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Bridging Gaps: Connecting Climate Change Risk Assessments with Disaster Risk Reduction and Climate Change Adaptation Agendas

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Introduction

Climate change, and associated variability, is having a transformative effect on both our human and biophysical systems (IPCC, 2018, 2019; Lenton et al., 2019). Significant impacts are already evident, posing increasing risks to vulnerable populations and societal and planetary security (Lenton et al., 2019; Rockstrom et al., 2009). Society continues to face immediate and persistent choices about how to reduce these risks despite documented and acknowledged uncertainties associated with the

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S. Flood et al. (eds.), *Creating Resilient Futures*,
https://doi.org/10.1007/978-3-030-80791-7_4

response capabilities and adaptive capacity of both social and natural systems (Adger et al., 2017; Patterson et al., 2018; Thomas et al., 2019).

Meeting the challenges posed by climate change requires not only strengthening capacities to respond to both extreme and slow-onset hazards as and when they occur, and continued investment in both adaptation and mitigation efforts, but also a concerted effort to increase alignment with disaster risk reduction (DRR) efforts in order to make communities more resilient. This reality increases the urgency associated with continued needs to (i) understand the nature and variability of current and emerging risks, and (ii) increase the capability of assessing climate risks and resiliency opportunities as they evolve. This chapter examines the concept of risk and the possibility of integrating and enhancing policy and practice linkages between climate change risk assessments (CCRA), climate change adaptation (CCA) and disaster risk reduction to address all three of these critical policy spaces.

Conceptualising Current and Emergent Risks

The IPCC derives risk from the sum of the magnitude of the hazard, the relative 'value'/importance/ quantity of what is exposed to the hazard (i.e. people, infrastructure, etc.) and the vulnerability of what is exposed (the ability or lack thereof to cope and adapt to the hazard) (IPCC, 2013, 2014; UNISDR, 2009). This forms the basis of the definition that risk amounts to 'potential for consequences where something of value is at stake and where the outcome is uncertain' (Humphrey & Murphy, 2016). Measured as a function of probability and consequence (King et al., 2015), future climate risks introduce a large amount of uncertainty in evaluation and management (Shortridge et al., 2017; Viner et al., 2020).

Associating a particular likelihood with specific risks is challenging because risk is a dynamic and ever-moving social construction that is reimagined and reinvented by society over time as values and norms change (Adger et al., 2018; Viner et al., 2020). These shifts, often stochastic and non-linear, are governed by people's perceptions of risk, which are in turn based on different values and knowledge (Adger et al., 2009) as well as shifts in exacerbating physical conditions (IPCC, 2018).

While climate change is an accelerator of natural and anthropogenically derived variance in physical conditions (Lawrence, 2016), social processes act as risk modifiers in the face of the documented uncertainty (Thomas et al., 2019). Social functioning, health and wellbeing, and human rights/governance factors (e.g. equity) all influence the acceptability of risk (Adger et al., 2018; Fellenor et al., 2020; Kasperson et al., 1988) whereby responses to perceived outcomes, either in anticipation or in reaction, ultimately change the landscape of likelihood or the distribution of consequences in society. This means that risk is iterative (Fig. 4.1) and must not be considered neutral or fixed, and instead remains a 'relative concept regarding the ambiguity and uncertainty related to the knowledge of the outcomes, and the likelihood of the hazard with respect to the values of the risk perceiver' (Käyhkö, 2019, pg1).

The complexities of risk are such that while some are observable and others emergent in the physical world (Rockstrom et al., 2009; Steffen et al., 2015), many are 'indirect, systemic ones or related to collective and political systems rather than to individuals' (Adger et al., 2018, pg2.). Increased global interdependence in the form of economic, social and cultural integration makes it inevitable that impacts in one country or

