% 15.9.1 72.80% 15.a.1 43.01% 15.b.1 43.01% 15.c.1 0% 16 Peace, justice and strong institutions 16.1.1 53.63% 16.1.2 0% 16.1.3 13.13% 16.1.4 15.54% 16.10.1 0% 16.10.2 65.28% 16.2.1 28.50% 16.2.2 33.78% 16.2.3 19.69% 16.3.1 10.02% 16.3.2 75.13% 16.3.3 0% 16.4.1 0% 16.4.2 7.25% 16.5.1 6.74% 16.5.2 44.56% 16.6.1 65.28% 16.6.2 0% 16.7.1 50.14% 16.7.2 0% 16.8.1 100.00% 16.9.1 61.66% 16.a.1 28.24% 16.b.1 20.73% 17 Partnerships for goals 17.1.1 78.76% 17.1.2 78.24% 17.10.1 79.79% 17.11.1 0% 17.12.1 98.60% 17.13.1 79.59% 17.14.1 13.47% 17.15.1 27.40% 17.16.1 12.95% 17.17.1 65.80% 17.18.1 0% 17.18.2 100.00% 17.18.3 100.00% 17.19.1 100.00% 17.19.2 59.93% 17.2.1 56.00% 17.3.1 96.89% 17.3.2 93.26% 17.4.1 60.10% 17.5.1 0% 17.6.1 97.93% 17.7.1 0% 17.8.1 98.96% 17.9.1 90.91% 0-25% 25-50% 50-75% 75-100% Not applicable 63 Recognizing data challenges, a recently developed SDGs Geospatial Roadmap aims to encourage the use of geospatial and location-based information to augment official data for SDG reporting to help fill data gaps (IAEG-SDGs WGGI, 2022). Chapter 10 further explores emerging innovative uses of these approaches. Future scenario-building approaches for environmental sustainability and development are also being applied to planning of water usage and river basin management in the transboundary Indus basin (Box 4.5). Policy choices can accelerate risk reduction Policy choices can promote resilience building, or can become root causes, drivers and amplifiers of disaster risk. For example, a policy of housing evictions of low-income residents can accentuate disaster vulnerability in cities. The dismantling of environmental laws that protect natural reserves can exacerbate climate change and lead to deforestation, reduced water quality and a higher risk of flooding or landslides. Top-down reconstruction and social protection approaches that require affected communities to accept government or institutional plans while limiting community active participation and agency in enacting post-disaster efforts can also become drivers of disaster risk rather than creating long-term resilience (Bowen et al., 2020; Wu, 2022). The absence of grass-roots input can maintain systemic risks and societal inequalities, jeopardizing long-term sustainable development (Wu and Drolet, 2016; Chavda et al., 2022; Wu, 2022). Conversely, well-designed adaptive social protection efforts can reduce vulnerability and exposure (e.g. geographic, social and economic) and build Box 4.5. Co-designing future water resource pathways in the Indus basin The Indus basin is home to about 250 million people across Afghanistan, China, India and Pakistan. Approximately 110  million people living in the basin are living in extreme poverty (Wada et al., 2019). With low to moderate levels of access to basic services, health care and education, large parts of the basin’s population are vulnerable to climate change impacts and have low adaptive capacity, with the population expected to increase. Strategic decisions need to be made across the different sectors and countries to ensure sustainable development pathways for the basin’s region. These are especially relevant in managing the transboundary governance of risks that transcend multiple jurisdictions and hazards and which may have impacts over long distances in other surrounding areas, such as in mountainous regions. Stakeholders across different sectors and countries representing three basin development priorities – economy, society and environment – used a game-like scenario policy tool to develop and co-define a joint vision about existing challenges and possible pathways for the Indus basin. Figure  4.4 illustrates a business-as-usual scenario agreed by stakeholders as the likely future based on current development pathways, which is one of increasing risk. Then it indicates three resilient future scenarios according to different stakeholder preferences, values and world-views. The pathways to each of these identify trade-offs that need to be weighted to reach them, for example, developing large-scale water infrastructure versus small-scale nature-based solutions may lead to alternative pathways. The internal drivers represented are measures and policies that basin stakeholders (subnational to regional) have the ability to agree and adopt. The external drivers are global factors such as climate change and economic shocks that are the sphere of uncertainty against which regional pathways need to be adapted to become robust. Source: Schinko et al. (2022) 64 community resilience (World Bank, 2001; Davies et al., 2013). For example, after the 2015 earthquake near Kathmandu in Nepal, many international nongovernmental organizations entered the country to help local reconstruction and recovery through the official adaptive social protection scheme (Holmes et al., 2019; Rayamajhee et al., 2020). An innovative cities and infrastructure research project aimed to counter top-down approaches, and was successful in fostering cooperation between local residents and external helpers to swiftly identify the reconstruction and recovery priorities of local communities (Knowles, 2018). This cooperation also encouraged local residents to share their traditional construction techniques with the external sponsors, which resulted in outcomes better suited to their physical and socioeconomic context (Wu, 2022). Similarly, community and ecosystem-based DRR projects aimed to integrate local and scientific knowledge, and explicitly considered issues of wellbeing and equity in the design process (Klein et al., 2019). Better joint planning across sectors can increase the efficient use of scarce resources and reduce the underlying causes of risk. Cooperative crosssectoral planning can also help create governance approaches that are clearer and easier to implement, INTERNAL (PATHWAYS) RESILIENT FUTURE 1 RESILIENT FUTURE 2 RESILIENT FUTURE 3 Resilient Futures Differentiated by value differences between stakeholders BUSINESS AS USUAL CURRENT SITUATION provide reference for PAST AND PRESENT POSSIBLE FUTURE Constraints Input based on SSPs Risks EXTERNAL (SCENARIOS) Challenges Synergies Trade-offs Solutions = Policies, Technologies, Infrastructure Figure 4.4. Conceptual representation of the co-development of the nexus visions and transition pathways in the Indus basin Note: SSP = shared socioeconomic pathway. Source: Wada et al. (2019) 65 thus reducing the administrative burden of local governments. For example, research in Jagobiao Barangay in the Philippines identified the siloed nature of local policymaking. Local government officials reported there were nearly 40 separate national plans they were required to implement in their district (GNDR, 2019). Better joint planning can reduce such fragmentation. Efforts to reduce the root causes of vulnerability and exposure can be particularly effective during a postdisaster recovery and reconstruction period. For example, after the devastation of the 2010 Chilean earthquake and tsunami, in several of the worst-hit communities in Constitución, Chile, the Government provided disaster survivors with “half a good house” living units (Moore, 2016; Wu, 2022). The unfinished half allowed dwellers freedom to expand according to their own needs (Zilliacus, 2016). This type of housing structure was highly appreciated by the local residents, especially low-income families, who could arrange their limited resources to meet their urgent priorities (Franco, 2016). The long-term benefits strongly illustrated that these residents continually improved their housing, to support their ongoing recovery and prepare for prospective extreme events (Moore, 2016). This example portrays the capacity of communities to facilitate their post-disaster housing reconstruction and carry out their own recovery agenda (Wu, 2022). 4.4 Ways forward Disasters are the result of dynamic interactions among hazards, pre-existing local vulnerability and exposure. They are the effects of human choices, and are affected by the socioeconomic, technological and demographic characteristics of a society (IPCC, 2018a; UNDRR, 2019; GousseLessard et al., 2022). Good disaster risk governance aims to avoid the creation of situations of vulnerability and exposure by tackling drivers and root causes of risk. Addressing the root causes and drivers of vulnerability and exposure reduces risk and contributes to sustainable development. Development pathways, whether planned or unplanned, frequently increase vulnerability and exposure to known hazards. The Fuego Volcano example shows how forensic disaster analysis approaches are useful for decision makers. Forensic approaches combine retrospective longitudinal analysis, disaster scenarios, comparative case analysis and meta-analysis research, along with enhanced involvement of development stakeholders. This gives a holistic understanding of particular events and ways to accelerate future risk reduction (Burton, 2015; Oliver-Smith et al., 2016, 2017). However, understanding risks requires investing in data and analysis that can help better understand how and why disasters occur. Disaster data is used as an input to policy formulation and practice and to measure the outcomes, so these should be mutually reinforcing processes. The adoption of green or transformative approaches in disaster recovery is sometimes seen as the way to transformation, and it is true that such efforts have long been needed. Green recovery, regenerative agriculture and similar practices should be in place to support implementation of the Sendai Framework and the SDGs. However, these need to be considered within broader efforts to address structural inequalities and wider human development. Addressing the root causes of disasters requires a political and social commitment to sociocultural change. Present and future dimensions of vulnerability, exposure and hazards of communities, sectors and systems are intertwined with modes of governance and development planning in each geographic area, whether national, regional or local. Disaster risk governance should be backed by open and transparent collective action, vertical and horizontal cooperation and coordination among actors, and different ways of defining and reaching consensus regarding sectoral policies with positive impact in a geographic region. It implies multichannel governance, with horizontal relations among actors and their territories (Davoudi et al., 2008). It also needs to focus on the local level, including local government resources and capacity, and deeper collaboration with civil society and communities (Chavda et al., 2022). 66 5. How systems undervalue key assets and opportunities for learning Risk assessment has traditionally favoured quantitative data analysis based on short-term and economics-based approaches. However, in the context of today’s increasingly complex systemic risk, there is often a gap between the information available and accessible and the knowledge that needs to be used. This chapter looks at this challenge from three key angles. First, it argues there is a need to get better at collecting “traditional” data, particularly on vulnerability, exposure and disaster loss and damage. Second, it is necessary to acknowledge that systems often measure the wrong things, and take a risky short-term, myopic approach. Third, it highlights that the very concept of cause-and-effect risk assessment needs to be reconsidered, and that systemic risk assessment has much to learn from emerging good practices in management of so-called “wicked” problems that require flexible, curious and participatory management. Then, it concludes by presenting the evolutions needed to overcome shortcomings to better assess and manage systemic risk. 5.1 Shortcomings of incumbent approaches to risk management Governance systems are not collecting the right data, key assets are being undervalued in decision-making and learning opportunities are being missed. Measuring value more holistically is essential to reducing and managing risk. This needs to be considered across governance systems and the private sector, not only within DRM authorities. Disasters are intrinsically interlinked with systemic disaster risks from development, and vice versa (Keating et al., 2016; Keating and Hanger-Kopp, 2020). There are three pitfalls with the way in which value is defined in the incumbent approach to risk management: indices measure the wrong things, they take a short-term approach and they are myopic in that they fail to take into account cascading impacts and/or transboundary risks. All three of these limitations hinder the ability to effectively understand, assess and act on complex and systemic risk. 5.1.1 Measuring the wrong things The old adage that “what gets measured gets managed” is highly relevant in the risk management space. Factors not measured are excluded from financial balance sheets and governance decisionmaking. Current risk reduction efforts focus largely on valuing a narrow set of immediate, short-term impacts, but therefore fail to measure other factors such as biodiversity loss, deforestation and unpaid care. Systems also fail to account for the value of lesstangible assets that become crucial when lesspredictable systemic risks emerge. For example, 67 during the COVID-19 crisis, it has become evident that countries do not have a way to measure the value of having strong, flexible, well-managed companies that can produce essential key items such as medicine and hand sanitizer during crises. Non-market values to humans in areas such as social and religious customs and aesthetic value are also undervalued; these are key to human wellbeing, as is the value of biodiversity to ecosystems including the human ability to survive. Other important indices (e.g. the economic value of human life) remain ethically contentious and are therefore often excluded from corporate balance sheets and government decision-making. Better quantification of the real extent of financial and social assets at risk is essential, particularly in an uncertain and volatile climate future. Furthermore, the understanding and application of how to account for impacts that cascade into or over one another is limited. A building designed to withstand flooding and high winds may simultaneously contain no design consideration for airflow in the event of a pandemic. Equally, the design of a dam in one jurisdiction traditionally considers only the risk to the communities and environments in that same jurisdiction. Such design decisions are also usually made based on historical and limited trend data. In the context of systemic risks such as climate change, this means that infrastructure may rapidly become “out of date” and vulnerable. 5.1.2 Short-term thinking The second pitfall is the time frame over which the destruction and creation of value is considered in risk management. Most disaster impact assessments typically take a short-term view. This short-termism means little data and insights on indirect or concatenated impacts, or ripple effects, are available for risk managers wanting to understand more comprehensively the potential positive and negative consequences of events (Ladds et al., 2017). In addition, there is considerable empirical evidence that individuals exhibit a myopic bias when making risk-based decisions for lowprobability events (Meyer and Kunreuther, 2017) (Chapter 8). There have recently been changes in the legislation of jurisdictions across the world to balance Milton Friedman’s theory that a company’s sole responsibility is to its shareholders (Harris, 2018; Atkins, 2019). In corporate reporting, a wider range of risks is beginning to be considered alongside the financial balance sheet. Such a change represents a significant shift in what corporations consider valuable and therefore what risks they manage; however, more remains to be done. Private sector risk assessments typically consider the value created or lost over 12  months. This is evidenced by the alignment to this time frame of shareholder reporting and incentive schemes such as employee bonuses. There is often a lack of experience in to how to integrate systemic risk reduction initiatives with much longer time frames. However, there are also some good counterexamples, such as the work of the Economic Commission for Latin America and the Caribbean over the last four decades. This has made a major contribution to changing short-term corporate thinking on disaster risk, in particular through the development of a widely recognized disaster impact assessment methodology (ECLAC, 2014). Even staying exclusively in the economics sphere, the indirect and long-term impacts of disasters are likely much greater than the acknowledged short-term ones. Hochrainer-Stigler et al. (2019) estimated the available financial resources and expected annual disaster loss for Austria, including direct and indirect damage. They found an urgent need for increased investment in prospective risk management, even for medium-level risk (50–100  year return periods) due to the largely unacknowledged risk from indirect losses. Social and environmental values are often created and lost during financial value creation. The impact of the short time frame is that, even when they are accounted for, the time frame over which the value of social or environmental assets is lost is considerably shorter than the time taken to repair them. For example, a balance sheet will not yet include the destruction of groundwater by mining over 40 years of production against the 200+ years it will take to recover, or take into account the 68 species loss as a result of such destruction. Many balance sheets would be shown to be untenable if loss were accounted for in this way. Likewise, many risk assessments would be deemed to require urgent and widespread attention if assessed over longer time frames, such as those related to climate change. This short-termism is a dangerous form of simplification that masks latent and potentially highly expensive risks built into financial systems. However, long-term risk assessment is possible, and there are examples in other sectors and systems that provide sources for learning. Within the insurance industry and some parts of the investment communities, financial returns are routinely assessed over multiple decades, but this thinking is not prevalent in other parts of the financial system. Similarly, the private sector has developed methods for consideration of safety factors in infrastructure design that look at cascading impacts of design choices. These can provide lessons for other sectors. In the public sector, risk assessments typically take a longer view than 12  months, particularly in the case of infrastructure, but the practice of discounting means impacts beyond 20– 30 years effectively become ignored. It is particularly concerning that even where longerterm time frames are considered, the mechanisms for integrating systemic risks, particularly from climate change, are not yet developed. This represents a growing and potentially gamechanging risk to current systems and longer-term investments. Reconsidering the choice of discount rate and better accounting for climate change present opportunities to act on investment risk and promote intergenerational equity. 5.1.3 Myopia that ignores transboundary and systemic impacts The third pitfall of current systems is that they tend to align with political and geopolitical borders, thereby ignoring systemic and transboundary risks. The impact of a virus or risk to biodiversity from consumptive behaviours in one country may be minimal or even invisible in that country, but devastating for an adjacent, economically and politically separate community. For example, in February 2021, a cold wave in Texas, United States, left semiconductor plants without electricity, affecting microchip manufacturing and consumers across the world, disrupting an estimated $30 billion of global trade (Williams, 2021). Semiconductor supply chain shortages in Taiwan Province of China in mid-2021 due to the COVID-19 pandemic have also had global impacts on manufacturing supply chains (Feigenbaum and Nelson, 2021). Global corporations span political and geographical boundaries, and hold more financial resources than many nations, so the choices they make about which risks to govern and who they regard as their primary stakeholders have the potential for significant positive impacts on systemic risk. Improving understanding of the transboundary nature of risk can also positively reinforce disaster resilience. For example, during the COVID-19 outbreak, a major distributor of electronic components in China, TTI, temporarily locked down due to the country’s pandemic prevention policy. However, TTI took rapid actions to scale up the operation of its warehouses in the Americas, Asia and Europe to receive incoming shipments from suppliers and make outgoing shipments to customers to fill the resulting supply chain gap (TTI, 2020; Haraguchi et al., 2022). Similarly, around the world, during the first waves of the COVID-19 pandemic, the flexibility of global manufacturers to rapidly adapt and adjust manufacturing capacity to meet new and unexpected demand for products such as hand sanitizer and face masks became a key asset in addressing the pandemic (Table  5.1). The DRR community can potentially learn from such examples of flexibility. There are few mechanisms measuring transboundary systemic risks, let alone planning for and providing redress from transboundary impacts. The maturity of models that convert the value of these elements to the common economic unit – money – has increased significantly in recent years, but a gap remains (Chapter  10). Although independent models exist, integration and dependencies are complicated and messy and are usually considered only partially, if at all (Steffen et al., 2020). And this is where it is important to complement such models with approaches that recognize how “messy” interdependencies are part 69 of all human and natural systems, and that these can be perceived in relational ways without either controlling or eliminating such variables from consideration (Chapter 6). 5.1.4 Results of measuring the wrong things Floods and droughts have significant impacts on poverty, because of their extensive, low-intensity, high-frequency nature. Such recurrent disasters may not be highly visible (and may not even be recorded in the media and usual databases), but nevertheless have a large impact on people’s wellbeing and long-term prospects (Erman et al., 2019, 2020). Earthquakes and tsunamis have lower average impacts on poverty because they are less frequent, but they have massive and acute impacts when they do occur. A single earthquake or tsunami can push millions into poverty overnight (Hallegatte et al., 2020). A World Bank study considering the impacts of disasters related to natural hazards suggests that, in the Philippines alone, almost half a million people a year face transient consumption poverty due to disasters (Walsh and Hallegatte, 2019). These impacts are missed in current damage and loss reporting methods. As these costs are not well counted, they are also not well managed. A myopically narrow definition of value in scope and time frame decreases the incentive for investment in reducing longer-term negative impacts and pays insufficient attention to recovery planning when value is depleted. Product Industries/sectors Countries Examples Hand sanitizer Manufacture of alcoholic beverages, sugar and alcohol mills, manufacture of paints, manufacture of cleaning products, refrigeration industry, university laboratories, Argentine and Brazilian Armed Forces Argentina, Brazil, Chile, Colombia, El Salvador, Guatemala, Mexico National and international groups using the alcohol byproduct from the production of non-alcoholic beers Cosmetic groups: L’Oréal in Argentina, Natura in Brazil Masks Textiles, paper and cardboard manufacturing Argentina, Brazil, Chile, Colombia, Dominican Republic, Guatemala, Haiti In Chile, Caffarena and Monarch, manufacturers of socks, stockings and T-shirts, produce masks Personal protective equipment for health professionals (e.g. masks and shields) Automotive industry, household appliance manufacturing, plastics industry, threedimensional printing in technology centres and universities, machinery and equipment manufacturers Argentina, Brazil, Chile, Colombia, Costa Rica, Uruguay In Argentina, Ford, Volkswagen, Mercedes-Benz and Fiat Chrysler produce face shields In Chile, Comberplast, a plastics company, produces masks and face shields with recycled plastics Table 5.1. Example initiatives by the manufacturing sector in Economic Commission for Latin America and the Caribbean countries to convert production capacity in support of health system supply needs during the COVID-19 pandemic Source: Haraguchi et al. (2022), adapted from ECLAC (2020) 70 The way in which people assess time and value is creating a compounding negative impact on systemic risk and inhibiting achievement of the Sendai Framework goal and the 2030 Agenda. A short-term focus can miss significant disaster impacts, and also fail to understand and ultimately address the dynamic interconnections between disaster risk and long-term well-being (Keating et al., 2016). A shift is required from an almost exclusive focus on the protection of privatized gains in financial systems, strategic economic infrastructure and global supply chains, towards the management and reduction of socialized risks (Maskrey et al., 2022). Consideration of safety factors requires a longterm view, but even in this context, the importance of systemic features is not always recognized. Furthermore, the understanding and the application of how to account for impacts that cascade into or over one another are limited. Myopia affects approaches to handling complex, existential systemic risk such as biodiversity loss. Despite being high on the list of grand societal challenges, biodiversity does not receive the focus that is intuitively appropriate for something widely accepted as being essential to food security and human well-being (FAO, 2019; Zeng et al., 2020). Deforestation, changes in forest habitats, poorly regulated agricultural land and mismanaged urban growth have resulted in a range of conditions that increase the likelihood and impact of globally significant health events such as outbreaks of vector-borne diseases and pandemics. These changes have altered the composition of wildlife communities, greatly increased the contact of humans with wildlife, and altered niches that harbour pathogens, increasing the chance they will come into contact with humans (UNESCO, 2020; Platto et al., 2021). The current system of risk determination and mitigation deals predominantly with market exchange values. Although these may be used to justify biodiversity protection measures, the exchange values for biodiversity and ecosystems constitute only a fraction of the real benefit of these systems (Gowdy, 1997; Alho, 2008; Conniff, 2010). Lessons can be learned from Costa Rica, which effectively combined protecting areas for conservation with innovative payments for ecosystem services and strict enforcement of regulations on biodiversity protection, hydrological services and carbon sequestration (section  8.3.1). Forest protection measures in Brazil and Indonesia have also shown that human disease risk can be reduced indirectly by management of the landscape, ecosystems and the biodiversity they contain (Whitmee et al., 2015). One of the starkest examples of this circular logic or complex interactions is that of disaster poverty traps. Poverty traps occur when a household or community’s response to a disaster reduces their well-being in the longer term and ultimately reinforces their vulnerability to the next disaster event, resulting in a vicious cycle from which it is almost impossible to escape. A family might get caught in a disaster poverty trap when forced to use erosive coping strategies following losses from a disaster (Heltberg et al., 2012). Erosive coping strategies are short-term fixes with devastating long-term consequences, such as selling productive livestock, removing children from formal education, arranging for girls to marry early to relieve economic pressure or gain income, or taking out a high-interest loan. Recent examples of erosive coping strategies during the COVID-19 pandemic are the national policies in Australia and Chile that allowed pension fund contributors to draw on savings in their pension funds to cover basic needs during the crisis. In Chile, this was a frank process of impoverishment whose impact will be seen in future years when those who used these funds in advance will see their pensions severely diminished: “Official data shows that, up to February 2021, close to 10.5 million people withdrew money using the first or second withdrawals and, of those, 30  percent depleted their accounts” (Evans and Pienknagura, 2021). In the worst cases, industries, governments and individuals can contribute “negative resilience” (Gallopín, 2006) or “perverse resilience” (Holling, 2001; Ráez-Luna, 2008). This occurs when systems that are oppressive and exploitative of humans and ecosystems are resistant to change. 