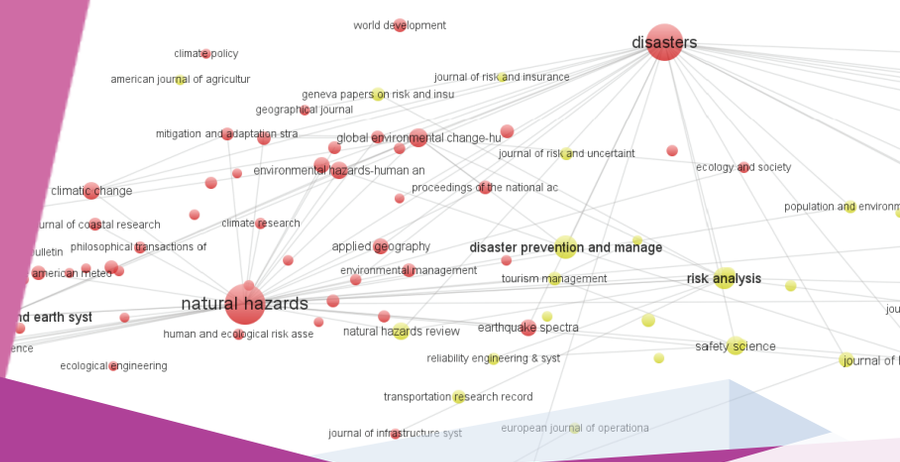
Integrated Research on Disaster Risk (IRDR)

Transformative Development and Disaster Risk Management

AIRDR Project Report No. 4



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International Centre of Excellence

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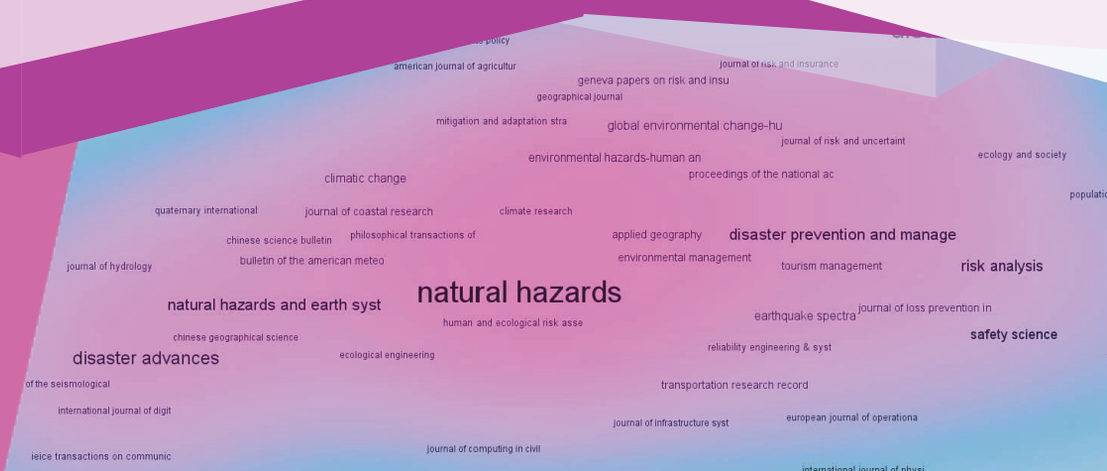
The United Nations Office for Disaster Risk Reduction



IRDR

IRDR was established by the International Council for Science (ICSU) in 2010, in co-operation with the International Social Science Council (ISSC) and the United Nations International Strategy for Disaster Reduction (UNISDR). IRDR's main legacy will be an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts. This will include a shift in focus from response–recovery towards prevention–mitigation strategies, and the building of resilience and reduction of risk through learning from experience and the avoidance of past mistakes.

This report was commissioned by UNISDR to inform the 2015 Global Assessment Report on Disaster Risk Reduction, section on the Future of Disaster Risk Management. It builds on work conducted for the IRDR Assessment of Integrated Research on Disaster Risk (IRDR AIRDR Publication No. 1).

Suggested citation: Gall, M., S. L. Cutter, and K. Nguyen (2014). *Transformative Development and Disaster Risk Management* (IRDR AIRDR Publication No. 4). Beijing: Integrated Research on Disaster Risk.