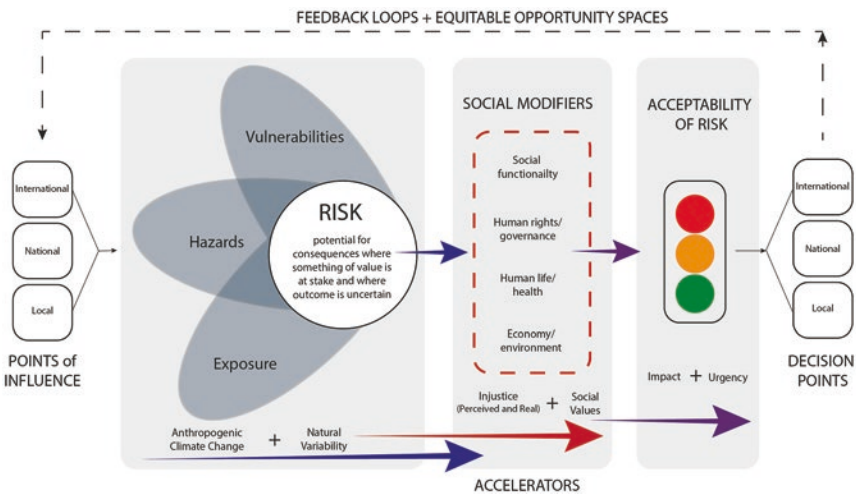

Fig. 4.1 Illustration of social modifiers and accelerators of an iterative risk cycle

region will be transferred elsewhere across the globe (Foresight and Government Office for Science, 2011; IPCC, 2018), whether considering physical impacts (e.g. Nicholls & Kebede, 2012) or social implications (e.g. Levermann, 2014). This ensures that scale, both in terms of pre-risk (influence) and post-risk (decision points) identification, has a critical role to play in risk reduction efforts (Mechler et al., 2019).

Assessing Risk

Failure to plan for and manage future climate risks will result in significant damage to infrastructure, economies and society in general. An effective CCRA provides a sound basis for making decisions on whether risks, and the level of those risks, are acceptable to society or specific communities. Achieved by obtaining, collating and analysing information on how risks deemed unacceptable can be reduced to sub-threshold levels of acceptability, CCRAs have traditionally been based on historic causal chains and event analysis data from past events and failure reporting (Aven, 2016), often in isolation from influencing or cascading events (ASC, 2016). The interlinkages between existing risks, vulnerability to those risks and the adaptations developed to manage those risks are often neglected in methodologies (Jones & Boer, 2003) and CCRAs have previously assessed potential impacts of climate change without taking account of ongoing adaptation plans and activity (ASC, 2016). Interdependencies and cascading risks are also often under-represented because of reductionist processes (Lawrence et al., 2020) and there is strong evidence to suggest that in times of rapid and non-linear global change these approaches are no longer adequate to capture future risks (Centeno et al., 2015; Stirling, 2010; Zscheischler et al., 2018).

Nonetheless, risk assessments have long been considered a more appropriate basis for developing adaptation strategies to manage future risks than simply collecting baseline climate data and using that data in change scenarios (Palutikof et al., 2019). This has resulted in a shift away from the linear 'top-down' approaches that begin with observed and modelled climate data, then evaluate the impacts and select appropriate adaptation options. Instead, more 'bottom-up' or context-based approaches, focussed on co-produced evaluations of exposure and vulnerability as the assessment component to identify adaptation options, are being employed (Aven, 2016; Howarth et al., 2018). Context-based adaptation enables the development of CCRAs that are more focussed on understanding the social and physical limits of a system (thresholds) as well as the determination of probabilities of breaching the thresholds, now and in the future (Reeder & Ranger, 2011). Co-considering options with stakeholders and plotting out options with timelines and potential impacts allow for greater flexibility in decision-making and facilitate learning over time. This 'change-through-learning' is a critical element for dealing with the inherent uncertainties as well as creating pathways to adaptation decision-making (King et al., 2015).

Connecting Existing Frameworks

The integration of CCRAs and CCA and DRR agendas is seen as a key step in dealing with the complexity associated with current and future climate variability and change, and reducing the negative impacts of extreme events. There is a growing body of literature that discusses the importance of building these linkages, especially in the context of sustainable development (e.g. UNISDR, 2015; United Nations Climate Change Secretariat, 2017). Not all areas of work in DRR and CCA overlap or should be integrated, however, both agendas have similar scope to convene diverse stakeholders across sectors and scales to strategically plan and enable action with the aim of supporting vulnerable communities. Using a socialised context-based concept of risk (Fig. 4.1) as a starting point for integration encourages an acknowledgement of the overlap of process as well as the existence of multiple feedback loops within the policy system (Fig. 4.2). It also places CCRAs as an initial focal point for CCA and DRR efforts over time.