71 Given the need to measure more things to effectively manage systemic risk, the challenge becomes how to keep track of multiple variables, some of which are inherently uncertain. In this regard, the thinking around management of wicked problems may provide DRR practitioners with an opportunity for learning. The toucan of South America is one of many species endangered by loss of rainforest Credit: © Shutterstock/Ondrej Prosicky Photography the (wicked) problem may create other problems elsewhere in the complex dynamic system. Wicked problems display many of the characteristics of systemic risk. A wicked problem is difficult (or impossible) to resolve fully due to incomplete and at times contradictory information and frequent changes in requirements and output functions in a turbulent context (Forrester et al., 2018). It refers to an issue that cannot be fixed but which constitutes a moving target without a single (simple) solution where the term “wicked” denotes resistance to resolution, rather than evil (Andersen and Gatti, 2022). Wicked domains are situations in which feedback in the form of outcomes of actions or observations is poor, misleading or even missing. In contrast, in “tame” or “kind” domains, feedback links outcomes directly to the appropriate actions or judgments and is accurate and plentiful (Rittel and Webber, 1973; Hogarth et al., 2015). A wicked environment cannot be reduced to a kind one just because it can be assessed. Yet this is what people often attempt to do, by continuing to use standard tools and processes on these complex areas, even though there are no repeatable patterns in complexity. Hence, the ability to deal with wicked problems in social systems requires cross-functional and collective processes induced by supportive values and leadership principles. Conventional decisionmaking models assume reasonable stability around tasks and organizational design parameters, in contrast with situations where decision makers face unprecedented interdependencies of unpredictable factors or forces embedded in complex wicked problems. However, there are certain actions policymakers and analysts can take to better understand and devise solutions to managing wicked problems. Sections  5.2.1–5.2.5 below set out some key elements. 5.2.1 Enable systems thinking and systems approaches Humans are exceptional at recognizing and learning patterns (e.g. chess grand masters). They are capable of doing so in kind environments and in wicked environments. Yet, since the industrial revolution, education systems have optimized 5.2 Wicked problems and systems-based approaches In organizational, social and societal settings, the term “wicked problem” is often used to refer to an issue with a high level of complexity without any determinable final point of stability. Due to highly complex dependencies among many moving elements, the resolution to one aspect of 72 delving deeper and more narrowly, transmitting information rather than connecting it. However, a resurgence of systems thinking is now occurring, from the structure of projects to the role of intergenerational facilitators (Hogan, 2019). A similar revolution is needed in the realm of work to combat many of the processes that discourage people from identifying and connecting information or seeking external “non-expert” input. It is these types of connections that are needed to respond to the wicked problems that risk governance seeks to address. In practice, systems thinking is reflected in many day-to-day skills. Providing room in the work environment to hone the habits of systems thinking can be a first small step towards mainstreaming systems approaches (Waters Center for Systems Thinking, 2020). 5.2.2 Integrate diverse knowledge The system of learning in most countries is designed to reward early and hyper specialization, sinking people deeper into the trenches of highly specialized knowledge (Epstein, 2019). While this is necessary to advance knowledge, it can also miss the opportunity to seize insights generated in interdisciplinary, intersectoral, interdepartmental, integration of knowledge. This does not mean specialized knowledge is not important, but it also needs to be integrated effectively with broader transdisciplinary approaches, as well as indigenous and traditional knowledge systems and polycultural ways of knowing (Chapter 6). 5.2.3 Recognize that deep uncertainty is a characteristic of wicked problems Existing approaches for planning under deep uncertainty are likely to be most useful when they seize opportunities to draw on collective intelligence. Adaptation pathway approaches, which are popular also in flood risk management, are gaining traction as a method in this area. They have the capacity to explicitly address systemic characteristics such as path dependencies (Werners et al., 2021; HangerKopp et al., 2022). 5.2.4 Use diagnostic approaches Diagnostic approaches (checklists) can also be useful to identify problems and decide whether their environment or their constituent parts are wicked or kind (Peters and Tarpey, 2019). This is part of the evolution needed in how to approach the problems and generation of responses to systemic risk. 5.2.5 Use a variation of the “precautionary principle” and “planetary boundaries” Principle  15 of the 1992 Rio Declaration on Environment and Development is now an established principle of environmental law. It adopts the precautionary approach to threats that are serious or could potentially cause irreversible damage. This means that cost-effective measures should be taken to prevent the threats being realized, rather than waiting for full scientific certainty, which may come too late or be impossible to determine in complex systems (United Nations, 1992; PintoBazurco, 2020). The idea of outer limits can also be applied, such as the concept of planetary boundaries developed by the Stockholm Resilience Centre (2021). The concept of planetary boundaries certainly applies to existential threats if not to lesser global ones. 5.3 A long-term, holistic and systemic perspective In an increasingly interconnected and complex world, where the risks faced are compounding and cascading, the dominant approach to risk management is no longer fit for purpose. A systems-based approach is needed to understand contemporary drivers of risk and of impacts when risks are realized. Fortunately, there are promising signs that systems are beginning to transform to take into account some of the present limitations in managing systemic risk. The Group of Twenty (G20) Financial Stability Board created the Task Force on Climate-related Financial Disclosures to improve and increase reporting of 73 climate-related financial information (TFCFD, n.d.). As climate change presents financial risk to the global economy, the task force aims to help financial markets access clear, comprehensive, high-quality information on the impacts of climate change. This includes the risks and opportunities presented by rising temperatures, climate-related policy and emerging technologies in a changing world. Similarly, the G20 Taskforce on Nature-related Financial Disclosure aims to deliver risk management and disclosure frameworks for organizations to report and act on nature-related risks, which underpin an estimated $44  trillion of global economic output (TNFD, n.d.). The end goal of this second task force is to support a shift in global financial flows away from nature-negative outcomes and towards nature-positive outcomes, starting with a shift in risk perception and the value of natural systems, based on the incentive to protect organizations’ economic bases and revenue from nature-related risks. In 2020, the Dutch Central Bank and financial supervisor, De Nederlandsche Bank, became “the first central bank to highlight biodiversity as a material financial risk”, highlighting that 36% of the portfolio values of the Dutch financial institutions were exposed to nature-related risks (UNEP, 2020). Parts of the financial sector, including investment managers and insurance firms, which act at a global scale across markets and geographies, are relying firmly on long-term value creation for profitability. They are playing a significant role in mobilizing funding away from activities such as use of fossil fuels, which were traditionally unaccounted for as drivers of systemic risk from climate change (Buchner et al., 2019). This may be partly driven by a shift from shareholder primacy to stakeholder primacy, witnessed most recently in Canada, but also in Bhutan, New Zealand and Wales (Borduas, 2019). Key to unlocking the potential of this shift as a way to address stagnation in progress towards the Sendai Framework goal, will be for these same actors to include the reduction of social vulnerability and exposure as a key part of the value creation process. Or, more broadly, to see these risk drivers as progressive opportunities for change rather than defensive drivers that need to be reduced and controlled (Møller, 2011). At the same time, there are also emerging good practices of better valuing a wider range of assets. As an example, biodiversity credits or “biocredits” are coherent units of measurement that track conservation actions and outcomes and can help to improve tracking and transparency. When they are well designed, they can make investments in biodiversity management more financially attractive, for example, by attaining private sector finance. They can be used by governments to monitor their actions and report on biodiversity commitments. As much of the world’s biodiversity and its richest biodiversity spots are found in remote and poor tropical regions, biocredits must be inclusive and founded on fair benefit-sharing principles (Porras and Steele, 2020). Figure 5.1 illustrates an example of an institutional set-up for biocredits based on these principles. Systemic risk is inherently uncertain due to its complexity. Therefore, new approaches to better reduce systemic risk are building uncertainty into how they approach risk. While older, rigid tools and processes favour inaction when faced with uncertainty, new tools are finding ways to embrace it as a planning parameter. Adaptive planning, evolutionary development, early delivery and continual improvement encourage flexible responses to understanding the problems that need to be solved and to finding the solutions, which are both key elements in understanding systemic risk. For example, in software development, Agile Project Management is now the accepted method when developing a complex response to a complex system. Use of tools such as Sense Maker (The Cynefin Co, 2021) enables the collection and interpretation of multiple types of data from across a range of scales and data types. The Association of Southeast Asian Nations has developed a flood hazard and risk analysis framework that integrates climate change projections into disaster risk assessments to help address future systemic risk. A similar integration was piloted in a case study survey from coastal areas in Ghana, which explored improvements in adaptive capacity indexes to treat climate change as one of the threats to be addressed in all-hazards risk reduction (Frazier et al., 2022). The systemic risks associated with floods and landslides in the Lao People’s Democratic Republic and Myanmar have been assessed using multi-stakeholder 74 Local supply Communities and technical experts Aggregation/ bio-bank, trust fund Credits demand Resellers and final buyers Biocredit 1. Community and local engagement 2. Project idea note 3. Project design 7. Sales of credits (or certificates) to buyers, e.g. governments and companies 6. Periodic third-party verification 5. Reporting and issuance of certificates 4. Validation and project registration Actions CO2 8. Money is transferred to a bio-bank/ conservation trust fund and through them to those engaged in local actions Figure 5.1. Example of an institutional set-up for biocredits founded on fair benefit-sharing principles Source: Based on Porras and Steele (2020), using Plan Vivo Foundation’s process for community-based biocredits 75 transdisciplinary consultation processes and community engagement at the river basin level in combination with dynamic simulation models and tools for assessing systemic risk (Keaokiriya et al., 2022). 5.4 Ways forward The terms “systemic” and “complex” convey connection and dynamism. This means that every risk, every potential negative outcome, may at the same time be a driver that can potentially cause another negative outcome. These outcomes may either amplify or dampen one another, thus increasing or decreasing the impacts on the system. It is important to note this dynamic interconnectedness can also reduce risk and increase resilience; this is what systemic risk governance seeks to achieve. Current practices of attributing measurement and value linked to traditional economic practices also need to evolve to better address systemic risk at the global level. There are two emerging ways forward for assessing and managing systemic risk: (a)  the application of systems-based approaches to address the dynamic drivers of risk and (b) the mobilization of collective intelligence for these approaches to provide impactful outcomes. Existing knowledge, including from the management of wicked problems, points to logical steps to take and methods that can be employed immediately. New ways of combining modelling and data-driven approaches with community consultations are emerging. As the chapters in Part III outline in more detail, knowledge co-production efforts need to be more closely linked to improve large-scale modelling efforts. Increasing the value of attributes such as flexibility and the ability to work across traditional sectoral and geographical boundaries are key in the effective management of systemic risk (Haraguchi et al., 2022). Having diverse subject matter experts contribute to developing shared outcomes will highlight differences and create confrontation at collective and individual levels. Most people do not willingly put themselves in situations where their expertise is questioned. Confrontation and conflict are created because people are taught that in such situations, there are those who gain something and those who lose something. It is essential that governance systems, not DRM institutions only, engage in risk reduction efforts. To be effective for a systemic approach, risk reduction cannot be viewed as a competitive advantage or information to be protected, as that limits damage control to the impact on each corporation or institution. Managing the complex systemic risks of the future will require mobilization of large numbers of people and significant financial resources. It is cost-effective to invest in a sustainable future, but the investment will be possible only if government as a whole, and the private sector, acknowledge its importance and invest in building resilience. A landslide renders a mountain road impassable, cutting off rural villages in northern Lao People’s Democratic Republic Credit: © Shutterstock/Matyas Rehak 76 6. Shifting perceptions on risk When does linear problem-solving fail, and how can people’s decision-making become better informed to understand and manage the systemic nature of risk? Later chapters look at managing risk from the perspective of new conceptual, mathematical and computational methods, predominantly in network and complexity science. This chapter recognizes that complex problems are not susceptible to simple, predetermined solutions, and examines the question from a different angle. Focusing on ecological–social risk, it aims to look from the perspective of different world-views and knowledge systems about how humans understand and act in the world they inhabit. This is required to explore, recognize and move beyond some established habits of mind and to see in new ways that enable human societies to tackle ecological–social risk at the local and planetary scales. This chapter also argues that knowledge systems based in linear causality and clear-cut concepts of true and false rarely recognize that the creation of that knowledge is selective and relative to the knower’s context. Such an approach to risk focuses on some contexts to the exclusion of others, effectively hampering a systemic understanding of human and planetary systems and risk. For example, in community-based DRR, there is usually a strong dichotomy maintained between local or traditional knowledge and scientific knowledge. A critical review of such approaches is needed to see how they can become truly inclusive of local communities and their knowledge. Otherwise, they may be processes that are done at community level by outsiders rather than with communities (Maskrey, 2011). This can mask exclusion, dichotomy and the dominance of one knowledge system over another, behind the “promise of participation” delivered through community-based approaches (Trogrlic et al., 2022). A first step is to shift from the idea of people and systems being simply interconnected, to the concepts of interdependent and interrelational thinking and acting in systems. This requires a shift from thinking of individuals and organizations as external and separate entities to an understanding that they are all part of the same system. Approaches also need to change, from a focus on control, quantification and competition, to the idea of exploration, mutual learning and compassion. This process requires humility, curiosity and a new scientific respect for relational world-views. Innovative approaches such as the collection of “warm data” can help this process (section 6.3.2). Such approaches can help improve risk understanding, and point at ways of routinizing, even bureaucratizing, the exercise of imagination, which is essential to understanding the systemic nature of risk (Pozek, 2022). The chapter next gives some insights into indigenous or traditional knowledges from a relational worldview. It demonstrates how indigenous communities are adapting and integrating new technologies and participating in and influencing government and official processes for risk reduction. It then explores how scientific values and habits of mind can inhibit human capacity to find new ways of knowing, and looks at some recent innovations in how to move beyond these limitations. It concludes by suggesting some possible ways forward. 77 6.1 Learning from indigenous knowledge and ways of knowing “Manawa whenua, wē moana uriuri, hōkikitanga kawenga” “From the heart of the land, to the depths of the sea; repositories of knowledge abound” A Maori proverb (Reilly, 2008) The traditional indigenous Maori world-view in New Zealand is formed around the understanding that humanity is created through eco-genealogical connections to the land, which is understood as a foundational ancestor. Many indigenous peoples’ appreciation of ancestral lands, and all they contain, manifest in deep emotional, spiritual and familial attachments. Acknowledging the interconnectedness and interdependencies of humanity and the natural world also draws attention to the intergenerational obligations imposed by this material heritage, and the moral responsibility of enacting continual and considered stewardship at all times (Kenney and Phibbs, 2014, 2015). Similar deep relational ties are common to many indigenous and traditional cultures that bind successive generations to maintaining the environmental, social and spiritual well-being of living lands, which are intimately linked to the embodiment of identities (both human and nonhuman) (Marsden, 1992; Agrawal, 1995; King et al., 2007; Langton et al., 2012). Elements of the natural world – fauna, flora, waterways and terrains – are considered to have agency alongside humanity, as illustrated in the personification of rivers and mountains in Maori culture (Whyte, 2014). This systemic approach to understanding the connection between communities and ecosystems is increasingly being understood within wider political systems. For example, in the New Zealand legal system (O’Donnell and Talbot-Jones, 2018), the Whanganui River is recognized as a legal person (New Zealand Government, 2017). Drawing on similar cultural traditions, the constitutions of the Plurinational State of Bolivia and of Ecuador also recognize Mother Nature as having rights that governments are required to protect (Shelton, 2015). Rather than excluding contexts, this approach to decision-making embraces contexts and works adaptively with, instead of attempting to control or conquer, complex living systems. Local or traditional knowledge is also highly dynamic and includes opportunities for communities to create “hybrid knowledge” on risk by using traditional methods and triangulating with data gained through science and technology (Trogrlic et al., 2022). In the face of changes in planetary systems due to climate change and overexploitation of ecosystems, communities around the world are seeking new ways to understand and manage ecological–social risk. On the island of Sulawesi, Indonesia, Kaili communities are the largest ethnic group in the city of Palu. They have built past knowledge of hazards into specific names for disaster-related phenomena, such as lingu (earthquake), lembotalu (for tsunamis, which literally means three big waves) and nalodo (for post-earthquake liquefaction), as well as informative folk songs about previous events. The Kaili communities also established safe areas named kinta, which they believed to be safe from liquefaction phenomena. During a mass liquefaction in the Petobo district of Palu in 2018, the houses in kinta proximity were only mildly affected, with their use as safe areas avoiding loss of life and significant damage and loss (Triyanti et al., 2022). “Getting scientists to consider the validity of indigenous knowledge is like swimming upstream in cold, cold water. They’ve been so conditioned to be sceptical of even the hardest of hard data that bending their minds towards theories that are verified without the expected graphs or equations is tough. Couple that with the unblinking assumption that science has cornered the market on truth and there’s not much room for discussion.” (Kimmerer, 2020) 78 In New Zealand, following the 2010–2011 and 2016 earthquakes in Canterbury, the local Maori tribe Ngāi Tahu partnered with central and local governments in ensuring environmental restoration, biodiversity and future sustainability of the region. Collaboration with Environment Canterbury encompassed the geophysical profiling of Ngāi Tahu lands and earthquake changes, global information system mapping of sites of tribal significance and restoration of traditional food gathering sites (Kenney, 2019). Project results have shaped measures for protecting cultural heritage values, informed regional planning and supported economic recovery in Canterbury. Longer-term outcomes include the development of heritage risk models that map risks to traditional assets and the creation of heritage risk alerts that categorize graduated outcomes in terms of risk exposure (ECan, 2013). Also in New Zealand, the Maori tribe Ngāti Rangi resident around the active stratovolcano Mount Ruapehu uses traditional knowledge of volcanic activity to inform contemporary risk management planning (Pardo et al., 2015). Indigenous indicators of increasing volcanic activity, changes in fauna behaviour and the reaction of flora to altered soil chemistry are documented, while digital sensors and cameras have also been deployed at ancestral monitoring locations (Gabrielsen et al., 2017). In this context, modern scientific technologies are operationalized alongside service to holistic cultural stewardship and the preservation of an ecogenealogical relationship, because Mount Ruapehu is considered an eponymous ancestor by Ngāti Rangi (New Zealand Government, 2019). As climate change has exacerbated the incidence and intensity of extreme weather events globally (IPCC, 2021b), flooding disasters have also increased, creating social devastation, economic destabilization, infrastructure destruction, and environmental erosion and collapse, especially in indigenous communities (Kelman, 2015). Yet, there is evidence of indigenous or traditional cultural attributes being mobilized (Saunders, 2017; Dube and Munsaka, 2018) to predict flood risks and facilitate broader community recovery and resilience following significant flooding events (Hiwasaki et al., 2014). Flood management planning in some areas in Nepal and on the Tibetan Plateau rely on traditional approaches to forecasting and responding to floods. Flood mitigation and prevention practices include cultivating flood-resilient crops and creating drainage channels and moats. Community-based early warning systems use environmental indicators to identify patterns associated with the onset of flooding. These may range from cloud shapes, rainfall patterns and fauna activity, to wind velocity, star positions and outside temperatures (Gautam et al., 2007; Dewan, 2015). Local communities respond with emergency preparedness measures, including stockpiling resources, raising storage areas for essential supplies, moving living spaces to the second storey of houses, relocating animals to higher ground and establishing evacuation routes. Immediately following flooding events, traditional health remedies (e.g. green coconut water used to treat diarrhoea, cholera and dysentery; Adams and Bratt, 1992) are also used in the absence of other “conventional” response and recovery resources. “In a culture where the myth of objectivism is very much alive and truth is always absolute truth, the people who get to impose their metaphors on the culture get to define what we consider to be true – absolutely and objectively true. All cultures have myths, and people cannot function without myth any more than they can function without metaphor. And just as we often take the metaphors of our own culture as truths, so we often take the myths of our own cultures as truths. The myth of objectivism is particularly insidious in this way. Not only does it purport not to be a myth, but it makes both myths and metaphors objects of belittlement and scorn: according to the objectivist myth, myths and metaphors cannot be taken seriously because they are not objectively true. However, the myth of objectivism is itself not objectively true.” (Lakoff and Johnson, 2003) 79 Box 6.1. Australian Aboriginal cultural burning and wildfire management Much of the Australian landscape is prone to large-scale devastating wildfires. For example, the “Black Summer” fires of 2019–2020 burned so fiercely that they created their own firestorms, burned almost 19 million ha of land, destroyed 3,113 houses, resulted in the deaths of 33 people (Filkov et al., 2020) and killed at least 1  billion mammals, birds and reptiles (Dickman and McDonald, 2020). Such fires cannot be extinguished and can be controlled only at the margins. They are also occurring more frequently, with droughts becoming more severe and average temperatures increasing due to climate change (Abram et al., 2021). There is an ongoing debate about how to manage forests to reduce these human and ecological impacts, which has focused on the binary options of: (a) planned burning by fire authorities to mitigate wildfire risk by reducing fuel load in forests or (b)  preserving the forests in their natural state, knowing they will be devastated by spontaneous fires (e.g. due to lightning) every few years. Government authorities have also recently begun to consider a third way – that of Aboriginal fire management. After the Black Summer fires, Aboriginal techniques of “mosaic burns” or “cultural burning” were promoted strongly as an effective measure to reduce the risk of recurrence (Betigeri, 2020). Such burning is done in small areas, and its timing and frequency is informed by local knowledge of the environment and weather patterns. This creates cooler fires that clear fuel such as broken branches, fallen trees and underbrush, but without killing trees (Gerretsen, 2018), and allows fauna to escape and flora to regenerate from the unburned neighbouring areas. In contrast, contemporary risk reduction burns employed by fire services tend to be larger in scale, occur more frequently and have an increased propensity for causing uncontrolled wildfires (Bowman et al., 2004). Where cultural burning is practised, fire risk is reduced overall, and even when larger fires pass through these areas, they do not burn as hot or cause such devastation. These techniques, often described as “firestick farming”, were practised by Aboriginal peoples in Australia before European settlement (Bird et al., 2013), to reduce the incidence and level of fire intensity, to regenerate pasture for game animals such as kangaroos and to select for staple food plants (Gammage, 2012; Pascoe, 2018). New progress in wider acceptance of cultural burning was marked in 2020 in the State of Victoria, with the government’s adoption of The Victorian Traditional Owner Cultural Fire Strategy, co-developed with Traditional Owners to reintroduce cultural fire practices (The Victorian Traditional Owner Cultural Fire Knowledge Group, 2020). Credit: Gareth Catt/Kanyirninpa Jukurrpa Minyawu Miller, an elder in the Punmu Aboriginal Community, lights fires in the Great Sandy Desert in Australia 80 Extreme heat events, drought and wildfire also challenge indigenous and traditional communities’ adaptive capacities, as they do for industrial agriculture, forestry and water resources management (Berkes, 1999; Langton, 2010). The burning practices of indigenous peoples have also played a critical role in the creation and stewardship of ecosystems in North America, including by the Karuk and Yurok in California, United States, in particular to manage the California hazelnut tree (Bibby, 2004; Kalies and Yocom Kent, 2016; Lake et al., 2017). Polycultural knowledge about such risk can sometimes be made through governments and institutional actors learning from indigenous cultures about ecological management practices that go back millenniums, such as Australian Aboriginal techniques for land management through fire (Box 6.1). 