Transformative Development and Disaster Risk Management

July 2014

Contents

1. Introduction

Disasters are signs of failures—failures of preparedness, response, and recovery. Most often however, disasters are failures of long-term development and risk reduction planning. They thrive on underlying societal challenges such as inequality or poverty that Wisner et al. (2004) termed "root causes" and "unsafe conditions." The past decades have been characterised by a shift toward more proactive disaster risk management and the efforts to reduce vulnerabilities with the objective to bring about sustainably developed and resilient communities (World Bank and GFDRR 2012).

Thus far though, disaster risk reduction strategies have largely failed to achieve this goal. Despite efforts such as the Hyogo Framework for Action (HFA) and a scientifically deeper understanding of vulnerability, losses continue to rise (White et al. 2001; Wirtz et al. 2014). Sustainable development remains elusive (Dittmar 2014) with vulnerable populations and economic assets continuing to be placed into hazardous areas. This is concerning and exposes the gap between risk reduction knowledge and, particularly in regards to informing and shaping sustainable community development (O'Brien 2013; Schipper and Pelling 2006).

The significance of disaster risk reduction for sustainable development planning has gained renewed interest given the importance of disaster risk reduction for climate change adaptation. Disaster risk reduction as a pathway towards sustainable development reverberates in a special report issued by the IPCC on this topic. In this report, O'Brien et al. (2012) refer to the ability of disaster risk management to alter existing development trajectories as *transformation*, which "involve[s] fundamental changes in the attributes of a system, including value systems; regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biophysical systems" (O'Brien et al. 2012, 441). Transformation occurs as society learns. This learning includes building partnerships, which helps to increase local capacity and contribute to institutional change. This in turn allows society to continually move from vulnerability, adaptation and development to resilience (Figure 1).