Cohesion between operational and technical aspects is essential to ensure a robust approach to dealing with climate risks (Banwell et al., 2018; Birkmann & von Teichman, 2010; IPCC, 2018; Mastrandrea et al., 2010). Operationally, increased integration could maximise efficiency by reducing human, technical and financial resource-use across

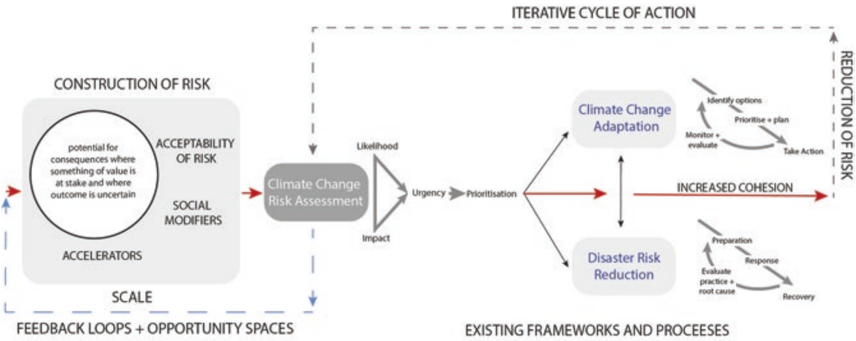

Fig. 4.2 Model of potential integration for CCRAs with DRR and CCA agendas

duplicated institutional structures and implementation efforts (Schipper & Pelling, 2006; Thomalla et al., 2006). Technical integration would enable the sharing of expertise, knowledge, lessons and tools, increasing the efficiency and effectiveness of risk reduction (Birkmann & von Teichman, 2010). However, this oversimplifies the complexity associated with integrating different assessment methods, stakeholders and timescales. Often treated as separate issues with critical disconnects between policies and efforts, these agendas are habitually centred in different departments with little or no coordination (Chmutina, Jiygasu, & Bosher, 2017; Mastrandrea et al., 2010; Papathoma-Köhle et al., 2016). While there continues to be an operational shift toward more proactive and pre-emptive approaches to DRR, it remains highly influenced by reactive emergency management practices (UNDRR, 2019; UNISDR, 2015). In contrast, CCA has typically fallen into the domain of environmental agencies and departments. At present, many countries have ministries dedicated to disaster management, but climate change is often omitted from the scope of considerations in DRR policies, plans and programmes. Similarly, at the level of implementation and action, climate scientists and adaptation practitioners often do not interact with the disaster risk community and associated humanitarian actors.

In addition, technical language and framing have played a large part in the separation over time of these agendas. Historically, the climate change adaptation community used 'vulnerability' as the frame for understanding and responding to climate change whereas disaster communities focussed on 'risk' (Forino et al., 2015; Mastrandrea et al., 2010; Roberts et al., 2015), demonstrating differences of origin in both research and practice. To enable a greater degree of harmonisation, the IPCC actively reframed its AR5 report to focus on risk (Connelly et al., 2018; Pelling, 2011). However, it must be recognised that when AR5 was published, climate change policy was based on a specialised UN convention that required global cooperation in order to function, whereas DRR was guided by an international framework but enacted at the national or subnational level (Roberts et al., 2015; Schipper & Pelling, 2006). These discrepancies in terms of language, scale, scope and legal status posed, and continue to pose, a considerable challenge to the evolution of an integrated approach to climate risk management.