6.2 Established “scripts” and the systemic nature of risk The current scientific world-view is a representation (or manifestation) of the culture and the conditions of the system in which people are making their decisions, despite its foundation in the idea of objective knowledge. However, people and institutions inside this world-view rarely recognize the extent to which it is a way of knowing that operates within a particular context. A perspective that allows for the complexity and multiplicity of contexts is needed to understand the systemic nature of risk. 6.2.1 Limitations of habits A key challenge of operating and making decisions under conditions of significant uncertainty is the human tendency towards the formation of habits. Everyone forms habits, it is how human brains have evolved, or not evolved. A habit always begins with a single decision at some point in time. Repeating that decision, or that way of making a decision, becomes a habit over time. And habits are undeniably hard to change, particularly when it comes to decisions made under uncertainty when the holding to scripts and scripted ways of making decisions dominate. These are habits of thinking that are “efficient”, but they limit people’s capacity to understand and act on the systemic nature of risk. The world-view that people bring when approaching challenging decision-making moments is also an underlying and rarely acknowledged habit. However, it can lead to a simple dualistic (“right” or “wrong”) approach, which provides an increased sense of certainty that gives decision makers an illusion of control. These scripts can serve useful purposes at times. Seeing a lion charging means run. But what do these scripts mean for decision makers in complex institutional or bureaucratic settings? What if running from the lion is not, after all, the best way to avoid becoming prey, and that deeper knowledge of lions and their environment could lead to avoiding the risk, or responding more effectively? The scripted approach can prevent decision makers from being able to recognize patterns outside the dimensions or parameters of the scripts they are effectively working within – for example, outside the protocols of their institutional setting. It means if people are making decisions within a setting where it is implicitly understood that decisions always have a right or wrong answer, then they will act accordingly and seek simple answers to complex questions. Over time, this behaviour can lock in significant limitations and flaws that create additional risk when viewed from a systems perspective. The challenge, then, is how to break free from dualistic decision-making approaches and get into new habits of examining old habits when making a decision that is itself a result of a habit. Making decisions based on the systemic nature of risk is never simple, and it is important to find ways to release people from their scripts. There is a need to find ways of managing systemic or complex cascading risk within dynamic societal and environmental contexts (and within the contexts of those contexts), all of which are constantly shifting. Complex decision-making environments require decision makers to allow all, or as many as possible, of the different contexts to be perceived at the same time; not just those that are convenient to expedite a decision, such as focusing only on the economic or political outcomes. 81 People will often continue to try to make sense or understand a risk-related problem (or come to an “objective” decision point) based on the elimination or exclusion of many of the contexts. This may feel like an appropriate way to navigate the complexity of the systemic nature of risk and yet it excludes relevant contexts. How can the curiosity needed to address complex systemic risk be reconciled with the need for those in positions of governance and decision-making authority to make decisions? Box 6.2. Deep demonstration and small business in a circular economy future in Viet Nam The UNDP deep demonstration approach, called the Sensemaking and Acceleration Protocol, is being used in programmes for building resilience in micro-, small- and medium-sized enterprises (MSMEs) in Viet Nam in the wake of COVID-19 (Ulziikhuu, 2020). It takes a systems perspective in terms of sectoral scope and timescale, asking how to boost the performance of MSMEs in COVID-19 recovery and also how they can be part of a long-term “circular economic rebound” in Viet Nam (Wiesen et al., 2021). MSMEs are the backbone of the Viet Nam economy, accounting for 98% of all enterprises and 40% of GDP (Wiesen et al., 2021). However, the question of their future resilience is not simply about growth. The country’s economic growth in recent years has been based on the linear “take–make–waste” model that has put increasing pressure on ecosystems and depleted natural capital. Continuing this growth model would not meet the country’s long-term goal of development based on increased productivity, innovation and competitiveness that is in harmony with sustainable development. Such change will not occur merely by applying new environmental regulations to current linear, extractive and polluting economic growth. It is not a matter only of preserving the environment, and it does not belong only to a single ministry. It needs to be rooted in governance innovation and cross-ministerial collaboration. The approach of aiming for a circular economy requires wider system change that is transformative of the current socioeconomic logics. The challenge is how to achieve such transformation. The model being applied is described as a “sense–reframe–position–transform” model. Currently in the sensing phase, it aims to “see” the system in a new way and understand various drivers and their connections, before attempting to plan how to change them. One of the contexts this phase is looking at is the role of financial capital in changing behaviours in the system, investigating the effects that leveraging existing capital and resources could have across different programmes to catalyse transformation. It is also looking at distinctive features of Vietnamese culture and building on traditional understandings, such as the circular economy practices used in the agriculture sector for decades. However, there is a gap in public awareness about what the transition would mean and what changes are needed in consumption and production practices. The model establishes a process for identifying the dimensions of these challenges and working experimentally and collaboratively towards a broad vision, but the intermediate components of the system transformation are not yet known because these will emerge from the process. Source: Wiesen et al. (2021) 82 6.2.2 Learning about the properties of systems An alternative approach to scripted decision-making in the midst of complexity and with significant uncertainty is being able to adopt a perspective that can perceive a much wider range of contexts. An example is the UNDP systems innovation approach being used in Viet Nam (Box  6.2). This approach focuses on the conditions of the system in which a decision is made, rather than focusing solely on the decision itself as if it is made in isolation. The Viet Nam initiative will appear too open ended for many observers. How will anyone know whether or not it was successful if the outcomes are not predetermined? This involves a shift in thinking, to explore how different systems of learning and knowing can inform each other to help scientists and policymakers step outside some old habits of thought in reducing risk. However, supporters of this approach note it is the very state of uncertainty that creates potential to learn about the properties of the systems through the process of making decisions. This is a powerful form of learning that can shift the structures (or the conditions of the system), and ultimately shift the culture and world-views in which the decision makers exist. It is potentially critical in opening new possibilities for decisions based on a more adaptive understanding of the systemic nature of risk rather than maintaining a rigid certain approach to the irreducible complexity of challenges like the climate crisis, ecological breakdown or transitioning energy systems. Another example of adopting a “learning about the properties of systems” approach within a complex system is the Inclusive City-Community Forecasting and Early Warning Service, known as Developing Risk Awareness through Joint Action, being used in Kenya and the United Republic of Tanzania (Resurgence, 2020a). It is a practical, ecosystemic approach that is working in Dar es Salaam and Nairobi with a wide range of interested people including those living in informal settlements and municipal and national government representatives (Box 6.3, including Figure 6.1). 6.2.3 No more fixing The challenges of reducing loss of life, limiting economic and wider ecological impacts, and minimizing loss of systems function are difficult to approach. However, when a decision is approached as a way to achieve a pre-specified outcome, this constrains the possibilities for learning to the decision itself. Instead, approaching from the perspective of perceiving the wider sets of constantly shifting, dynamically interacting contexts embraces unprecedented opportunities for learning about the properties of the systems. This learning is possible by releasing decision makers from the perceived need to fix a specific problem and work on issues identified from the relationships of the systems in which the problem exists. It is important to establish a learning culture that allows those who are making the decisions to start a journey of “building their muscles”, developing their capabilities and building their ability to perceive the conditions of the system that give rise to the manifestation of risk, as was done in Australia (Box 6.4). 6.2.4 Building habits of examining habits Decision makers need to be humble about their ability to perceive all of the multiple contexts giving rise to the conditions of the systems that result in risks being manifest. In doing so, they will then be building on the ability to focus attention increasingly on the drivers – the messy, constantly shifting dynamics of all of the systems that are interacting with each other – that give rise to the contexts which establish the conditions of the systems that result in the risks that drive disasters. This will kickstart a new habit of examining habits. The global community now needs to decide to restore relationships by embracing pluralistic ways of knowing, rather than perpetuating dualistic ways, to build human understanding and ways of managing the systemic nature of risk. 83 DARAJA stakeholder group Value added to information Actor Information channel Feedback flow Less dominant flow Dominant flow Kenya Meteorological Department Red Cross Nairobi City County / NMS Urban intermediaries (NGOs) Community media City media National media Community leaders Website Social media Community response groups Local administration SMS Facebook WhatsApp Face to face Radio Social media Radio Social media Newspaper Radio Phone call SMS Face to face Residents of informal settlements Face to face WhatsApp / Facebook Phone call/ SMS TV Figure 6.1. Inclusive and dynamic weather and early warning information in Nairobi Note: DARAJA = Developing Risk Awareness through Joint Action; NGO = non-governmental organization; NMS = Nairobi Metropolitan Services. Source: Resurgence (2020b) Box 6.3. Developing Risk Awareness through Joint Action on weather data in Kenya and the United Republic of Tanzania The Developing Risk Awareness through Joint Action approach is focusing on translating technical weather and climate information produced by scientists and forecasters at the national meteorological agencies into useful and accessible knowledge for community users. It aims to shift perceptions and change the conditions for real-time preventive or preparatory actions on the ground for populations largely in informal settlements who are exposed to a full range of risks, including rapid urban flooding. A significant component of the challenge of preventing loss of life, livelihood and property from urban flooding addressed by this ecosystemic approach is building the confidence of the affected populations in the highly technical information produced. Such information is not accessible unless it is transformed for those who may benefit most from using it. This requires a change in the scientists’ and the communities’ perceptions and engaging in the forecasting system in a new way. The approach embeds mutual learning about what information is possible and what information is necessary, relevant and understandable. Figure 6.1 shows Nairobi’s inclusive and dynamic weather and early warning Information Ecosystem Map pioneered under the Developing Risk Awareness through Joint Action approach. 84 Box 6.4. Profiling interconnected causes and cascading systemic disaster risk in Australia Australia has undertaken a national learning process about the properties of systems without a predetermined form for the outcomes. The Government’s National Resilience Taskforce, together with Emergency Management Australia, led an interactive process to investigate what makes Australia vulnerable to disaster. The results were published in the report Profiling Australia’s Vulnerability: The Interconnected Causes and Cascading Effects of Systemic Disaster Risk (National Resilience Taskforce, 2018) and informed the Australian national DRR framework. At the start of the process, not much was known nationally about what people’s preferences and value priorities were when at risk of being severely affected by disaster loss. Significantly, profiling systemic vulnerability recognized that everyone and everything is vulnerable to the effects or disruption caused by severe to catastrophic events. Often, vulnerability is mistakenly perceived as a sign of weakness, with a tendency to downplay personal, institutional and community vulnerability, especially for people of affluence or in power. The process had two principal objectives and products to deliver: 1. New knowledge, in the form of stories, concepts, understanding, narratives and/or data about key drivers of vulnerability from a wide cross section of people through workshops designed for this purpose. 2. A national vulnerability profile that reflected inclusive understandings of the complex interdependent nature of the causes of vulnerability, the roles and responsibilities for tackling these, and the hope and agency for driving change. The approach and methods were designed to be repeatable and adaptable, and to result in co-producing a systems understanding of disaster. They used visual representation of cause and effect, and generated associated stories of lived experience that underwent extensive synthesizing and sense-making. The report narrates how risk and vulnerability are created, transferred and experienced during disasters, including stories of experiences and the values affected or lost. These stories and the system patterns identified highlight that tensions, conflicts in values and different ideas on acceptable trade-offs can arise among different parts of society and among different roles within organizations. For example: a prosperous now versus a prosperous future; ourselves versus others; blame versus learning; stability versus change; people versus planet; tangible versus intangible; and liberties versus regulation. A “resilience checklist” was also developed that assists in the discovery of what “doing things differently” looks like. Figure 6.2 builds on the resilience checklist and illustrates the three different pathways or ways of thinking, deciding and acting in the Australian context: doing things the same, doing things better and doing things differently. Sources: O’Connell et al. (2018, 2020); Buchtmann (nee Osuchowski) et al. (2022) 85 Figure 6.2. A DRR system narrative in Australia Note: VRK = values rules knowledge. Source: O’Connell et al. (2020) 86 87 6.3 Relational practices to explore the way forward Practical explorations for de-patterning, challenging hard-programmed habits (scripts) and repatterning for culture level shifts are already under way. The UNDP deep demonstration model applied in Viet Nam, the Developing Risk Awareness through Joint Action approach in Kenya and the United Republic of Tanzania, and the cascading and systemic risk approach in Australia are examples of moving beyond the usual scripts. There are also other varied and experimental typologies aiming to develop a shared practice to better understand and navigate the shifting contexts of the systems in which risk management decisions must be made. 6.3.1 Enhancing the technical practice of disaster risk management Practitioners are increasingly experimenting with ways to bring relational approaches into bureaucracies and design processes (e.g. Box 6.5). Box 6.5. Practical experiments in DRM critical technical practice To uncover and highlight the benefits of interdisciplinary collaboration and reflexivity in disaster risk modelling, communication and management, a team of researchers from the Nanyang Technological University Singapore undertook an experiment with new ways of approaching DRM beyond the engineering discipline (Lallemant et al., 2022). Workshops, outreach events and professional collaborations were designed to enhance DRM technical practice through events such as: ● Artathon: A 2 day event in San Francisco, United States, that brought together engineers, artists and scientists to collaborate on new works of art based on local disaster and climate data. It was conducted as a team-based marathon that culminated in an exhibition. ● Understanding Risk Field Lab: A month-long arts and technology “un-conference” exploring critical design practices, collaborative technology production, hacking and art to address complex issues of urban flooding in Chiang Mai, a medium-sized, flood-prone city in northern Thailand. ● A virtual workshop held over a 4 month period in 2020 on responsible engineering, science and technology for DRM, with 17 participants recruited via an online call. These events aimed to apply four key design principles: 1. Egalitarian interdisciplinarity: To give equal weight to people and approaches from different disciplines, not merely to use them in support of technical solutions. 2. Inclusivity: To avoid reinforcing unequal power relations and engage meaningfully with a “diverse spectrum of stakeholders of risk reduction interventions” (Wobbrock and Kientz, 2016; Meng et al., 2019), going beyond interdisciplinarity to consider ways of knowing that are more diverse (Ford et al., 2016), including those outside academia. 3. Creativity: To use novel ways to engage, analyse and implement risk reduction measures and support climate risk understanding and communication by working past the “delimited solution space created by narrow and siloed approaches to problems” (Lallemant et al., 2022), including novel collaborations (Scheffer et al., 2017; Lehmann and Gaskins, 2019). 4. Reflexivity: To develop a reflexive process, prior to and following innovation in DRM, aiming at discovering successes and challenges from practice. For communities of practice, this reflexive process may take place at professional events like scientific conferences, inclusive events and workshops, or through participatory or human-centred design events. Source: Lallemant et al. (2022) 88 GOAL: Initiatives for a critical technical practice in disaster risk management DESIGN ELEMENTS DESIGN PRINCIPLES Participant selection Time Output-orientated activities Open-space technology Place-based activities Budget and resources Creativity Egalitarian interdisciplinarity Inclusivity Reflexivity Figure 6.3. Design principles and elements to promote critical technical practice Source: Lallemant et al. (2022) Figure  6.3 illustrates how the four design principles can be integrated into events and programmes to move beyond the scripts of engineering and technology by foregrounding the contexts and assumptions underpinning the way they create knowledge and data and pushing the technical disciplines to evolve (Lallemant et al., 2022). 89 6.3.2 Generating and using warm data “One of the biggest shifts in my thinking thanks to the warm data lab has been around the nature of technology. I used to believe that technology was inherently neutral, but I now see that line of reasoning as naïve. A technology does not exist independently from its contexts. And these contexts are part of complex systems. So, it’s clear to me now that we need to think hard about whether certain technologies should ever be built or released.” David Jones, Executive Producer/Principal Program Manager, Office Envisioning, Microsoft (International Bateson Institute, n.d.) As ecological–social systems are relational in nature, some practitioners such as the International Bateson Institute are experimenting with methods to gather and impart relational information in new ways. Warm data is a type of information to develop in tandem with existing forms of data. Since the subject being perceived dictates the need to understand in different ways, these methods aim to produce different kinds of information. However, the kind of information produced is intentionally a slippery mess of variables, changes and ambiguities. It does not sit nicely in graphs or models, and it takes longer to produce. As it describes relational interdependencies, it must also include the necessary contradictions, paradoxes, binds, double-binds and inconsistencies that occur in interrelational processes over time. The creation of warm data is the delivery of these multiple descriptions in active comparison, usually in a form that permits and even encourages the subjectivity of the observer (Box 6.6). Box 6.6. Zero Step Warm Data Project on Energy, International Bateson Institute and UNDP The International Bateson Institute, together with UNDP and other partners, facilitated the Zero Step Warm Data Project prototype in May and June 2021 as a complementary process to the formal United Nations High-Level Dialogue on Energy. It used a “people need people” online format to bring together more than 700 people on all continents across more than 25 countries in 67 warm data sessions (People Need People, 2020). Participants in the prototype, including United Nations staff, private sector businesses, governments and communities, were able to experience a shift in perception, and to appreciate that shifting perceptions is the action that shifts everything and opens new possibilities for a range of decisions that could previously not be seen or acted upon. The zero-step prototype opened a new space to explore that the problems of energy access and energy transition are not about the amount of energy, not the access to technology, not the availability of data and not the amount of finance. Energy access and energy transition problems are within the business models, within the economic models, within the politics, within the history, within the education and, ultimately, within the culture, all of which are descriptions of each other. It was agreed it was important to find ways together across the wider high-level dialogue on energy processes. The aim was to be quicker to mutually learn that choices being made to continue current (linear) trajectories of change, and not to challenge deeply embedded habits, assumptions and relationships with energy are the exact choices that are resulting in a collective inability to manage the results of those choices. Source: People Need People (2020) 90 6.4 Ways forward The examples of traditional and experimental approaches to understanding ecological–social risk presented in this chapter constitute a wide range of possibilities to use and create new polycultural and transcontextual knowledges and to apply them in practice. The common characteristics are that these approaches aim to be non-linear, relational and inclusive of different world-views, to bring an awareness of different contexts and the way that knowledge is being created and used. They aim to help create a picture of systems and relations among ecosystems, and to encourage a shift towards humility and curiosity in decision-making. These methods shift away from measures of success that reinforce narrowly defined behaviours which hold decision makers into scripted ways of perceiving. Instead, the exploratory methods aim to help people see the constantly shifting patterns within the complex systems in which they are being asked to make decisions. They have the potential to bring a deeper understanding of the systems of knowledge and decision-making, and the risks that are part of current models of understanding ecological–social risk. These traditional and new approaches involve: ● Communities who continue to practice risk management from within their indigenous and traditional knowledge systems, who also bring relational and interdependent world-views into wider community engagement and their own use of technology. ● Groups of governmental and scientific experts intent on working with communities to “translate” the systemic nature of risk and scientific data for use with and by a range of groups. ● Methods to push technical disciplines engaged in DRR to evolve towards a greater understanding of their own contexts and to adopt relational approaches. ● Open-ended collaborative deep learning processes intended to leave behind the scripts and understand the contexts to create the new forms of knowledge and data needed to address ecological–social risk. All of these are showing promise. Some may ultimately reinforce, in different ways, the scriptedness and the narrowness of contexts from which their proponents are trying to achieve escape velocity. It is the experimentation with new patterns of behaviours and new patterns of relationships that is most important in finding a way, or finding multiple ways, to tackle the legacy of past and future patterns of human thought and action that increase ecological–social risk. Fundamentally, these explorations include holding and honouring each other’s stories, connecting and caring, investing in flexibility and relationships, and exploring new metaphors and myths that create possibilities for new realities for decision makers through wider and less-constrained perceptions. These approaches help decision makers focus on the appropriate modalities for risk management and risk reduction interventions in complex, adaptive systems contexts (i.e. within societies and nature). They are needed to work in parallel with other forms of data and analysis of risk in systems, to reframe how to see and address risk at local and planetary scales. 91 X X Part II The role of biases and communication in risk reduction 7. How human biases and decision processes affect risk reduction outcomes Although humans have classified themselves as Homo sapiens (wise hominids), in most daily situations people rely on quick short cuts (heuristics) to allow mostly accurate decisions, rather than on a deep and full assessment of the relative costs and benefits of each decision. Research into decisionmaking has concluded this occurs for a variety of reasons relating to the basic architecture of human minds and the large amount of information processed every waking minute. Habits of mind become biases that interact with people’s social motives and the world around them to determine the decisions they make. This also affects the decisions made individually and collectively about how to cope with disasters. This chapter offers insights into why human minds form habits that are resistant to change, how these cognitive biases can result in suboptimal decision-making around disasters and also how understanding this can be harnessed to accelerate effective risk reduction. 