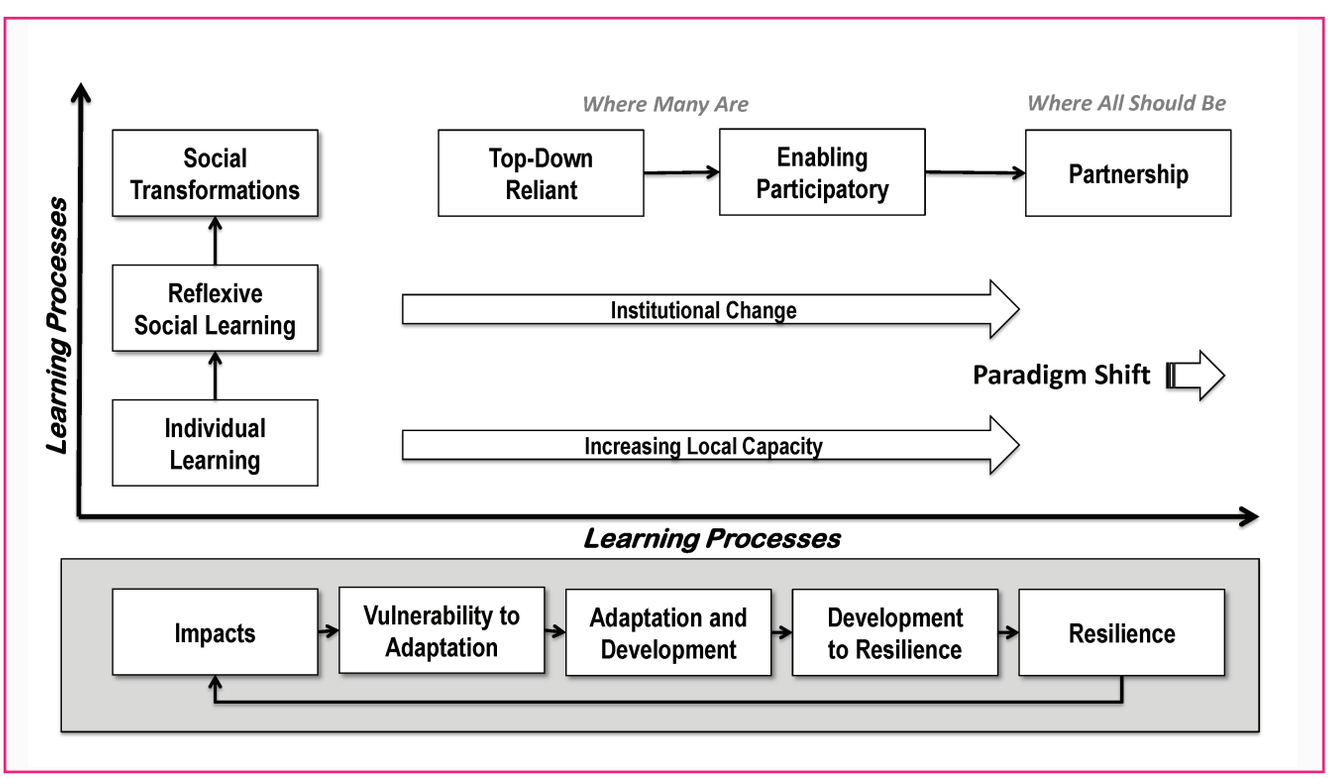


Figure 1: **O'Brien et al. (2011) propose an adaptation continuum toward resilience (which results in lower impacts) driven by organisational and social learning, increased local capacity and participation.**

The concept of transformation originated in the human dimensions of global change discourse and centred on the transformation of settlement patterns, technology, communications, economies and energy (Grunwald 2014), and the resultant human impact. The notion of large-scale transitions in these systems as a requirement for sustainability was initially explored not only in the Bruntland Report (World Commission on Environment and Development 1987), but also more forcefully articulated in a U.S. National Research Council report, *Our Common Journey* (1999), and more recently in the United Nations Development Programme (UNDP) report, *Supporting Transformational Change* (2011), and the Intergovernmental Panel on Climate Change (IPCC) report, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (2012).

In light of the connection between development and disaster risk reduction, it is important to explore what constitutes transformative disaster risk management. This literature review summarises our current scientific knowledge on the emerging field of transformative disaster risk management: what we know about the relationship between disaster risk management and development; how it has evolved over the past years; and where the research gaps are in our present knowledge. This overview builds on the efforts by the IRDR working group on the Assessment of Integrated Research on Disaster Risk (AIRDR) to provide the science-based evidence for the development of the post-2015 framework for disaster risk reduction (http://irdrinternational.org).

Five key policy questions are addressed in this review:

- How does transformation relate conceptually to research on vulnerability and resilience?
- What areas of disaster risk reduction have the potential to transform development?
- Do incremental steps of improved disaster risk management lead to transformed policy and practice?
- What are concrete development benefits of transformative disaster risk management?
- How can progress in disaster risk reduction and development be measured?

2. Methods

This literature review summarises the current state of research based on original studies published in peer-reviewed journals. Its methodology replicates the approach developed by the IRDR AIRDR working group (Gall, Nguyen, et al. 2014). The original AIRDR database contains 1,060 peer-reviewed, academic, English-language journal articles culled from 39 journals published between 1999 and 2013. For the purpose of this review, a subset of 63 transformation-related articles within the AIRDR database were supplemented with 182 additional articles based on a keyword search (Table 1) utilising the academic citation indexing and search service *Web of Science*. See the *Annex* for a complete listing of all reviewed publications.

Table 1: **Search terms used in Web of Science to identify additional transformation-related peer-reviewed journal publications.**

Search Strings	
Disaster & development	Disaster & economic benefits
Disaster risk reduction & climate change adaptation	Disaster & economic stability
Disaster risk reduction & sustainability	Disaster & economic growth
Disaster & future growth	Disaster & economic costs
Disaster & transforma*	Disaster & economic sectors
Disaster & equity	Disaster & GDP
Disaster & externalities	

*includes all derivatives of the word stem such as transformation, transformative, and so forth.

By using this combined approach it was possible to minimise two biases: focusing solely on indexed journals and analysing only journals that publish specifically on disaster risk. Some challenges remain and could not be overcome. Those are the exclusion of monographs, edited books, grey literature and non-English language publications. Books, reports, and so forth were excluded because a) the quality of the peer-review process is not transparent, and b) the review and classification criteria (see below) could not be transferred. Furthermore, research on war or civil unrest, technological hazards (e.g., oil spills, nuclear accidents), climate (e.g., carbon dioxide concentration, El Niño), and diseases (e.g., HIV/AIDS, malaria) were also excluded to keep the focus on natural hazards.