A key opportunity for improving the links between DRR and CCA arose in 2015. The Sendai Framework for Disaster Risk Reduction, the Paris Agreement, the UN 2030 Agenda for Sustainable Development, and the New Urban Agenda were created as increasing attention was paid to coherence between international policies (Murray, 2014; Roberts et al., 2015). However, there are still disconnects between the agreements as well as a gap in the current conceptualisation and implementation of these conventions at scale (e.g. Stafford-Smith et al., 2017). This gap can partly be explained in the measurements of attainment for these policies (Le Tissier & Whyte, this volume).

However, there is scope for optimism with cross-cutting areas where integration, at least in theory, could occur, opening up the scope for improved cooperation alongside action. For example, the post-extreme-event reconstruction and recovery processes offer catalysts for change through climate-proofing infrastructure or improved social conditions. Attempts to use insurance incentives in post-event rebuilding through resilience bonds (Vaijhala & Rhodes, 2018), or green bonds (Gianfrate & Peri, 2019), have had limited success, although they remain in their infancy within the market. Covid-19 has seen a large swell of interest in 'building back better' strategies, although it remains to be seen how this interest will manifest itself at the national and subnational level (Clark & Gruending, 2020; Iyengar, 2020). While powerful debate still exists around who defines trajectories of 'build back better' strategies (Collodi et al., 2019; Mittul & Irina, 2019; Su & Le Dé, 2020), the use of adaptation planning and processes to increase an understanding of underlying risk and uncertainties, and address increasing vulnerability, thereby reducing the potential for maladaptation, provides an excellent potential example of CCRA, CCR and DRR integration. By employing long-term socio-technological solutions that allow improved urban planning, increased access to health care systems, sustainable investment plans and co-design/participatory societal planning, CCA and DRR agendas can create increased cohesion between pre- and post-extreme-event impacts.

Another potential avenue for connectivity includes increased understanding of the root causes of disasters and how this practice can be reframed by the no-natural disasters movement (Gould et al., 2016; Kelman, 2020; Oliver-Smith, 2002). Defining a disaster as a social construction that 'does not happen unless people and cities are vulnerable due to marginalisation, discrimination, and inequitable access to resources, knowledge and support' (Chmutina, von Meding, et al., 2017) centres both CCA and DRR on equity and social justice as well as long-term time frames with a collective outcome. This frame also recognises that the most effective way of addressing the risks posed by climate change, hazards and disasters is to lessen the underlying factors causing vulnerability (Schipper & Pelling, 2006).

Both of these examples highlight the importance of stakeholders and co-production as a key component of increased integration. Traditionally, DRR has largely been a task for local actors, with critical support from national and international organisations, particularly humanitarian action, whereas CCA is primarily driven by the 1992 UNFCCC international agreement and enacted by principal actors at the national level (Schipper & Pelling, 2006). However, increased efforts, primarily at the city-scale, through initiatives such as the Rockefeller/Global Resilient Cities initiative, have created a strong CCA focus at the subnational level (Johnson, 2018) that offers an entry point for scaled integration. Whilst city-scale CCA initiatives have created an impetus for change locally, they have also been used as an argument to justify the withdrawal of national-scale support in favour of a localism agenda (Kythreotis et al., 2020; Lobao et al., 2018). Overall, this may enable a deeper connection between all three policy spaces but reduce the effectiveness of action when considering global interdependence and broader resilience goals. Downscaling and enhancing CCA activity at local scales and broadening stakeholder engagement in CCRA efforts to increase connectivity with the DRR agenda, therefore, must not be at the expense of national-scale efforts.

Discussion/Conclusion

More and more, there is an underlying acceptance that current responses to extreme events and subsequent disaster situations will no longer be sufficient in a more variable climate where changes are already being seen across the globe. Current responses to extreme events and climate risk are not sufficient. Considerable social, ecological and biophysical impacts and losses that have both direct and indirect short- and long-term effects are being felt, especially in the most vulnerable populations. Making decisions on whether risks are acceptable and, if necessary, obtaining reliable information how those risks can be reduced for human and natural systems is a fundamental foundation for all three of the CCRA, CCA and DDR frameworks. Identifying cross-cutting frames such as equity, that can be used both as facilitators as well as benchmarks in the implementation of these agendas, can provide an important avenue for increased cohesion and connectivity to enable this necessary integration.

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