7.1 Why human decisionmaking processes matter In 2007, the people of Iceland endured the largest banking collapse as a percentage of an economy ever (The Economist, 2008). This crash led to sharp, albeit short-lived decreases in human security including cuts to government programmes, increases in unemployment and a significant loss of faith in Icelandic political institutions. These contributed to political instability and street protests. The collapse was eminently predictable when viewed from a historical perspective. So, how was it that this systemic risk went “unseen” for so long? On close inspection, the investments that underpinned the growth of the financial system in Iceland, but also internationally, were based on unsustainable beliefs about the growth in global housing markets and on loans that were increasingly unlikely to ever be repaid. After the crash, the Government of Iceland confronted the fact that the systems designed to prevent this kind of failure – from the formal regulatory systems to the informal governance mechanisms – had failed (Hreinsson et al., 2010). It then established an investigative commission, which concluded that the Government and the larger social environment had allowed a slow and steady growth of systemic risk until it reached the point of collapse. The investigative commission’s Working Group on Ethics specifically examined questions of what influenced the decision-making that drove the systemic risk. It concluded the formal and informal systems that surrounded the financial institutions – the corporate culture inside the banks, the incentivebased salaries and the weak financial regulatory system – were set up to reward short-term decision93 B4 - = + + + + + + - - - + + + + + + + + + + + + + + + + + - - - = - - + - + + - + + - - + + + - + + + + - + - - - - + + + + + + + + + + Reinforcing effects Natural GDP Balancing effects Output gap (GDP – nGDP) GDP R2 MACROECONOMY R1 B1 Credit availability Solvency/ capital ratio Growth of balance sheet Cost of interest payments MARKET DISCIPLINE R National pride Complicated business environment POLITICAL INTERVENTION Goal-driven thinking “Good news” Public image of bank Press uncriticality Foreign criticism discredited SOCIETAL FACTORS R R PR work and donations Public trust towards banks Small population Enforcement strictness Political Material leverage rewards Authorities’ discipline Risk Fiscal policy Size of balance sheet B3 B2 Profits Authorities’ ability to provide liquidity and backup Central bank currency reserves Perceived run Liquidation premium Market manipulation Shareholder leverage Risk-seeking behaviour Socially responsible behaviour Bad owner selection BANK MANAGEMENT Management cohesiveness Internal social reward R2 R Figure 7.1. Systemic risk in the Icelandic financial system, 2007 Note: nGDP = nominal GDP; PR = public relations. Source: Arnarson et al. (2011) 94 making and emphasize narrow, immediate concerns about short-term financial gain. In addition, the principle that ownership and responsibility must go hand in hand had been deactivated (as it had in most countries around the world) as the Government had become the ultimate guarantor of the financial institutions. For these reasons, the deeper or more systemic concerns, including questions of overall sustainability, were regularly overlooked by the government and social environment (Arnarson et al., 2011). All this took place within a particular cultural context that further compounded the risk factors. Iceland is a small, homogeneous society with a strong sense of national identity. In the years before the crisis, bankers and business people were perceived as the nation’s representatives who were raising the country’s status abroad and enhancing wealth at home. Almost everyone in Iceland was benefiting from the financial boom, so there was little motivation to critically question the bankers’ behaviour. The Iceland example illustrates the key challenge that is also central to understanding inaction around DRR. It is easy for governance systems to create conditions that reward decisions made on the basis of incomplete information and that emphasize short-term benefits at the expense of real longerterm risk (Figure 7.1). While biases are part of the human cognitive system, it does not mean such negative outcomes are inevitable. The underlying biases people bring to the table affect the collective response to disaster risk, but they are not inherently negative. Rather, they interact with larger cultural and institutional systems to cause outcomes. Larger systems can shift towards rewarding and encouraging effective risk reduction, but this requires action. This shift is all the more urgent given the current levels of global risk, especially arising from climate change. Changes to basic incentive structures can support different behavioural outcomes in the case of financial systems. Changing how such systems price risk is a powerful tool. For example, in Florida, United States, although the State Government intervened to subsidize the increasing costs of insuring buildings constructed in areas increasingly at risk to hurricanes, several companies ceased offering insurance at all, on the basis that the future risk was too significant (Kunreuther, 2011). This highlights the cost of the risk. It also underscores the importance of interactions between governments and markets in pricing risk, which can be significant. It reveals opportunities for connecting private insurance approaches with governmental compensation, or combining private responsibility with nationwide solidarity. This may be a valuable systems-based approach to support long-term thinking where the cost of bearing such risk is weighed and considered a public good (Danielson and Ekenberg, 2013). 7.2 Bounded rationality The information processing ability of any human is orders of magnitude more complex than that of any computer, but it is not infinite. Analysing the world and making decisions about how to act takes time and energy. The complexity of the world often pushes people to engage with more information than they can consider consciously. Human minds therefore use different tricks and short cuts to help prioritize what issues and events to focus on, and how deeply to process the information related to those issues and events. Psychologists like to say humans have evolved to be “cognitive misers” (Fiske and Taylor, 1991). In general, human systems use the smallest amount of focus and attention necessary to understand and solve problems. Doing so is evolutionarily smart – it allows humans to juggle multiple different tasks simultaneously and maintain awareness of their environment to keep scanning for potential threats. People can devote their full attention to reasoned examination of best solutions to any question they are considering, but such attention is not the typical way they interact with decisions. If everyone went about their grocery shopping by thinking thoroughly and rationally for every single item and the combination of how to maximize health, price, environmental and any other 95 concerns they may have, they would spend hours at the supermarket each time. Instead, under most conditions, people use heuristics, or mental short cuts. On average, these create generally acceptable solutions to problems, rather than a full and complete calculation of a best overall answer (Figure 7.2). Importantly, people are almost never aware of their use of mental short cuts, as they mostly originate in the part of the brain that processes automatic behaviours. Automatic behaviours (e.g. walking and even reading) have been extensively practised to the point of requiring minimal cognitive effort. This idea of effortful versus automatic cognition has been studied in psychology under the general term of the “dual-process theory” of reasoning (Evans, 2003). It is so named because it specifically argues human minds have two separate ways of processing information and reacting to the social environment. Heuristics-based decision-making is one of these two modes of thinking. This “intuitive thinking” approach is fast and relatively low effort in terms of the amount of mental attention it requires, and is also termed “thinking fast” (Kahneman, 2013). Humans tend to use this approach to make decisions in situations that either require relatively little attention or that are complex and rapidly evolving. When presented with the need to make rapid decisions, especially in conditions where there are multiple issues competing for their attention, heuristic-based decisions allow people to make a decision and move on relatively quickly. This is significant for DRR because when sudden-onset disasters occur, there is a need for rapid decisions under situations of incomplete information with many issues competing for attention – conditions in which intuitive thinking is the typical approach to decision-making. Experts also use these mental short cuts, as shown in a study of decision-making in humanitarian disaster response that showed intuitive, heuristic-based decisions were the dominant approach to decisions Non-conscious Faster, low-effort, heuristics-based decision-making Conscious Slower, effortful, reasoned decisionmaking X X Decision point Figure 7.2. Heuristics and decision-making Source: Infographic courtesy of © One Earth Future Foundation (2022) 96 in disaster response (Comes, 2016). In contrast, decision-making to prevent the development of new risk, to reduce known risk outside the context of an immediate crisis, and to perceive and address systemic risk requires deliberative thinking, or “thinking slow”. Heuristics may also be tuned to optimize perceptions of cost and benefit in a person’s local environment. They provide quick answers to common problems and have developed precisely because they work well in most situations. However, these heuristics introduce identifiable biases that do not always result in good decisions, especially when the situation is complex or high pressured. Heuristics respond to specific and immediate environmental cues. They focus attention and decisions on imminent crises, but they mean that slower-moving risks, frequent low-impact disasters or crises with long lead times, and their systemic impacts, can easily be overlooked by intuitive thinking (Broomell, 2020). While, in general, any individual person can be successful in operating according to deep or engaged decision-making, on aggregate, “thinking fast” represents the most common way that people engage with decisions. Biases, or heuristics, that can emerge and which are particularly relevant in disaster decisionmaking include: ● Myopia and simplification, or the tendency to simplify complex problems and make decisions based on limited and personally relevant information. ● The tendency to overemphasize information that is more easily remembered or made salient by a specific environment. ● Anchoring, or using an irrelevant number as the basis for decision under conditions of great uncertainty. ● Optimism and overconfidence, or a general tendency for people to see situations as less threatening than they are and to see themselves as more capable than they are. ● The status quo bias and loss aversion, or the tendency to accept existing situations (even if negative) and to be concerned more about the risk of loss than the potential gain. Not all decisions are made by heuristics. The second process of decision-making, “deliberative thinking”, involves a conscious consideration of the different benefits and risks of different possible choices. Such rational decision-making is exceptionally powerful and is at the core of humans’ evolutionary success – but it is also effortful in time and attention, and is something people do not always do. Some theories suggest people do it only if they feel the automatic response needs to be double checked or corrected. People are more likely to use deliberative models when aware that the decisions are highly important, when they have time to make a decision and when they feel they have sufficient information to make a good decision. In practice, this means people are more likely to take problems seriously and engage with the need for DRR when those problems are consequential, made salient or active by the environment, when they threaten direct and personal loss, and when they affect individuals directly. An example of this comes from risk reduction decisions around volcanic activity. Some volcanic eruptions easily meet the criteria above: they are characterized by visible indicators of danger or rapidly evolving situations that focus attention, loud noises, or other elements that drive salience, loss aversion and other heuristics to encourage people to pay attention – and react – to imminent risk of disaster. In contrast, other types of volcanic activity have fewer of these elements but are equally dangerous. An assessment of the social dynamics of volcanic risk found successful communication was facilitated in part by the consistent transmission of specific risk information, particularly in locally relevant languages and by locally trusted representatives (Barclay et al., 2008). When the risk was seen as a slower developing risk over a longer term, or was less clear or politically polarized – as in volcanic dangers in Guadeloupe, Montserrat and Tenerife – at-risk populations were much less likely to engage effectively in DRR. Therefore, the challenges for governments are how to promote good decisions and how to create systems to expose risky cognitive biases to incentivize those good decisions instead. 97 7.3 Social, psychological and individual factors influencing risk perception People have a variety of social needs, arising from a collective approach as social animals to collaboration and community development. In general, people want to seek out situations and understandings of the world that meet these needs. This makes it easier to convince people of information or understandings that reinforce or align with their core social motives. These biases exist in a feedback loop with many institutions. As people want to get this information from their social environment, it is easy to reward political systems or governance institutions providing this information, which then incentivizes establishment of systems that interact with the biases. In the disaster context, this means risk reduction may be more (or less) likely, depending on how messages and incentives are framed and understood. 7.3.1 Core social motives Core social motives include belonging, self-identity and place in the world, agency (ability to act), enhancing positive views of the self as a community member and trusting others. Belonging People want to feel they belong to social groups and are part of socially cohesive communities. They are willing to adapt their beliefs and behaviour significantly to fit into social communities (Baumeister and Leary, 1995). In some cases, it is more important for a person to belong than to be right. In the context of risk behaviour, this can easily lead to “herding” situations, where groups develop a shared attitude around risk, leading to members of the group complying with that shared understanding without directly engaging with the underlying information. This can have implications for risk reduction. A study of Australian students found those who strongly identified with newly developing groups focusing on climate change prevention were more likely to commit to activities to prevent climate change, compared to students who cared just as much about the issue but felt less connected to it as an identity (Bongiorno et al., 2016). When risk issues become polarized or factionalized in such a way that “risky behaviour” becomes a signifier of group membership, then the commitment to risky behaviour can also become attractive. For example, in the United States, some people have Australian youth hold signs and banners calling for action on climate change at a rally in Victoria Credit: © Shutterstock/Christie Cooper Plymouth on the island of Montserrat, buried under deep ash after the 1995 eruption of the Soufrière Hills volcano, remains abandoned today Credit: © Shutterstock/James Davies Photography 98 modified their diesel trucks to deliberately produce large clouds of black soot. This practice of “rolling coal” is a way to demonstrate their commitment to political ideologies that dismiss the threat of climate change (Tabuchi, 2016). Self-identity Generally, people do not feel comfortable when their beliefs about themselves or their view of the world are challenged. They will seek out information confirming their beliefs, even when it is upsetting (Swann and Read, 1981). As an example, a study of wildfire preparedness in Australia found people within the same communities reacted differently to the idea of wildfire mitigation strategies depending on what deeply held belief they saw as most significant to them. Some people saw wildfire risk reduction strategies as inconsistent with their commitment to environmental preservation (as it required clearing vegetation), while others saw the strategies as a demonstration of commitment to keeping the community safe. The result was tension between people prioritizing risk reduction and those prioritizing one form of environmental protection, with decisions to clear vegetation (or not) being a public signal of which stance was taken (Paton and Buergelt, 2012) (Figure 7.3). Agency In general, people need to feel they have control over their lives, and they react differently to a loss of control. Experiences can range from anger I’m worried Australia’s native forests and unique wildlife will never be the same This is a wake-up call for the world on the impacts of climate change Leadership on the bushfire response requires the Prime Minister to lead on climate change action The current bushfires demonstrate the cost of climate inaction Climate change is making bushfires worse Governments should mobilise all of society to tackle climate change, like they mobilised... Climate change makes bushfire hazard reduction more difficult to complete safely Mining and burning coal makes bushfires worse The federal Coalition government has done a good job managing the climate crisis There is no connection between climate change and bushfires Have been directly impacted Have not been directly impacted 85% 70% 83% 57% 82% 59% 79% 48% 79% 52% 77% 51% 73% 47% 61% 32% 34% 32% 31% 34% Figure 7.3. Attitudes towards wildfires and climate change risk for people affected and not affected by past events in Australia Source: The Australia Institute (2020) 99 and hostility to passiveness, mental distress and emotional dysregulation (Fiske and Dépret, 1996). This is particularly relevant to DRR. If mandates or other government actions are perceived as limiting people’s agency, or not engaging with them, some people may resist. In contrast, those who feel more engaged in the decisions made around risk reduction may be more likely to comply. An unfortunate example of resisting public measures comes from the town of Güssing in Austria, where a climate risk reduction programme including an ambitious transition to clean energy was rejected. This was partly because of a sense by the community that the programme was being forced on it through a non-inclusive process (Komendantova et al., 2018). History is also important. Communities experiencing chronic states of uncertainty (e.g. about their safety, finances or health) and which are typically the most marginalized are especially likely to experience a lack of agency with associated distrust of governments (Afifi and Afifi, 2021). The 2012 special report of the IPCC highlighted this specifically in the context of climate-related disaster risk, pointing out how marginalization and a lack of information tended to compound each other to create heightened vulnerability. This was seen as due to “an inability to understand extreme event-related information due to language problems, prioritization of finding employment and housing, and distrust of authorities” (IPCC, 2012). At the same time, for communities with a greater historical experience of agency, the threat to perceived ability to act that characterizes disaster can strongly motivate careful information search and associated risk reduction behaviour (Pittman and D’Agostino, 1989). Enhancing People generally like to feel they are good people with positive characteristics. Given the choice of different stories about themselves and the world, they usually choose to believe the interpretations that describe them in the most positive ways. This occurs especially when these interpretations reinforce other motives such as understanding or social connection (Kwang and Swann, 2010). In the disaster context, this can support DRR behaviour. If people see themselves as heroic or in positive terms for engaging in risk reduction, they may do so. However, it can also support the optimism bias, the tendency of people to see the world as less risky than it is or to see risks to themselves as less significant than they are (Caponecchia, 2010). Trusting People have a strong need to see others as trustworthy, and they object strongly when expectations of fairness are violated (Brosnan, 2006). In the context of disaster response, this can support quick community organization. The early phase of community response to disasters is often characterized by collective support and a strong sense of collective community. For example, an assessment of a 2004 fire in the informal community of Imizamo Yethu in South Africa found that in the initial response and early recovery periods, the community came together to share resources such as food and shelter, as well as childcare, access to education and other elements. While such collective support does not always persist in disaster recovery, the community remained strong and cohesive several years later (Harte et al., 2009). The same motive to trust and support each other can also lead to systemic impacts after disaster. Governance institutions that fail to respond well to disasters often suffer significant damage to their perceived legitimacy. For example, the Icelandic commission identified a large drop in trust in government following the financial crisis. Similarly, the perceived failures of the Government of the Republic of Korea in response to the 2015 MERS outbreak contributed to a change of government, and arguably were one reason for the effective early response by the new government to the COVID-19 outbreak (Thompson, 2020). 100 7.3.2 Social environment and culture The personal and individual processes described in this chapter are only part of the story in understanding risk and human behaviour. People are all individuals embedded in complex social systems, and their behaviour is the result of individual characteristics, histories and biases interacting with these environments (Lewin, 1936). The social environments in which people grow and interact mean their biases and social motives play out in different ways across cultures. In the case of risk decision-making, in general, men and members of dominant ethnicities perceive less risk from risky behaviours than women and members of minority groups (Kahan et al., 2007). This effect appears to be related to cultural expectations around gender roles and the objective differences in risk faced by different groups. There is also a tendency for policymakers and those particularly committed to existing social structures to defend them, and to explain why systems are appropriate and not risky (Feygina et al., 2010). In reality, the objective risk faced by dominant groups is often less than that faced by marginalized ones. Structural inequality, manifesting in behaviours such as racism and sexism, influences individual decision-making around risk and perceptions of institutional decisions. Marginalized ethnic groups report more awareness of risk than people from dominant ethnicities, probably reflecting the real disparities in risk associated with systemic exclusion and social vulnerability, including greater exposure to hazards. In these circumstances, people may know behaviours are risky, but in the face of systemic exclusion and the socioeconomic consequences for them, they prioritize fulfilment of immediate and basic necessities rather than other personal risk reduction. Culture strongly influences which voices are seen as credible and shapes people’s understanding of narratives and what kinds of evidence or arguments are trusted. Culture is significant at the national and organizational levels (Bye and Lamvik, 2007). It affects risk perception through several pathways, including the relative centrality of different values that can affect risk perception and risk behaviour, as well as discrete shared social attitudes about specific systemic risks such as climate change (van der Linden, 2017). For example, cultural traditions on burial practices presented a challenge during the 2014–2016 Ebola virus disease outbreak in West Africa. It was only through close and respectful collaboration with local communities that the risk could be reduced (Box 7.1). Kitchen staff distribute food to community members in an outreach programme in Johannesburg, South Africa Credit: © Shutterstock/Sunshine Seeds 101 Box 7.1. Burial rites and risk during the Ebola outbreak in Liberia, 2014 Ebola is transmitted in part through contact with infected people. Therefore, an important component of limiting its spread is limiting unprotected physical contact with infected people – alive and dead. However, funeral traditions often involve rituals requiring close contact with the dead, thus creating a risk of infection. Recognizing this, in Liberia, in 2014, the government formed a partnership with the Red Cross, the entity designated as the lead for burial management in the Ebola epidemic response. A review of the work of the Safe and Dignified Burial programme – implemented by the Liberian Red Cross and technically supported by the International Federation of Red Cross and Red Crescent Societies (IFRC) – found that early in the response, local communities strongly resisted safe burials (Johnson et al., 2015). Doubts about the reality of Ebola or its specific transmission pathways interacted with strong cultural norms about appropriate burial practices to generate significant resistance to implementing safe and dignified burials. Safe burial practices, including cremation and disinfection of bodies with chlorine solutions, restrictions on physically handling the deceased and other approaches, were directly in contradiction of cultural norms about how to treat the dead respectfully. This created the conditions for socially motivated reasoning: people wanted to treat their loved ones respectfully, to honour their connection and live up to what was expected of them as good and moral people. In this context, it was easier for people to doubt the information presented about Ebola risk, or for them to accept the risk as a part of doing what was right. The result was violence directed against the Safe and Dignified Burial teams and an increase in “secret burials”, where loved ones would bury a deceased person in secret according to their traditions rather than notify health authorities of the death so that a safe burial could be carried out. Recognizing this, the Red Cross improved the training of team members on how to communicate about risk and stepped up work with local leaders trusted by the community to improve risk communication and community engagement. A Red Cross burial team member disinfects her hands after taking a sample from the body of a suspected Ebola fatality in Paynesville, Liberia The Red Cross strategy also included direct adaptation of burial methods to be more in line with local expectations. It ended the use of cremation as an approach and adapted protocols to introduce culturally appropriate rituals that safely replaced those that posed a risk of transmission. The IFRC evaluation of the programme indicated that the combination of these different approaches contributed to a change in local behaviour, leading to an effective reduction in transmission of Ebola. Sources: Johnson et al. (2015); IFRC, personal communication (2022) Credit: © Victor Lacken/IFRC 102 7.4 Engaging across decisionmaking processes 7.4.1 Awareness is not enough Research into decision-making has found awareness of risk is not enough to drive behaviour change. In fact, people regularly fail to reduce their personal risk even when they know in the abstract that such risk is real. This is because risk decisionmaking is a process (Ajzen, 2020). Biases and motivated reasoning can influence the decision and its execution at each step – from awareness of risk, to understanding options, to confidence that such options can be executed, to selection of a course of action, to execution of that action. One aspect of the challenge in promoting effective risk reduction relates to the availability of accurate information about risk. Forecasts may be accurate but uncertain, so governance systems and decision makers must accept a certain tolerance for uncertainty in decision-making, to manage systemic risk. However, as discussed in section  7.3, people are more likely to engage in risk reduction behaviour when they are aware of a risk, feel confident they have specific knowledge about what to do to reduce the risk and have the agency to act. For example, in Japan, people increasingly sought information about COVID-19 during early 2020. Surveys indicated that their first concern was to protect their own health, followed by other personal concerns such as education, welfare of family members and visa status of foreign residents. Their information-seeking also increased in frequency after the state of emergency was declared, indicating they perceived it as a real and increasing risk to them personally as case numbers grew (Robles, 2022) (Table 7.1). Table 7.1 summarizes the distribution of COVID-19 information-seeking by survey respondents in Japan across three periods. The significant time marker was the declaration of a first state of emergency in April 2020. Before the state of emergency, twothirds of 223 survey respondents had already been looking for information related to COVID-19 at least once a day, including 44.4% seeking information more than once a day. By the time the first state of emergency was enforced, more respondents (74.1%) reported seeking information at least once a day. After the first state of emergency was lifted, the survey respondents continued to look for such information regularly, but a little less frequently, with 22.4% checking more than once per day, 31.3% seeking information daily and 31.7% weekly (Robles, 2022). Frequency of information-seeking Percentage of survey respondents seeking COVID-19 information (%) Before state of emergency Mid Jan–7 April 2020 During first state of emergency 8 April–27 May 2020 After first state of emergency 28 May–Dec 2020 More than once a day 44.4 46.7 22.4 Once a day 23.2 27.4 31.3 More than once a week 15.8 10.0 20.5 Once a week 4.2 4.2 11.2 Rarely/never 2.3 1.2 4.6 Table 7.1. Frequency of information-seeking about the COVID-19 pandemic in Japan, 2020 Source: Based on Robles (2022) 103 Governments or other stakeholders that emphasize risk reduction methods requiring specific capacity run the risk of overlooking capacity limitations, such as calls for evacuation that assume people will have the transportation necessary to evacuate, or that the evacuating population is sufficiently able-bodied to do so. Even if people know risk exists and if they have the capacity to reduce it – two big “ifs” – they may not execute the recommended risk reduction behaviour. The biases discussed in this chapter can also lead to a status quo bias in which people are comfortable with situations even as they become increasingly risky. Those “biases” may also, in some cases, represent accurate judgments. Some people and communities may have historical reasons not to engage in risk reduction behaviour advocated by sources with little to no knowledge or appreciation of the conditions of their lives and restrictions therein (Komendantova et al., 2016). For example, wildfire risk is increasing in many countries, due to increasing construction in the urban–wildland interface and the systemic risks of climate change. Residents and property owners in high-risk areas can take risk reduction actions if they have the means, some through their own labour and some requiring financial investments not available to everyone. Research from Australia (McLennan et al., 2015) and the United States (Martin et al., 2009) has consistently found people who are more aware of the potential risk of wildfires report more intention to take steps to reduce risk. However, this is mediated in part by whether people feel they have options they can take to meaningfully reduce risk – if people feel less capable of executing mitigation strategies or less aware of them, they report less willingness to take risk reduction action. The selection of strategies is also important. Research from Australian at-risk communities suggests a significant proportion of the respondents reported plans to stay in place and defend their buildings from wildfires using strategies that would likely not work (McLennan et al., 2015). 