The methodology and literature analytics involved content and cluster analysis. The goal was to identify key topics, study areas, methodological approaches, authorship, and changes in publication output over time. To do so, each article was reviewed and classified based on: study area, number of authors, authors' disciplinary backgrounds, number of disciplines, authors' countries of affiliation, and the type of research partnership (e.g., academic, academic-governmental). Information on disciplinary background and type of partnership was confirmed through internet research. In addition, publication content was reviewed and classified using keywords capturing research topic, hazard type, major disasters and methodology. A publication's original keywords were dismissed to ensure uniform classification across all works by the research team.

A word count analysis (based on stemmed words, e.g. government, govern, governance) was performed on the full texts of all 245 publications to identify central themes in research on disaster governance (see cover for visual of word cloud). To group and classify similar research, publications were coded using 50 keywords derived from the initial content analysis as well as the word count analysis. Subsequent cluster analyses on these coded publications provided the quantitative results (Pearson correlation coefficient) resulting in grouping the publications into prevalent knowledge domains on transformative disaster risk reduction discussed in the results section. All content

analysis was performed in EndNote X5 and NVivo 10.

To set the findings into a broader context, additional literature was cited in the background paper but did not undergo the rigorous methodological steps outlined above. These references are included in the reference section of the report. To reiterate, all reviewed publications upon which the results are based are found in the *Annex* section.

The results section is divided into three central research themes that emerged from the reviewed literature. Each research theme—called a knowledge cluster—begins with a brief summary of the current state of knowledge and then moves to remaining challenges within the specific research domain. The results section concludes with knowledge gaps and systemic shortcomings in transformative disaster risk reduction research.

3. Results

While increasingly pervasive in the development and sustainability literature, the concept and term *transformation* are additions to the vocabulary of disaster risk reduction. The Hyogo Framework for Action makes no mention of transformation and the term is also not (yet) included in the UNISDR terminology on disaster risk reduction (see http://www.unisdr.org/we/inform/terminology), but does appear in the IPCC (2012) report. Consequently, most of the research reviewed in this background paper draws on research conducted on climate change adaptation, vulnerability and resilience, where the idea of transformation has more currency rather than explicit transformative disaster risk reduction work.

As Figure 2 shows, publications on transformation-related disaster risk reduction research have significantly increased in recent years. The primary focus remains largely at a conceptual level and is driven by theoretical discussions surrounding drivers (e.g., social learning) and elements of change (e.g., participation and mainstreaming). Research regarding assessments as well as conceptual frameworks on vulnerability and resilience are also of significance. It is important to point out that research on bottom-up approaches, new partnerships, accountability and participation is applicable to transformative disaster risk reduction as well as disaster governance. Although we attempted to avoid repeating information provided in the background paper on disaster governance (Gall, Cutter, et al. 2014a), some key concerns were revisited to highlight linkages.