7.4.2 Individual and structural pressures in risk decision systems To understand behavioural outcomes, it is necessary to think less in terms of individual-based approaches and more in larger structural and systemic ways that show how individual decisions are influenced by larger social systems. These may include issues such as laws, policies, systems, physical designs, discrimination, restricted access, financial constraints and other aspects of lived experience that help facilitate or constrain behaviours (Blankenship et al., 2006). Individual decisions and individual abilities to make good choices about DRR have to be understood in the context of community histories and the structural reasons that prevent individuals effectively accessing the information and resources needed to reduce risk. Their decisions are influenced by social norms, due to direct capacity limitations and even through the impact of chronic uncertainty on the neurology of those who live with it (Fugariu et al., 2020). As a rule, people are also inclined to attribute their success to internal factors (e.g. intelligence or personality), whereas unfortunate outcomes are blamed on unfortunate circumstances. Unfortunately, institutional structures often appear to reinforce biases towards higher-risk behaviour, as shown by the Iceland example in section  7.1 above. Before the systemic failure, when there was an abundance of liquidity and most investments turned a profit due to unusually favourable market conditions, bankers attributed this to their own brilliance or hard work (Thórisdóttir and Karólínudóttir, 2014). This led to an overestimation of their ability to take appropriate business risks, and resulted in a lack of critical assessment, ever riskier decision-making or both. Such optimism is particularly risky when it coincides with formal and informal incentives within wider systems. For example, in the financial system, investments in stocks are nominally based on longterm assessments of the economic performance 104 of the investment vehicle. In practice, investors are much more likely to make decisions based on short-term gains and losses. This creates a cyclical incentive structure where recipients of investment are incentivized to do whatever they can to deliver short-term performance increases, which then rewards short-term investors (Rappaport, 2005). In the case of the 2008 global financial crash, the focus on short-term performance created conditions where those people taking risky decisions were rewarded more than those who were not – right up until the crash happened. In the face of this pressure, it is easy for motivated reasoning to encourage herding behaviour. If peers are being rewarded for behaviour that is perhaps risky, but perhaps not, the combination of social pressure, optimism biases and fear of missing out can encourage people to take risks that a more sober assessment might suggest are unwise. Individual investors may harbour doubts about the increasingly risky investment behaviour of their colleagues but will hesitate to voice their concerns because of the false belief that nobody else shares them. This demonstrates the importance of the need for social belonging and avoiding anything that might lead to ostracism. However, this same characteristic can also be harnessed for positive social change. If members of a group believe others in their group care about disaster preparedness and have made adequate arrangements, they too will be more likely to follow suit. These same cognitive biases in social systems can also be used to positive effect. An example from Indonesia helps provide insights on how better understanding cognitive biases can accelerate effective disaster recovery (Box 7.2). Box 7.2. Social connection for resilient recovery in East Java, Indonesia In 2006, a mudflow inundated 12  villages and destroyed more than 10,000  homes in the Sidoarjo district of East Java (Farida, 2014). In responding to this disaster, the local government unintentionally took two separate approaches to supporting recovery: one more in line with existing social motives for social connection and identity maintenance, and one less supportive of these motives. Survivors from one village, Renokenongo, were housed in temporary camps set up close to each other and close to their original village. Survivors from another village, Siring, were dispersed. While survivors of both villages were provided with some compensation for their loss, the community of Renokenongo was able to re-establish community identities and community rituals as well as establish networks of mutual support in ways that the Siring community was less supported in doing. Survivors from Siring originally struggled to reconnect with each other and with the loss of their connection to the village itself (including opposition from the government to their listing their residence as Siring instead of the locations they were placed), but over time they were able to establish community connections with each other through electronic communications. Both communities organized to support each other and demand fair treatment from the government and the natural gas company identified as the cause of the disaster. However, the preservation of the Renokenongo social and cultural context appears to have had a significant impact on its community resilience, while the inadvertent intervention in the Siring social structures had the opposite effect (Farida, 2014). 105 7.4.3 How understanding biases can help accelerate disaster risk reduction Governance systems work best when they understand the basic drivers that influence people’s risk decisions and, importantly, what these specific drivers look like in their social and cultural environments. Effective DRR is more likely to occur when risk is apparent and captures people’s attention. This provides an opening for deliberative thinking to avoid or reduce risk. Where this is not the case, social, governance and structural pressures need to be aligned with existing biases or mental short cuts, to encourage effective risk reduction behaviour. Crisis moments challenge many core social motives including desires for agency or control in the world. They often create moments where people are highly motivated to seek out good information about what can be done to reduce risk. Such moments can lead to significant calls for reform if governance institutions are found to be underperforming, and can lead to the creation of stronger systems for prevention and response to disasters. If they are not effectively captured by governance institutions and translated into systems that can maintain forward A small house is washed away by a torrential mudflow Credit: © Shutterstock/Dark\_Side motion, there is a significant risk that recognized threats may shift from salient and immediate concerns into background threats where the underlying biases discussed above work against risk-informed decisions. Crisis moments aside, the biases discussed in section  7.3 are particularly problematic in longerterm or slow-moving crises, in prolonged and small disasters that are less media focused, and in preventing and reducing risk outside the context of a disaster. Smaller-scale recurrent disasters such as landslides or floods cause systemic threats that undermine economies and can account for up to 50% of global losses due to disasters (UNISDR, 2015). These threats are often underappreciated, as the relative lack of attention they get from media or public discussion means they are not seen as relevant, or they are dismissed as not being immediate or significant threats. In these conditions, issues of bias-informed approaches to governance or social systems may be important. These issues also underscore the critical need for institutions that act for the long term. Specifically, because it is difficult for individuals to track and prioritize longterm or slow-developing issues, effective collective institutions need to address these issues. 106 7.5 Ways forward Greater public awareness of human biases and how they play out may help reduce their impact. Ensuring meaningful opportunities for engagement and participation, for example in the early warning or communication processes, may also be useful. Clearly and transparently communicating preferences, criteria and trade-offs during policy development can enhance the quality of decisionmaking processes (Ekenberg et al., 2017). For example, preferences may differ around economic or safety-oriented considerations, short-term versus long-term effects and risks affecting local communities directly compared with systemic risk from more distant sources. Further analysis is needed on how biases and heuristics dampen or amplify perceptions about potential risk scenarios in the present or the future. To reduce the impact of behavioural and cognitive biases, people should have access to data describing situations they can relate to psychologically, and authorities must design risk communication and programmes that take into account these known heuristics and biases. Developing social systems that engage directly with existing biases to support more just and more effective systems for risk reduction can also be useful. There is no reason why social systems cannot be developed that deliberately build on human predispositions to support effective risk reduction. Bias-informed incentives can shape behaviour in ways that produce positive and effective action. One way to do this is by formally changing incentives to align rewards with longterm and short-term or heuristic-driven decisions. Such changes can improve risk performance by supporting behaviour in line with what would be expected from risk-informed decisions, even if the decisions are made for reasons other than a full assessment. Increasing the accessibility of tools to manage risk is also fundamental to a stable climate future and continued sustainable development. For example, changing pricing systems to move the costs of environmental challenges closer in time to the decisions that generate them may be a tool for using short-term and salience-driven biases to support effective climate action. Overall, this chapter has highlighted that: ● DRR actions should be informed by an awareness that engagement, uptake and compliance will not be the same across different communities. Structural, historical, cultural and individual factors will influence how people are motivated to engage with risk reduction recommendations. ● Governments and other stakeholders should incorporate an analysis of biases and social motives into planning for behaviour change to reduce risk. Whenever possible, actions should be designed to reinforce social motives and align with biases rather than require people to behave contrary to them. ● Structural constraints on behaviour should also be considered in making risk reduction recommendations, including issues such as the capacity and history of different communities and their existing resources. 107 8. Addressing biases to increase investment in risk reduction Why is it that individuals and governments still do not invest enough in DRR, despite experience and evidence of its value? Why is there such a gap between the intention to reduce risk and action taken to build resilience, despite the availability of scientific data and advice on risk? What are the cognitive biases and financial incentives that work for and against smarter investments in risk reduction? This chapter suggests that the cognitive biases and mental short cuts (heuristics) outlined in Chapter 7 influence the decision processes of those at risk from disasters and of the key decision makers concerned with their welfare. It outlines how an understanding of biases and heuristics can make action to promote risk reduction more effective. In many countries, tools such as insurance are not widely available or are seldom applied to cover losses from disasters. Investment in pre-emptive risk reduction is also insufficient. Governments often rely on other economic incentives or regulations to encourage investment in DRR. These include lowinterest loans or grants and community engagement processes, and the enforcement of risk reduction policies, building codes and land-use regulations. This chapter suggests an understanding of biases and heuristics in decision-making can help make the design of such products, policies, regulations and standards more effective. The first section looks at how individuals make decisions about risk reduction and how cognitive biases affect those decisions. The second section considers how this knowledge can be applied in governance and financial systems. The third section outlines the role that different stakeholders (e.g. individuals, communities, the private sector and the public sector) can play in this process. Overall, the chapter highlights the need to rework the way current institutional arrangements design and account for the costs of disaster-related losses, particularly long-term risks. Adjusting the design of products can make them more effective, but new financial products and incentives that can better address the impacts of systemic risks are also needed. Just as green bonds have helped accelerate renewable energy finance, similar products are needed to incentivize and ease investment in disaster- and climate-resilient products. 8.1 The impact of biases and heuristics on risk-related decision-making Recent experience of a disaster event often creates a willingness to invest in risk reduction, which leads to long-term benefits for a community facing recurring hazards. For example, in the United States, following Hurricane Andrew in 1992, the State of Florida re-evaluated its standards and enacted a new building code in 2001. It moved from being a state with poorly enforced building codes to having one of the most effective codes in the country. A study of the difference in realized damage from hurricanes 108 in Florida during the period 2001–2010 found homes built to the new standards suffered 53% less damage than homes built before enactment of the building code (Simmons et al., 2017). Similarly, in 1990, a major fire destroyed 427 homes in Montecito, United States, after which homeowners were required by law to make their homes more resistant to embers by putting screens over vents and replacing external cladding with less-flammable materials. When another major fire struck in 2017, the residents of Montecito emerged with no fatalities, no injuries and only seven homes lost, even though winds gusting over 96  km/hour pushed fire and embers deep into the community (Kolden and Henson, 2019). However, the cognitive biases described in Chapter  7 can create resistance to DRR action, investment and regulatory measures. They can also lead to individual and institutional decisionmaking processes that fail to consider the costs of disasters and the benefits of risk reduction. This is particularly the case in novel, rare or compound risk or events where individuals have limited or no personal experience, such as for systemic risk or extreme events. People have a tendency to either not pay attention to the potential consequences of risk or to overreact based on experience of a recent event. This tendency has been revealed in surveys of homeowners in flood- and earthquake-prone areas (Kunreuther et al., 1978; Botzen et al., 2015; Paudel et al., 2015) and those facing wildfire risks (Arvai et al., 2006). Many of the errors decision makers exhibit in dealing with extreme events can be traced to misperceptions of risk (Slovic, 2000), coupled with systemic biases and heuristics (Meyer and Kunreuther, 2017). These include myopia, simplification, optimism, amnesia, inertia and herding. People’s perceptions about whether they have the capacity to make a difference through their actions also play a role. The impacts that cognitive biases and heuristics have on risk-related decisions affect individuals, communities, and private and public sector organizations alike, leading to challenges as well as opportunities. Cognitive biases are not the only factors influencing decision-making and action on DRR. Challenges such as poverty, lack of agency or insufficient access to technical advice also need to be considered. However, key decision makers in the private and public sectors are unlikely to take effective measures or actions to reduce current and future disaster risk and loss if they do not perceive risk accurately. The three fictitious cases below present examples of cognitive biases and heuristics that may affect Apartments destroyed by Hurricane Michael in October 2018, Mexico Beach, Florida Credit: © Shutterstock/Terry Kelly 109 individual- or community-level decisions about investing in DRR. The examples relate to key systemic risk challenges, namely protecting against catastrophic hazard damage and taking action to reduce the impacts of climate change by switching from fossil fuels to energy-efficient and renewable energy technologies. 8.1.1 Example 1: Failure to invest in wildfire risk reduction measures The Rai family purchased a house in a community subject to wildfire damage, but none of the family members have themselves experienced a fire. They decide not to invest in fire-proofing measures and not to clear vegetation in the front yard. These are decisions that reflect various biases, such as: ● Myopia: This is reflected in the decision not to invest in wildfire risk reduction because the upfront costs of making the property safer are perceived to be too high relative to the shortterm benefits of undertaking these measures. ● Simplification: This is evidenced by the focus on the short term, and a belief that the chances of a wildfire are so low that the potential consequences on the house are not considered. ● Optimism: This often goes hand in hand with simplification. In this case, their inaction is based on an optimistic underestimation of the likelihood of a recurrent disaster causing damage to the property. 8.1.2 Example 2: Failure to purchase flood insurance The Kamau family, whose residence is in a floodprone area, did not purchase flood insurance until after flooding damaged the house, even though coverage to pay for losses was highly subsidized. Instead of learning from that experience, the Kamau family members decided to cancel their flood insurance policy several years later because they did not suffer losses from another flood. As in the previous example, several biases are at play: ● Optimism: Before suffering damage, the likelihood of a disaster was perceived as being so low that they did not pay attention to potential consequences and concluded they did not need insurance. ● Simplification: After a disaster they focused on uninsured losses and decided to buy coverage without fully considering the likelihood of another flood occurring that would cause damage to the house. ● Amnesia: Having not experienced losses from floods in the following years, they cancelled their insurance policy because the impact of being uninsured before the previous flood faded from memory and they felt premiums had been wasted. 8.1.3 Example 3: Failure to invest in solar panels to reduce the risk from climate change The Gonzalez family members are considering installing solar panels on the roof of their home because they are concerned about the impacts of climate change and know this action reduces greenhouse gas (GHG) emissions. After reflecting on whether to do it now, given there are other pressing issues on their agenda and budget constraints, they decide to wait due to the following biases: ● Myopia: This is reflected in the decision to focus on the high upfront costs of installing solar panels without considering savings from lower electricity expenses in the years to come and the potential to be self-sufficient if the grid is damaged during a disaster. ● Inertia: The family is unsure about the best course of action, so decide to maintain the status quo even when a more desirable alternative exists. ● Herding: As none of the neighbours have invested in solar panels, why should they? 110 8.2 Reworking risk messaging and incentives to promote financial investment in disaster risk reduction Understanding the cognitive biases at work in the above examples helps to suggest how public policy and financial incentives can be reworked to promote risk reduction more effectively. A solid risk analysis based on listening to experts remains the bedrock for effective DRR. However, the way this information is applied is of equal importance. This section looks at four elements essential to risk reduction action: ● Listening to experts. ● Reframing the presentation of risk information. ● Redirecting financial incentives and regulatory frameworks towards resilience. ● Evaluating strategies. 8.2.1 Listening to experts Scientific risk assessments by experts are essential in designing strategies for reducing risk and future losses from extreme events. They can assist members of the public and key decision makers by providing the most accurate available information on risk. This information needs to be communicated in a clear and transparent manner. To illustrate what “listening the experts” might mean, consider each of the three examples discussed in section 8.1. Failure to invest in wildfire risk reduction measures For key decision makers to reduce the risk associated with wildfires, they need the following data from experts and informed interested parties: ● The probabilities of primary fires from external sources (e.g. nearby forests) that can damage or destroy properties in their community and the uncertainties associated with these probabilities. ● The potential direct damage to properties and indirect losses to the community from fires of different magnitudes and the uncertainties surrounding these estimates. ● The risk of fires that spread from one property to another as a function of whether each of these properties has invested in mitigation measures. ● The most cost-effective mitigation measures to protect individual properties. ● The expected costs and benefits, should a wildfire occur, if the property owners and communities adopt specific mitigation measures. ● The impacts of climate change on the above estimates. Failure to purchase insurance against catastrophic damage Those considering purchasing insurance against potential losses from future disasters need the following information from experts and informed interested parties: ● The probability of future disasters causing damage to the property. ● The magnitude of the damage that would occur using different scenarios of future disasters. ● The cost of insurance as a function of the deductible and coverage amount. ● The reduction in the insurance premium for investing in DRR measures. Failure to install solar panels For key decision makers to advise property owners on whether to install solar panels on their homes or facilities, they need the following data: ● The upfront costs of installing solar panels and how these costs can be spread over time. ● The expected benefits from the reduction in electricity costs, including the possibility that excess electricity generated can be resold to the grid. ● The reduction in GHG emissions over time when switching from fossil fuel energy to solar power. ● The impact that utilizing energy-efficient technologies will have on reducing losses from future disasters related to natural hazards and other extreme events. Expert insights are essential to provide sound advice on each of the issues above, and solutions will vary based on the specific hazards and vulnerabilities encountered. Such insights are invaluable in helping design products and services tailored to local conditions, and in ensuring individuals have the information they need to make good decisions. 111 8.2.2 Reframing the presentation of risk information Reframing the way risk information is presented can have a practical and powerful impact on its efficacy in promoting risk reduction action among individuals, communities and governments (Thaler and Sunstein, 2021). Several practical approaches have proven particularly effective in this regard. Address the myopia bias: Stretch the time-horizon In some cases, the simple action of stretching the time-horizon may be an effective way of dealing with the myopia bias. Empirical studies have shown key decision makers are much more likely to consider risk reduction measures if they are told that over the next 25 years, there is a greater than 1 in 5 chance of having at least one disaster that causes damage to their property instead of describing it as a 1 in 100 annual probability (Chaudhry et al., 2020; Robinson et al., 2021). A similar reframing of probabilities over time was successful a number of years ago to encourage people to wear seat belts while driving, by indicating the likelihood of an accident over a 50 year lifetime of driving rather than per single trip (Slovic et al., 1978). Address the optimism bias: Be constructive Communicating risk often involves conveying statistics on the magnitude of damage, number of fatalities and other losses. The optimism bias leads people to believe such disasters will not happen to them, or if they do, the consequences will not Box 8.1. Effective and constructive communication: the Blue Planet II television series David Attenborough, a pioneer in using captivating television documentaries to galvanize concern for the environment, has long issued warnings. However, he has recently stepped up a focus on practical actions that ordinary people can take to protect the natural world, combined with advocacy towards policymakers (WWF, 2020). His Blue Planet II wildlife documentary series raised the alarm about plastic waste, but also included information on practical actions that viewers could take to address the problem. Studies report that Twitter activity related to plastic waste more than doubled following the series, compared to the same period in the previous year. Nearly 9 in 10 people (88%) who watched it have since changed their behaviour. One food retailer reported it received an 800% increase in questions about plastic after the series (Collins, 2018). Without dedicated research to measure the impact of the television series, it can be difficult to attribute actions directly to it (Dunn et al., 2020), but it is likely that information on the problem and the options for practical action were more effective than bleak warnings alone. The impact of plastic pollution on marine life Credit: © Shutterstock/Tanya Sid 112 be severe. Some communicators attempt to shake audiences out of their optimism bias via vivid, sometimes horrific, descriptions of just how dire outcomes can be. A review of public health communication studies found that if fear was used, people were more likely to act if it was also combined with strong efficacy messages (Witte and Allen, 2000). This implies negative framing should be accompanied by communication that supports a sense of agency, hope, motivation, self- and collective-efficacy, and, importantly, practical steps required for change. Failing to do so can leave people feeling powerless, anxious and overwhelmed – sentiments that can provoke mental shutdown and crush the ingenuity and energy required to tackle big challenges. For example, a recent study of a wildfire-prone community in the city of Valparaíso, Chile, found psychological factors like a perceived lack of control over their lives and the environment crucially influenced people’s risk management behaviour. It hindered preventive actions and also made risk reduction a secondary issue for many. Even if people were aware of the risk and experienced fires several times per year, few collaborative actions resulted from the risk awareness (Lara Mesa, 2021). Pointing to positive and practical actions individuals can take is often a more effective approach (Box 8.1). Address the simplification bias: Construct scenarios One way to frame risk more effectively to address the simplification bias is to construct a range of scenarios to highlight the consequences of disasters occurring, including a worst-case scenario. For example, Mexico City faces seismic hazards that depend on the occurrence of various types of earthquakes, primarily due to site effects that amplify the ground motion (Reinoso and Ordaz, 1999). A recent project by the National University of Mexico considered the uncertainties associated with future earthquakes in Mexico City using three groups of seismic scenarios: (a) scenarios reflecting the likelihood of damage from future earthquakes, (b)  scenarios estimating maximum and recurring losses from earthquakes and (c)  historical, wellknown seismic scenarios and their consequences. These scenarios were then used to develop estimates of structural damage to the city for use by decision makers in risk reduction planning (Reinoso et al., 2022). To better address systemic risks, scenarios can also be developed that assess cascading and compound risks and indirect disaster losses. Showing potential direct and indirect losses can help highlight the necessity of pre-emptive risk reduction across a range of sectors. Such scenarios should not rely on economic metrics only, as this can lead to a tendency to highlight DRR interventions as successful if they protect high-value areas rather than high-vulnerability areas (Lallemant et al., 2020; Markhvida et al., 2020). Additional metrics can include the number or measure of “years of life saved”, which is calculated consistently in the field of public health (Tengs et al., 1995), and broader impacts across wider sectors, including impacts on potential tax revenue. For example, in Barbados, the cascading economic impacts of hurricanes have been analysed to estimate direct and indirect losses, including potential cascading impacts across the economy and society (Box 8.2). Scenarios can be even more effective if they also compare the costs of action and inaction. If this calculation is not done, there is a danger that investments may become “invisible” to observers, because when a hazard occurs losses are not incurred (as the disaster has been effectively prevented). Figure  8.1 shows how this “invisibility” can manifest following an investment in constructing houses on stilts in a flood-prone area. In this case, four scenarios (A to D) contrasting the costs of action with inaction can help make the benefits of DRR clearer, using visual representation and description. Scenarios are also particularly important in making the case for climate change action, as the negative impacts of this major risk are undervalued in economic and social systems. To illustrate this point, consider the expected flood damage due to sea-level rise combined with population growth in high-risk areas. An analysis of 136 major coastal cities around the world revealed that sea-level rise of an optimistic 20  cm by 2050 will cause the average annual flood losses in those cities to increase to $1.2 trillion in that year, compared to only $52  billion in 2005. A more pessimistic scenario in 113 Box 8.2. Scenario of cascading systemic economic impacts of a hurricane in Barbados Barbados faces high levels of risk from hurricanes. Tourism is a major component of its economy. As part of its planning for DRR, analysts constructed a Category  5 hurricane scenario and estimated the expected direct and indirect economic impacts. In the scenario, the hurricane moved across Barbados with 250  km/hour winds and corresponding storm surge flooding. The exercise used the Economic Consequences Assessment Model to estimate indirect economic losses and the Hazus Multi-hazard Loss Estimation to estimate direct economic losses. Under this scenario it was estimated that: ● Some 8.5% of hotels, residences, factories and distribution centres would be flooded and could not be used until extensive remediation work was done. ● Some 11.5% of the population would be displaced for at least 6  months, either fleeing internationally, or residing with friends and relatives – causing an effective average rate of 6% reduction in workforce availability after the event. ● Several transit corridors would be damaged in this event, further limiting the ability for commerce and tourism on the island for a duration of 6–12 months. ● Government tax revenues would decline by between 6.8% and 13.3%, depending upon the tax stream. Table  8.1 gives examples of the percentage outputs/production losses based on detailed costings under this scenario. There are some surprising results, such as the high impact on quarrying and the low impact on restaurants, that signal the importance of using and costing the realistic scenario to estimate direct and indirect losses due to the systemic nature of the risk (Lehman et al., 2022). Table 8.1. Sample of sector estimated losses in Barbados in the 12 months following a Category 5 hurricane scenario Selected sectors experiencing a decline in output/ production Decline (%) Hotels, apartments and guest houses 13.3 Crude petroleum and natural gas extraction 11.2 Quarrying of stone, sand and clay 8.1 Communications 7.6 Agricultural production (all types) 7.5 Construction 3.8 Restaurants 2.9 Overall decline in output/production 7.0 Source: Lehman et al. (2022) 114 which sea levels increase by 40 cm by 2050 would bring average annual flood losses of $1.6  trillion (Hallegatte et al., 2013). It is essential to link this kind of data to incentives for risk reduction, in addition to encouraging a switch to renewable energy, which can slow the pace of climate change. Address the inertia bias: Bundle risks and use “optout” options Another way to get individuals, including institutional decision makers, to pay attention to low-probability risks is to bundle several risks into one insurance policy or risk reduction product (Slovic et al., 1978). For example, a study of natural hazard insurance in Europe found insurance coverage is more widespread in countries where a range of risks are bundled into a single policy (Hudson et al., 2020). In Veneto, Italy, residents of this highly flood-prone area were surveyed after recent major flooding. While most expressed reluctance to buy flood insurance as individuals, many said they would find it acceptable for the government to introduce a compulsory insurance scheme that required them to participate (Roder et al., 2019). Figure 8.1. Schematic of invisibilities in DRR success using stilt houses as flood mitigation Source: Rabonza et al. (2022) 115 In addition, field and controlled experiments in behavioural economics reveal consumers are more likely to stick with the default options rather than going to the trouble of opting out in favour of some other alternative (Jachimowicz et al., 2019). This tendency was highlighted in a study of 1,187  homeowners in flood-prone areas of the Netherlands and the United Kingdom. It compared two options: (a)  providing flood insurance as the default on an existing insurance policy, with a choice to opt out of this coverage, and (b)  giving a homeowner the option to add flood coverage to the existing policy. The first product design option resulted in a higher proportion of homeowners having flood insurance, including those with little to no flood-related experience (Robinson et al., 2021). These examples of working with, not against, how people make decisions about insurance can also be applied to other areas to promote effective risk reduction and climate change action. For example, property developers can make solar panels the default by informing buyers they will be installed on the roof of a new house unless the owners decide they would prefer not to have them. Lenders and realestate agents can provide an economic incentive to maintain solar panels by indicating electricity bills would be lower than if fossil fuels were the source of energy (Kunreuther et al., 2021). Address the herding bias: Create social norms Working with, and building upon, existing social norms and practices can help address the herding bias and contribute to positive risk reduction practices. Religion, customs, social norms and other dimensions influence how people think and behave around risk. Attempting to change fundamental beliefs is likely to be counterproductive and unethical, and may risk undermining existing local and indigenous knowledge (Chapter  6). However, well-designed policies can help encourage change towards positive behaviours. For example, if policies promote a social norm for property owners to invest in solar panels, or adhere to building codes, and those who adopt these measures are given a seal of approval, neighbours will be more likely to follow suit. The success of any social norm campaign will require the media to help promote it. Box 8.3 shows how communications campaigns were used to convince residents in Nepal to invest in seismicresistant measures when rebuilding damaged homes following the 2015 earthquake. Risk communication can also hold up common beliefs and practices for reflection and discussion, particularly if trusted peers help lead the discussion. For example, in Australia and the United States, research shows men more often than women drive into flood water without knowing its depth and thus have higher death rates. A man who feels driving through flood water or working through extreme heat is a sign of masculinity might be reminded by a colleague that dying needlessly is not heroic and will devastate his family. People who feel there is no point taking precautions ahead of a storm because fate is in the hands of God might be gently challenged by a religious leader who points out that God also gave them the ability to develop evacuation plans. Special arrangements and specific formats for communications may also be required to address the needs of minority communities within a targeted region. These should take into account existing community decision-making systems and approaches (Mercer et al., 2009; Chapter 6 above). Using tools such as role modelling uncommon or “unthinkable” behaviour can help prompt discussion across groups, spark innovation, push boundaries and give people confidence to do things differently, as in flood-affected communities in Bangladesh (Box 8.4). It can also prompt critical reflection on the trade-offs between short-term and longer-term benefits, and help people check their assumptions, weigh their options and recognize near-term incentives for longer-term planning. 8.2.3 Redirecting financial incentives and regulatory frameworks towards resilience Economic incentives to invest in DRR and other policies to encourage risk reduction can help to overcome the disadvantages of myopia and shortterm thinking. Short-term economic incentives Well-designed policies and products can make it easier for people to invest in benefits that become visible over several years. For example, offering a 116 Box 8.3. Changing social norms on earthquake-resilient home construction in Nepal In Nepal, following the 2015 earthquake, many people rebuilding their homes were deterred from following earthquake-safe techniques because they felt it would require funds and materials they could not afford and skills they did not have. A long-running weekly radio programme, Milijuli Nepali, and a connected drama, Kathamaala, supported listeners to access the government incentive scheme that rewarded safe rebuilding techniques. Expert advice was shared on using affordable locally sourced materials. A platform was provided to swap ideas among ordinary people for saving money to invest in retrofitting and women retraining as skilled masons to boost their livelihoods were shown as role models. Stories were showcased from homeowners who recognized immediate benefits on top of the long-term risk reduction, including a sense of satisfaction in retaining traditional homes built by ancestors, the memories that come with them, and the ability to continue religious and cultural practices through the design and style of the houses. Listeners also reported a sense of pride and comfort at having a unique home within their community that supports livelihoods and social gatherings in their customary ways. A Nepali woman is interviewed about rebuilding houses to be earthquake resistant Credit: BBC Media Action (OI-m8020) Impact research showed nearly two thirds (62%) of regular listeners learned about governmentapproved rebuilding techniques for earthquake-resistant foundations, and nearly a half (45%) reported using these techniques. Statistical analysis supported that regular listeners were more likely to mention taking action than non-listeners (Saha et al., 2021). Creative storytelling and talented radio production skills, deep understanding of audience realities, up-to-date technical advice and a clear strategy for supporting decision-making combined to create programming that was highly appealing to audiences. So much so that listenership continued to grow years after the earthquake. This underscores the point that high-quality, engaging media is important for sustaining audience interest in risk issues and for sustaining commercial viability (Saha et al., 2021). 117 loan for investing in risk reduction measures tied to a multi-year mortgage can significantly reduce the annual costs, making the investment more affordable upfront. By making the investment financially attractive in the short term, homeowners are more likely to invest in making their house safer from future disasters. In countries where property owners are required to purchase insurance as a condition for a mortgage, the reduction in annual risk-based premiums due to lower claims from a disaster will likely exceed the yearly loan payments. In countries where insurance is not required, or the property owner cannot afford the annual loan payment, a pre-specified grant to the household based on the annual income (i.e. a means-tested voucher) or tax credits may provide incentives to invest in insurance or other risk reduction measures (Kousky and Kunreuther, 2014). Such incentives are also effective in promoting climate change action. By 2030, solar energy will become the cheapest source of power in Canada, China, the United States and 14 other nations (Manghani, 2021). To encourage homeowners to invest in solar panels, leases and power purchase agreements could cover the cost and maintenance of the panels. The homeowner would pay a regional Box 8.4. Television, social norms and flood and storm preparedness in Bangladesh In Bangladesh, research showed people were not undertaking measures to reduce risk before seasonal storms for many reasons, including the fear of being judged by their neighbours as doing something out of the ordinary. In one instance, a family that tied the house roof down ahead of a storm, was accused of witchcraft when everyone else’s roof blew away. In response to these types of social factors, a national television reality programme showcased communities coming together to take action to adapt to climate change and reduce risks. Normalizing risk reduction activities by showing large groups acting made it easier for people to talk about possible changes within their own communities and explore options together. The programme reached over 22.5 million people, with 78% reporting a better understanding of how to prepare for hazards and 47% reporting taking action to prepare. Source: Whitehead (2017) A local woman is interviewed about flood and storm DRR Credit: BBC Media Action (OI-m1560) 118 government or a private company a fee lower than the savings in the electricity bill (Sendy, 2020). This can contribute to a positive cycle where greater economies of scale, increased competition and improved institutional arrangements (e.g. streamlined permitting processes) reduce costs and create incentives for further technological innovation and supply chain efficiencies. Experts estimate such factors will drive the cost of solar energy down from the current price by 15–20% over the next decade, making this investment even more attractive. In California, a government regulation builds the long-term economic benefits of solar energy into new constructions. Since 2020, all new singlefamily and multifamily residences must be built with solar panels (Rogers, 2019). The California Energy Commission, which approved this legislation, estimates the monthly mortgage payment on a house will increase by $40 a month but the owner will save an average of $80 a month on electricity. As the cost of the solar panels is included in the mortgage, the owner’s costs are effectively lowered from the moment they purchase the house. A further regulation will place similar requirements on new commercial structures and high-rise residential projects from 2023 (Penn, 2021), which will also become part of the Building Standards Code. Over the next 30  years, this regulation will reduce GHG emissions equivalent to taking nearly 2.2  million cars off the road for a year (Rogers, 2019). Risk-based insurance premiums Risk-based insurance premiums are another tool that can help overcome the challenge that investment appears too costly relative to the shorter-term reduction in damage. Such premiums can offer lower costs to entities that have invested in preventive risk reduction measures. Catastrophe models have been developed and improved over the past 30  years, to assess the likelihood and damage from disasters of different magnitudes and intensities. Insurers and reinsurers utilize the estimates from these models to determine riskbased premiums and how much coverage to offer in hazard-prone areas (Grossi and Kunreuther, 2005). The estimates can also be used as a baseline for understanding which DRR activities can best reduce the risk to a particular asset. In France, a disaster insurance system called Catastrophes Naturelles incentivizes implementation of risk prevention plans to reduce risk as part of local flood risk management. These plans can prescribe high-risk zones in which new development is not allowed and recommend or require risk reduction measures to reduce floodrelated damage. The insurance system encourages communities to implement their plans by imposing higher deductibles on those who lag behind in implementation (Poussin et al., 2013). A continued reliance on short time-horizons as the basis for financial decisions remains a significant contributor to the failure of policymakers, investors, corporations and project developers to fully consider and respond to disaster risks. Much of the policy, regulation and accounting practice does not mandate consideration or disclosure of the financial impacts of disasters. However, mispricing or underestimating these risks can have a financial impact on an institution’s income statement or balance sheet, whether it is a company, a credit organization or an institutional investor. The consequences of this are significant and growing. By contrast, a taxation system that measures the real cost and provides an incentive by returning a portion of revenue to taxpayer’s local regions changes the financial and social incentives (e.g. Box 8.5). Box 8.5. Carbon taxes in Costa Rica Costa Rica was one of the earliest countries to begin to combat climate change through financial levers, when it adopted an innovative carbon tax on fuel in 1997. There is a connection for taxpayers between fuel use and benefits to their own communities, since a portion of the revenue goes to pay farmers and indigenous communities to protect and regrow tropical forests. The tax generates $33 million annually for these groups; it has helped reverse deforestation and benefited the economy. In 2018, 98% of the electricity in Costa Rica came from renewable energy sources. Source: King (2019) 119 8.2.4 Evaluating strategies Strategies for DRR at any geographic scale must be able to address the following questions: how well do proposed strategies prevent losses over time and are the monitoring metrics of choice properly capturing progress towards the goal of reducing losses as early as possible? Addressing these is not easy, and solutions often require a trade-off between efficiency and equity. Efficiency is normally determined by undertaking a cost–benefit analysis that compares the risk reduction benefits with the investment and maintenance costs of DRR measures. Equity is measured by comparing the utility of the poorest families under the proposed strategy relative to the current programme (Boardman et al., 2018). It is also increasingly important to consider how future generations will fare under different risk management strategies, given the significant negative impacts of climate change. 8.3 Role of key stakeholders in implementing disaster risk reduction measures Ensuring the values and agendas of key stakeholders are aligned towards risk reduction, ideally in a single strategic direction, is essential for effective DRR programmes and policies. However, different stakeholders will have different roles and responsibilities, as outlined below. 8.3.1 Public sector Governments and public sector entities play perhaps the most crucial role in ensuring the frameworks to accelerate risk reduction are in place. They should also take steps to address equality of income and equity and fairness issues by assisting residents and small businesses financially so they can afford to invest in DRR. At the most basic level, governments need to ensure regulations are in place to prevent, reduce or ensure the resilience of construction in unsafe locations, such as flood-plains, areas subject to sea-level rise or areas at extremely high risk of fire or other hazards. To do this, governments also need to better understand the climate projections for their jurisdictions. They should work with experts to update design standards to ensure resilient infrastructure design, particularly against increased temperatures, higher-intensity rainfall and drought impacts. In parallel, assessing the risks to current critical infrastructure under a range of future scenarios likely to occur within their lifetime is essential. Implementing these cost-effective protection measures can help reduce the need for costly humanitarian assessments, saving money and suffering. It is imperative for the public sector to incentivize the transition from fossil fuel to renewable energy sources by subsidizing solar and wind power initiatives and aiding property owners interested in utilizing renewable energy as a source of power. Actions such as putting a price on carbon via emission trading systems or carbon taxes can reduce the emissions that are increasing disasters and stimulate the innovation, diffusion and adoption of renewable energy, as Costa Rica has done (Box  8.5). Where possible, the public sector can also help create quality new jobs by committing additional funds for research and development of innovations in areas key to the climate transition, such as solar and wind energy and battery storage development. Taking measures to improve the targeting of humanitarian assistance so grant-based assistance is provided to the most vulnerable people, and ensuring longer-term assistance is provided through loans not handouts for those with resources, can also help incentivize future risk reduction. Encouraging private sector enterprises to review the resilience and sustainability to systemic risks of their own operations can send important signals to encourage preparedness. Also, encouraging insurers to provide protection against losses from disasters by supplying reinsurance coverage against catastrophic losses for those who take preventive measures can help ensure safety nets are in place (van den Bergh and Botzen, 2020). The public sector is also key in creating a new “social contract” to incentivize investment in disaster resilience. It can help specify the responsibilities and liabilities of national governments, financing bodies and the private sector to manage the negative externalities arising from disaster risks. 120 National governments and regulators need to define sustainable, disaster-resilient investments and encode risk metrics to change investor behaviour and raise awareness of disaster risks. Box  8.6 provides examples of how this is increasingly occurring through the deployment of green finance instruments such as resilience bonds. The annual climate change adaptation costs for developing countries are estimated to be in the range $140 billion to $300 billion per year by 2030, and between $280 billion and $500 billion per year by 2050 if global warming is limited to 2°C above pre-industrial levels (UNEP, 2016). However, these estimates are likely underrepresenting the real need when taking into account the capital requirements for making existing and planned infrastructure investments resilient to climate change. Globally, the need for infrastructure investment is forecast to reach $94 trillion by 2040, and a further $3.5 trillion will be required to meet the United Nations SDGs on renewable energy and water (Oxford Economics, Box 8.6. Innovative finance for risk reduction: green bonds for climate resilience Bonds are a major source of investment for the public and private sectors. Since the first labelled green bond in 2007 by the European Investment Bank, $1.5 trillion of labelled green bonds has been issued worldwide from a diverse range of issuers, including sovereigns, municipalities, national development banks, financial institutions and corporates. About 16.4% (1,265) of green bonds (7,725 deals) have included activities related to adaptation and resilience, mostly in the water and water-related sectors. Of these, 79% were issued by developed markets, 15% from supranational institutions and only 6% from emerging markets (Qadir et al., 2021). Recent examples include: ● Société nationale des chemins de fer français, the French national state-owned railway company, has used green bonds to finance the protection of natural resources and biodiversity in addition to low-carbon transport and rail energy efficiency. ● The city of Malmö in Sweden, one of the earliest municipal green bond issuers, used two issuances to raise funds for climate change adaptation and resilience measures for sustainable management of water, wastewater, land and natural resources. ● The Asian Development Bank issued a bond in 2019 that prominently featured adaptation and resilience activities. Investments include the Mongolian Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project, which is building 10,000 energyefficient and low-carbon housing units as part of 20 new eco-districts with resilience infrastructure like roads, water, sewerage, heating pipes and greenhouses for urban farming. ● Grupo Rotoplas, a corporate entity in Mexico, issued a $523 million green bond in 2017 that included resilience finance for innovative water solutions in markets where clean water is scarce due to droughts, water pollution and unreliable water infrastructure. The benefits of green bonds include that they provide issuers access to low-cost capital to finance their investment pipelines and help broaden their investor base, as demand for green bonds far outstrips supply. They are also well suited to large-scale projects that require capital investment ahead of revenues and help unlock discounted finance through blended finance facilities and funds. They also help bring visibility to resilience features and improve internal processes that enhance risk management and strengthen internal relationships and commitment to sustainability (Qadir et al., 2021). 121 2017). Assuming all of these infrastructure investments will require resilience features, the adaptation finance gap is likely to be at the scale of trillions of dollars rather than billions. In the face of these needs, adaptation finance flows remain woefully insufficient. Total tracked public and private investment in climate adaptation in 2018 was $30  billion worldwide (Buchner et al., 2019). Public finance will be insufficient to meet adaptation financing needs, particularly in developing countries. While there is limited data on private investment flows, securing private investment for adaptation remains a challenge. However, in 2018, GHG emissions reduction finance accounted for 93% of total climate-related investment flows globally (Buchner et al., 2019). Climate resilience bonds could help increase investment in adaptation and accelerate a resilient sustainable climate transition (Qadir et al., 2021). 8.3.2 Risk assessment experts The scientific community and sectoral experts such as engineers have key roles to play in providing accurate estimates of the probability and consequences of maintaining the status quo or implementing adaptation measures to reduce future risks. For full transparency, these experts should also specify the uncertainty associated with the estimates. They can then advise households and government agencies which adaptation and risk reduction measures are desirable to implement and most cost-effective. Given the differences in expert estimates, members of the public are likely to focus on the views of those who support their decision on whether to undertake DRR measures. 8.3.3 Private sector The private sector also has a major role to play in accelerating risk reduction action and in reducing losses from future disasters. For example, banks and financial institutions that provide property improvement loans can require specific risk reduction measures to be undertaken as a condition for a mortgage. In designing new houses, apartments and business facilities, developers can avoid construction on flood-plains or in areas affected by sea-level rise. They can also elevate newly constructed buildings (Aerts et al., 2014) and install other DRR measures such as shutters on windows when constructing new property in coastal areas subject to hurricanes. Developers can also negotiate a wind energy land agreement with landowners for wind energy projects such as wind turbines (Frassetto et al., 2018). Real-estate agents can provide relevant information to potential buyers and sellers of environmental features and highlight how they may increase the value of properties. In this regard, a study by Zillow revealed that houses in the United States with solar energy systems sold for 4.1% more on average than comparable houses without solar power. For the median-valued house, this translated to an additional $9,274 (Mikhitarian, 2019). The insurance industry can provide coverage to residents and businesses facing a specific risk and offer premium discounts if they undertake measures that reduce future damage and hence insurance claims. Moreover, given the risk assessment expertise in the insurance industry, insurers can play an important role in informing policyholders on the risks they face and effective risk reduction measures, and in providing information on risk globally, even in areas where insurance penetration is low. All parts of the private sector can take action to reduce the risk of disasters, including by ensuring business continuity when disasters cannot be prevented and by reducing their carbon footprints. Learning from the COVID-19 crisis, the ability to pivot production to address systemic risks is a private sector strength. Looking across a range of risks, private health-care organizations and employers can play an important role in promoting safety and in addressing hazards such as pandemics (Bode et al., 2020). Indirect actions can also help create awareness of good practices. For example, the Netherlands introduced energy performance labels in 2008 to provide information on energy efficiency of homes to potential buyers, which has been capitalized into the purchase price of properties (Brounen and Kok, 2011). 122

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8.3.4 Communities and local governments

A major challenge in implementing protective measures to reduce current and future risk is convincing local governments and the public of the importance of reducing damage from future disasters. To address this challenge, communities can hold meetings or other outreach events where key leaders and experts highlight the impact of severe disasters on homes, including indirect losses, such as the economic and psychological costs of evacuating if homes are severely damaged during a disaster. They could point out that adopting DRR measures would likely have enabled them to remain at home. Community leaders can also emphasize that when it comes to hazards such as wildfires, making houses and commercial and public properties safer is likely to reduce the damage to neighbouring houses.

Local and national governments can also enact or modify building codes and impose land-use regulations to reduce future losses from floods, hurricanes, earthquakes and wildfires, and implement nature-based solutions to limit risk from natural hazards. For example, in the southern Cotswolds in the United Kingdom, local communities collaborated with landowners to create in-channel, riparian, field and woodland structures that lowered the flood risk by reducing high water flows and increasing the infiltration capacity of soils (Short et al., 2019).

The non-governmental sector also has a key role to play in highlighting actions that can be taken by individuals, and local, state/province/county and federal/national governments to reduce risks, pilot and test innovative approaches, and scale up good practices in risk reduction.

#### Moreover, journalism collapse guarantees mass partisanship and social cohesion breakdown.

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Hal J. Singer, “Addressing the Power Imbalance: A Legislative Proposal for Effectuating Competitive Payments from Platforms to Newspapers,” Columbia Journal of Law & The Arts, 2023, https://heinonline.org/HOL/Page?handle=hein.journals/cjla46&div=26&g\_sent=1&casa\_token=&collection=journals

C. THREATS TO DEMOCRACY FROM NEWS DESERTS

As a result of the deteriorating news media landscape described above, hundreds of local newspapers have been acquired or have declared bankruptcy.125 One study estimates that the United States has lost nearly 1,800 newspapers since 2004 either to closure or merger, leaving the majority of counties in America beholden to a single publisher of local news and 200 counties without any paper.126

The elimination of local news threatens democracy. A critical function of a local newsroom is coverage of local and state government affairs.127 Without this coverage, Americans are more likely to rely on national news and partisan heuristics to make political decisions.128 A robust local news business is also a natural pipeline by which government officials effectively communicate to an electorate (and vice versa). Research shows that in areas with higher local news coverage, voters are better informed on their congressmen and that politicians more actively pursue their constituents’ interests through moderating their partisan voting, more frequently standing witness to committee hearings, and generating more federal funding for their districts.129 Local newsrooms may also provide a check on local government corruption and mismanagement.130 Moreover, robust local news coverage is positively correlated with higher rates of voter turnout,131 more support for local services,132 and greater levels of social cohesion.133

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#### Partisanship and social cohesion breakdown cause extinction.

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Cees Hamelink, “A Polarized Planet,” In book: Communication and Peace, Celebrating Moments of Sheer Human Togetherness, Palgrave Macmillan, 05/2020, https://www.researchgate.net/publication/341747127\_A\_Polarized\_Planet

Polarization

The Greek philosopher Herakleitos coined the phrase: “From differences results the most beautiful harmony”. Maybe he should have been somewhat more cautious because we are biologically, psychologically and linguistically wired to think in fragments as in most modern sciences where we are still haunted by Cartesian divisions. We understand the notion of “parts” better than the concept of “wholeness” because we tend to think in fragments and not in coherent patterns. Once we have fractured the world into stand-alone pieces, it is an illusion that simply connecting us through advanced technologies will create coherence. Through social media we connect but do not create togetherness. Common to all the forms of fragmentation—that I described—is a mode of thinking that William Isaacs (1999) called “thinking alone” which means being defensive about our positions, clinging to certainties and imposing judgements upon others. It reflects a binary discourse that categorizes people against each other. Men versus women, black versus white, impaired versus non-impaired, religious versus non-religious. Binary thinking fosters exclusion and discrimination. We have no shared discourse to converse about the fractures of humanity. Against this Isaacs argues that we need to “think together” which means listening, respecting, suspending assumptions and letting our inner voices speak up. “Thinking alone” fosters and feeds polarized fragmentation. The opposite poles are immobile and entrenched in their singular identities. Once people lose the capacity to think about themselves in terms of multiple identities, they are ready to believe that the others deserve to be dehumanized and eventually to be eliminated. The belief in singular identities tends to see violence as only way to protect your own identity. When fragmentation gets polarized, conflicting parties tend to forget that all have multiple identities and that identities are not static but dynamic lest we become each others’ enemies. Our identities and those of others are permanently in flow. We are “flaneurs” as Walter Benjamin phrased it. Especially in global cities there is a constant interaction between multiple identities and we need to reclaim the capacity to celebrate this. The city can only survive if we dance in the streets! There are no fixed identities; they are constructed labels for convenient purposes such as domination. Identities are fluid. As Kwame Appiah says in an interview with the Financial Times (31 August 2018) “Still, whatever their religion, sexuality, racial identity, or nationality, people should have a lighter hand with their use of these identity categories in a way that would mean that moments in our cultures where conflicts arise might be somewhat defused”. Essential identities do not exist however much many people care about them and get angry when what see as their identity is not taken sufficiently seriously. Identity can only develop in interaction with others. Appiah, “Beginning in infancy, it is in dialogue with other people’s understandings of who I am that I develop a conception of my own identity” (Appiah 2007, 20). As Appiah argues identity is not an authentic inner essence but it is—in the words of Charles Taylor—dialogically constituted. “Individuality presupposes sociability” (ibidem, 20) since we are social beings as Aristotle already knew. In Appiah’s felicitous phrasing “so much we care about is collectively created” (ibidem, 20). We should understand that our individual identities have strong collective dimensions… “because they are constituted in part by socially transmitted conceptions of how a person of that identity properly behaves” (ibidem, 21). In processes of polarization, the narratives about who we are tend to be narrowed down to the stories of others who think like us and behave like we do. The collective dimension impoverishes and the dialogical construction of our identity allows the input of a limited set of voices only. There is grave danger in the frozen identities to which the so-called nationalist/populist identity politicians greatly contribute. We need to answer this polarization of dividedness with creativity and flexibility, with storytelling, theatre, music and dance. Once dividedness polarizes, it paralyzes communities and stands in the way of their resilience. With polarization, the de-escalation of conflicts becomes practically impossible because conversation is no longer possible. Polarization confronts us with the most dangerous of all fractures. Humans have managed to create a formidable enemy—Mother Gaia—and we need protection against her devastating anger. A deeply polarized human species is unable to provide this protection that needs to be based upon togetherness, thinking together and conversing together.

Existential Risk

The accumulation of the fractures into polarization causes the human species—in the beginning of the twenty-first century—to face once again deep existential risks. Those are the risks where humankind as a whole is imperilled as they imply major adverse consequences for the course of human civilization for all time to come. Risks in this category are a recent phenomenon. This is part of the reason why it is useful to distinguish them from other risks. We have not evolved mechanisms, either biologically or culturally, for managing the present risks (Bostrom 2002) that are largely “unintended consequences of radicalized modernity” (Beck 1999, 3). The concern about the extinction of the species we belong to is based on carcinogenic ingredients in food supplies, organized (cyber-)crime, pollution by poisonous materials (acid rains, chemical products), series of natural disasters (asteroids, comets, volcanoes), genetic experiments, collapse of financial markets, the scarcity of water and energy sources, infectious pandemic diseases, the consequences of genetic engineering, artificial intelligence or molecular manufacturing, or on increasing global inequalities that endanger economies and politics (Stiglitz 2013). There is the persistent risk of nuclear, chemical and biological warfare with the observation that for the first time in history weapons of mass destruction and the knowledge of how to manufacture them are available for individuals and small groups. There is also climate change, the loss of biological diversity and the largely underrated issue of overpopulation.2 The human species has survived over centuries many risks but contemporary risks have a planetary scale and “In the charged reflexive settings of high modernity, living on ‘automatic pilot’ becomes more and more difficult to do, and it becomes less and less possible to protect any lifestyle, no matter how firmly pre-established, from the generalised risk climate” (Giddens 1991, 126). As Ulrich Beck writes in the world risk society we cannot be privately insured against the risks of modernity (Beck 1999, 4) and their global interdependence. Unprecedented technological progress that provided the conditions under which the mass murders organized on an industrial scale and made possible by an efficiently organized and managed modern bureaucratic state by the Nazi’s could take place. Technical skills and organizational talent is crucial to organize massive genocide and massive addiction to industrially produced goods such as mobile telephones. Under conditions of modernity Auschwitz could happen again. The need for highly efficient coordination makes modern society very vulnerable to disruptions and on a level of global interdependence such disruptions may have global consequences. Technological advances make humans ever more dangerous, and at the same time, humanity is incapacitated to deal with such unprecedented risks as it outsources its moral responsibilities increasingly to medical, psychotherapeutic, scientific, nutrition and technical-engineering experts. Whereas the Enlightenment promised to liberate humans from the selfimposed inability to use their minds independently of others (Kant), modern life is handed over to coaches and counsellors. As “the most likely global catastropic risks all seem to arise from human activities, especially industrial civilization and advanced technologies” (Bostrom and Cirkovi´ ´ c 2008, 27) humanity has the responsibility to reflect on the unintended and unforeseen consequences of its actions. Most urgent in terms of human survival are the fractures between humans and the Earth System. In the planet’s history humanity finds itself now in a new phase: the “anthropocene”. This means that humans are with their immense and unprecedented power the most influential force in the evolutionary process. Interestingly enough the social sciences largely have refused to accept that the Earth sciences can contribute to our understanding of the world as no longer a “humans among themselves affair” (Hamilton 2017). The “humans only” focus that prevails in the social sciences leads to humans watching their own extinction as a televised spectacle that takes place outside the cubicle of their daily lives. Humans may—as the most powerful species—be at the centre of the planet but are increasingly unable to control the planet. “Our understanding of the Earth we inhabit is undergoing a radical change. The modern ideas of the Earth as the environment in which humans make their home, or as a knowable collection of ecosystems more or less disturbed by humans, is being replaced by the conception of an inscrutable and unpredictable entity with a violent history and volatile ‘mood swing’” (ibidem, 47). It is debatable whether as Pope Francis states in Laudation Si: On Care for our Common Home (Encyclical published by the Vatican, May 24, 2015) nature “is the sister that cries out to us” and “a beautiful mother who opens her arms to embrace us”. As Clive Hamilton notes “Now when Mother Earth opens her arms it is not to embrace but to crush us” (ibidem, 48). Because “Nature is no longer passive and fragile, suffering in silence” (ibidem, 48). As Hamilton argues, we no longer have to save nature but we should save ourselves from nature and from ourselves. The most existential threat is now in the fracture between the unprecedented human power to disrupt the earth system and “the uncontrollable powers of nature it unleashed in the Anthropocene” (ibidem, 49). The interesting conclusion is that we are not any longer free to treat the Earth as we please. Our enormous power comes with an unsettling moral responsibility: we no longer can choose between dominion and stewardship. We have to accept that the anthropocene is anthropocentric (ibidem, 50ff.) meaning that we have the power to change the course of the earth system. This leads to the ethical conclusion that “we must restrain ourselves and restrict what we do” (ibidem, 54). In the conflict between humanity’s unlimited desires and ambitions and the finitude of the earth system we must control the dark side of technological development. We must understand that the forces that were expected to bring us more freedom, more equality and more civilization also brought disruption of the earth system, lethal arms systems, unprecedented ubiquitous surveillance and a tweeting culture that effectively erodes whatever minimal deliberative social processes we had developed. In this moral conflict, we must explore whether our conventional ethical repertoire is adequate. Can we rely upon the will of God or our love for nature? Can we trust enlightened self-interest? Can the notion of collective public duty stand up against the solid individualism of a modern capitalist society. Will the drive towards self-preservation outlive the rampant media-induced indifference? Our future is a confrontation between humans and an unpredictable earth system. This has a certain outcome if we think we can afford indifference and an uncertain outcome—at best— if we treat an angry mother Gaia with the care she deserves. The question is whether today’s global community is capable of dealing with the existential risk of extinction. Can we constitute a global resilient community that can avoid this?

Conclusion

As Abraham Lincoln, later president of the USA, on 16 June 1858 after he had accepted the Illinois Republican Party’s nomination as that state’s US senator, famously stated “A house divided against itself, cannot stand”.3 In order to deal effectively with a formidable existential risk, we must develop communal resilience. This involves the difficulty of accepting genuine dissimilarities. It implies recognizing the other as responsible agent. It demands the critically probing of the arguments for different positions and accepting that togetherness is only possible when groups no longer monopolize the truth. And learning that fractures do not necessarily exclude “togetherness” as long they do not end in the dead alley of polarization.4

If peace is conceptualized as “celebrating moments of sheer human togetherness” and if we aspire to peaceful living together, we must overcome the great obstacle of polarized fragmentation. It may not be the fragmentation in so many different terrains on our planet that creates the essential obstacle to the cosmopolitan togetherness that is basic to collective joy. But the greater problem is that fragmentation is based upon a mindset that is characterized by the belief in singular identities, in the exclusion of alterity, in rampant individualism and in “thinking alone”. This perspective fits remarkably well in the hierarchical social orders that characterize also modern so-called democratic societies. For the conceptualization of peace as moments of collective joy, it is also important to note that such orders are antagonistic to collective festivities. “Ecstatic rituals still build group cohesion, but when they build it among subordinates – peasants, slaves, women, colonized people- the elite calls out its troops. In one way, the musically driven celebrations of subordinates may be more threatening to elites than overt political threats from below” (Ehrenreich 2007, 252).

## CP

### Certainty Key---2AC

#### The CP dooms journalism --- it makes journalists uncertain about whether they’ll be liable for violating antitrust law, which chills their speech.

Kendrick 13 – Professor of Law at the University of Virginia School of Law.

Leslie Kendrick, “Speech, Intent, and the Chilling Effect,” William & Mary Law Review, 04/2013, https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=3481&context=wmlr

2. How Chilling Works

The question arises why legal rules not directed at protected speech might nevertheless chill such speech. Chilling may arise from different sources, foremost among which is uncertainty in the legal process.91 Uncertainty may stem from ambiguous rules or erroneous applications. Either of these may make a speaker fear that he will be held liable for speech that should properly be protected. The closer his speech is to the line between protected and unprotected, the more pronounced this uncertainty will be.92 Given the existence of both ambiguity and error, would-be speakers of marginal statements might well decide that they would prefer not to speak rather than to risk liability. Speech that is actually protected will therefore be chilled.93

It is worthwhile to examine this description in more detail. The mechanisms of chilling are diverse, and some so distinct as to have their own labels. The most prominent examples are vagueness and overbreadth.94 The doctrine of void-for-vagueness is partly explained on chilling grounds.95 A vague law creates uncertainty as to its scope; speakers who would otherwise engage in protected speech accordingly self-censor. Although vagueness is a general due process issue, its special significance in the First Amendment area is consistent with the conception of free speech as an affirmative value.96

Similarly, one chief explanation for the First Amendment doctrine of overbreadth rests on the chilling effect. An overbroad law is invalid not because it incidentally chills protected expression but because it directly reaches protected expression: hence the term “overbroad.” The chilling effect comes in as one explanation for why unprotected speakers—those who would have been reached by a properly drawn law—nevertheless may challenge the overbroad law.97 They may do so, according to this account, because the law is chilling would-be speakers of protected expression who stay silent to avoid prosecution but thereby lose the opportunity to challenge the law.98 The overbroad law essentially exerts a chilling effect on its own appropriate judicial review, the remedy to which is a special standing rule.99

But chilling also arises outside the context of these doctrines. A law that is not void for vagueness may still contain ambiguities, and even the clearest rule may be applied in error. These circumstances may make speakers uncertain of a law’s application. This uncertainty may translate into a variety of risks, any of which may cause a speaker to remain silent. For example, a speaker may be deterred • by the risk of wrongful criminal conviction and sanction;100 • by the risk of wrongful liability in tort for damages or other civil remedies;101 • by the risk of losing benefits to which he is entitled;102 • by the litigation costs of defending himself in criminal, civil, or administrative procedures, regardless of their outcomes;103 • by the personal and reputational costs of defending against a criminal, civil, or administrative proceeding, regardless of its outcome;104 • by the costs of obtaining legal advice prior to speaking;105 or • by the threat of investigation or surveillance, whether or not it results in legal proceedings.106

### Certainty Key---1AR

#### Even the perception of potential liabiltiy is sufficient to ruin solvency.

Vincent et al. 25 – Professor at Simon Fraser University; Professor in the School of Information at the University of Texas at Austin.

Nicholas Vincent, Hanlin Li, and Matthew Prewitt, “Collective Bargaining in the Information Economy Can Address AI-Driven Power Concentration,” Arkiv, 06-12-2025, https://arxiv.org/pdf/2506.10272

Fundamentally, CBI currently faces legal, technical, and social challenges to materialize. Legal concerns may in fact be the most foundational (and hence feature prominently in our suggestions): collective bargaining arrangements at a large scale – despite actually mitigating a stark power imbalance between AI builders and information producers – may be perceived as anticompetitive, and if so, information producers may hesitate to organize due to fears of antitrust consequences. As such, policymakers should prioritize expanding permissible coordination on the information production side, or clarifying CBI’s permissibility under anti-trust laws.

### Antitrust Key---1AR

#### Journalists will be prosecuted under federal antitrust law without the plan. AND even if not, they’re definitely chilled, which dooms solvency.

CC 21 – Representatives from a variety of groups, including several journalism unions.

Creators Coalition, “Re: Making Competition Work: Promoting Competition in Labor Markets,” Creators Coalition, 12-20-2021, https://nwu.org/wp-content/uploads/2022/01/CREATORS-COALITION-FTC-DOJ-20DEC2021.pdf

In today’s marketplace, these workers face myriad challenges, and the Federal Trade Commission and the Department of Justice’s inquiry into the intersection of antitrust and labor law casts much-needed light on these struggles.

Antitrust laws, as well as our members’ lack of collective bargaining rights, directly affect our members’ ability to earn a sustainable living through their creative work. In most creative fields today, industry consolidation and the domination of a handful of online distributors has vested excessive market power in the purchasers, publishers, and distributors of creative works, resulting in a grotesquely imbalanced marketplace that negatively impacts the advance of both commerce and culture to the detriment of creators and consumers alike.

The result is that these few and dominant corporate monopsonies are able to force unfair terms on individual creators and extract from the marketplace far more than their fair share, while the individuals who labor to bring creative work into the world are offered unfair terms, which they generally accept because they cannot hope to even minimally profit from their work otherwise. Meanwhile, smaller entities that try to compete with the monopsonies and attract talent with more favorable terms inevitably fail because they cannot sustainably compete with the dominant firms. And once the outsize player(s) in a particular creative industry adopt new terms that disfavor the creators, their midsize “competitors” are quickly forced by marketplace necessity to follow behind. This race to the bottom leaves creators with no choices but the swallow the newer, increasingly unfair terms, or to abandon their careers to pursue other ways to earn a sustainable living. Creators who attempt to attempt to escape the monopsonies in their sectors by distributing on their own work face an equal or greater imbalance of bargaining power in dealing with the handful of dominant digital distribution and monetization platforms.

While the specifics differ from industry to industry, many creative professionals do not even earn the equivalent of minimum wage, while their publishers and distributors demand more and more exclusive rights for the same amount of compensation, to the point that most creators can no longer sell rights for different uses to separate entities (and thereby earn additional fees), as was contemplated by the 1976 Copyright Act. As a result, in the last decade or so, freelance creators’ pay in most sectors of the creative economy has decreased dramatically, even as the revenues produced for others by the use of their works has skyrocketed. For instance, authors used to be able to sell audio books to audio book publishers as a way to earn additional money. Now, most major book publishers demand audiobook rights coupled with the book publishing rights, increasing the publishers’ income streams while depriving creators of their own bargaining and earning opportunities.

Enormous downstream pressure from internet monopsonies and monopolies has shrunk the number of buyers (and competition) for creative works. This lack of competition has of course increased the bargaining power of representatives and middle marketers, leading in turn to a gradual erosion of contractual protections, benefits, and income for creators. This trend, as shown below, extends across the various creative sectors. What’s more, the same internet platforms that disrupted and reconfigured the markets with complete impunity are now also creating their own publishing and production entities, directly competing with established publishers, record companies, image licensors, self-published creators, and other businesses engaged in artistic and cultural endeavors. These conglomerates then favor use of their own works on their platforms while increasing the pressure on creators to acquiesce to diminished terms of remuneration, thus further artificially depressing earning power.

Much has been made of the recent legal protections provided to “gig” workers in today’s economy, but creative freelance workers are the original underpaid gig workers—they work on a freelance basis for a defined set of publishers and distributors that provide standard contracts and low pay. Like traditional employees, these workers earn their livings by providing labor to the companies that hire them; they are not on an equal footing to negotiate the terms on which they provide services and licenses. Publishers and distributors generally, and increasingly, give individual creators contracts of adhesion to sign on an essentially takeit-or-leave-it basis, with little or no ability to negotiate better terms. Parity will not be achieved in these labor markets unless and until the individual creators in each field are clearly allowed to negotiate and act collectively with their de facto employers: publishers and distributors.

The labor and antitrust laws have been applied to creative workers as though they are businesses with the ability to negotiate freely and on an even footing with the buyers of their services and creative works – a marketplace fiction with economically lethal consequences. Since many creative professionals work under independent contractor agreements, and are classified as independent contractors rather than employees, they do not have the collective bargaining rights and other common employment benefits and face potential liability under the antitrust laws from acting together, in concert, to say “no” to certain terms, demand better pay, or boycott bad actors.

The members of our organizations desperately need the ability to collectively demand better treatment and terms for their work from those they work for. They need the ability to act together to say “no” to certain terms, demand minimums and better pay, and to boycott bad actors without risking suit for antitrust violations.

This is our coalition’s top legislative priority in the near term. As such, we have drafted suggested legislative changes to the NLRA, a free-standing antitrust exemption bill, as well as amendments to the PRO Act, should it become a potential candidate for enactment at some point in the future. Each of these proposals would give creative professionals the leverage they need to negotiate more fairly in a market dominated by a few large companies and internet platforms for whom the playing field is outrageously and favorably tilted. We respectfully ask that you consider our proposals, and work with us to help craft legislation that will bring more parity to the freelance creative workforce. In short, we seek your help in closing what is now a grotesque value gap between the pittance in remuneration earned by the creators of artistic works, compared with the billions of dollars in revenues and equity value gleaned by those who dominantly market and distribute such works to the public.

#### Even the perception of violating the law kills solvency.

Kendrick 13 – Professor of Law at the University of Virginia School of Law.

Leslie Kendrick, “Speech, Intent, and the Chilling Effect,” William & Mary Law Review, 04/2013, https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=3481&context=wmlr

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### ^Cross Apply “Certainty Key” Cards, too

### Court Hates Labor---1AR

#### Especially magnified because the Courts hate labor protections.

Velasquez 25 – Associate Professor of Law, Indiana Maurer School of Law. J.D., Harvard.

Alvin Velasquez, “Labor Organizing In a Time of Legal Chaos,” LPE Project, 04-14-2025, https://lpeproject.org/blog/labor-organizing-in-a-time-of-legal-chaos/

Over the past two months, the Department of Government Efficiency (DOGE) has followed the Silicon Valley mantra of “move fast and break things” to the letter. And one thing it has been trying to break quickly is public sector unions. In early March, for instance, the Department of Homeland Security’s (DHS) unilaterally terminated the collective bargaining agreements between it and airport screeners. More recently, the Office of Personnel and Management has instructed agencies to disregard provisions within union contracts governing reduction-in-force procedures.

The Trump administration is, however, far from alone in its attempt to break public sector unions, as both Republican and Democratic states have targeted them as well. The Republican-controlled legislature for the State of Utah recently passed legislation outlawing public sector unions. In union-heavy New York State, the governor fired 2,0000 corrections officers for refusing to cross the picket line and has barred them from ever working for the state again.

The scenario is not much better yet for the private sector. Despite the fact that many workers in recent years have successfully organized into unions using the process overseen by the National Labor Relations Board (NLRB), workers such as those at Amazon have failed to obtain their first contracts due to the structural imbalance in the National Labor Relations Act’s (Act) remedy scheme. Specifically, the Act requires that the parties negotiate in good faith, but contains no mechanism for requiring the parties to reach agreement. Additionally, SpaceX, Amazon, and other employers are trying to gut the NLRB by asking the courts to enjoin the agency from adjudicating cases using administrative law judges. At least one court has granted such relief, and the issue may eventually go up to the Supreme Court for resolution.

All of this raises a crucial question: How does labor organize in this time of legal chaos?

The Answer So Far

So far, organized labor has responded to the administration’s attack on public sector workers by framing it as an attack on essential government services. They are trying to demonstrate that the interests of public sector unions are aligned with the public interest. Additionally, organized labor has turned to courts to staunch the potential loss of membership, a strategy that is producing mixed results.

While it is understandable for labor to seek redress in court, there is one major problem with relying on courts – they have been historically hostile to labor’s interests. For almost a generation in the late 19th and early 20th centuries, courts engaged in “government by injunction.” They frequently enjoined peaceful labor activity. Fast forward to today and not much has changed. The Supreme Court has generally remained hostile to labor, and the current Supreme Court especially so. The current court has punished unions for going on strike and defunded public unions by barring them from collecting agency fees from non-member free riders. The Court has flirted with doing the same in the private sector as well.

Overcoming Government by Injunction

Labor unions eventually overcame the challenges brought by government by injunction through persistent organizing during the chaos. At first, courts’ use (and abuse) of the injunction to stymie labor organizing as an illegal conspiracy hindered labor’s ability to protect workers. However, political pressure by labor eventually led Congress to exempt concerted activity from the reach of antitrust law in declaring that “the labor of a human being is not a commodity or article of commerce.” When courts continued to enjoin labor activity on other grounds, Congress passed the Norris-LaGuardia Act in response to courts’ excesses. When Congress finally protected the right of workers to engage in mutual aid and protection but failed to provide enforcement mechanisms, worker agitation and hunger brought on by the Great Depression led workers to resist and be subject to violence. That led to the eventual passage of the National Labor Relations Act and provided a pathway for unions to sign up workers in record numbers.

The moral? Court decisions do not build up a labor movement. Congress passed laws to maintain labor peace, not from a sense of moral compunction. Courts used the logic of labor peace to defend the existence of collective bargaining. Court decisions may slow down the breaking of federal public sector labor unions, but who knows to what effect. As I write this, the Trump administration appears open to flouting court orders. Elon Musk and other members of Congress have called for the impeachment of judges who refuse to give them what they want. Organized labor cannot look to courts to construct order out of the chaos that the administration is bringing to bear against it. It must find a way forward that does not rely on solely on legal recognition for the legitimacy of its own institutional existence.