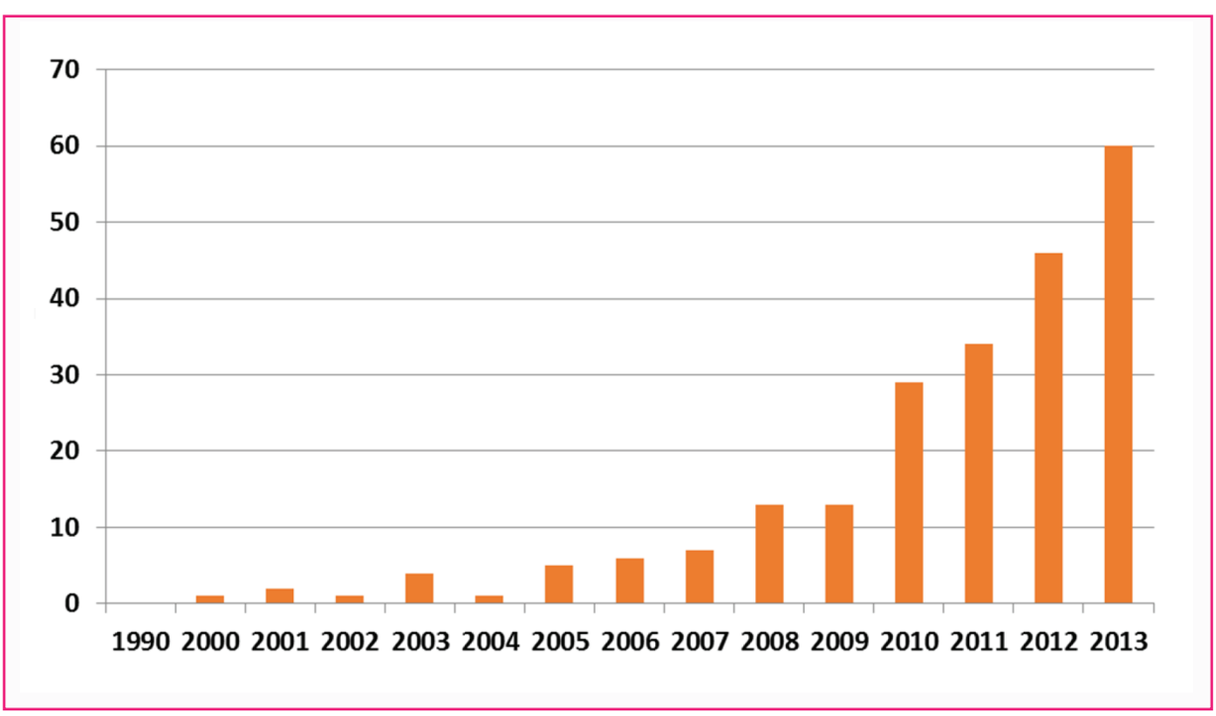


Figure 2: **The number of peer-reviewed, transformation-related journal publications per year shows a significant upward trend.**

Broadly speaking, there are three research clusters constituting the current knowledge on transformative disaster risk management: 1) drivers of transformation; 2) technical and adaptive elements of social learning (e.g. participation, representation, and integration); and 3) case studies of transition. These will be explained in more detail in the following sections.

Knowledge Clusters

1. Transformation Drivers: Vulnerability, Resilience and Social Learning

What is Known

Conceptually, much of the research addresses the initial drivers of transformation, especially vulnerability, resilience and social learning. This is not surprising given that in the adaptation continuum (O'Brien et al., 2011) vulnerability reduction, effective adaptation and higher resilience are pathways toward transformation. For example, when viewing transformation from a social-ecological resilience framework (Gunderson and Holling 2002) systems are deemed flexible and have the ability to self-organise and adapt within a set of critical thresholds. On occasions, a disturbance of the system may be large enough that a threshold is surpassed and, instead of returning to the pre-event equilibrium (status quo), the system is transformed and settles into a new development trajectory. Transformation can occur deliberately (so-called active transformation) or involuntarily (so-called forced transformation) (Folke et al. 2010). In the context of disaster risk reduction, transformation means a "reform in over-arching political-economy regimes and associated cultural discourses on development, security, and risk" (Pelling 2010, 50).

Making communities resilient is often interpreted as making them resistant to disasters and allowing them to functionally persist, meaning the system continuously returns to the pre-event state (often called engineering resilience) (Holling 1996). In such instances, the goal is a return to pre-disaster conditions as quickly as possible by limiting damage and losses. At present, this interpretation of resilience dominates—an interpretation that conceptually excludes the idea of transformation. Engineering resilience is characterised by traditional measures of disaster risk management such as hardening of infrastructure or reducing the failure probability of engineering designs (Cimellaro et al. 2010; Prevatt et al. 2010). Other loss reducing activities are educational campaigns, stronger building codes, wetland and barrier island restoration or the construction of early warning systems (Chapin et al. 2010). Such activities are considered adaptive; they are not transformative.

Another driver of resilient systems is the ability to learn from past failures and promote new adaptive solutions (IPCC 2012). Examples of social learning are the emergence of disaster governance with its collaborative, multi-party and multi-level platforms (Gall et al. 2014a), the use of scenarios and simulations to model and explore possible consequences (Choi and Fisher 2003; Easterling et al. 2000; Hallegatte and Dumas 2009); as well as adaptive actions/policies (Hyslop and Collins 2013; Ikefuji and Horii 2012; Pindyck and Wang 2013) or the development of publicly accessible information systems to educate and build trust across all stakeholders (Chapin et al. 2010; Troy et al. 2008). Social learning about the potential hazards in a community along with understanding those populations most at risk is the central contribution made by vulnerability science. Vulnerability assessments quantitatively or qualitatively connect the physical vulnerability, i.e. exposure of people and the things they value, with the social and economic characteristics of the exposed (Bloomer 2004; Stanga and Grozavu 2012; Sutanta et al. 2013; Wei et al. 2004). This knowledge has contributed to improved emergency planning by bringing vulnerable populations and their needs to the forefront of concerns. Children, the elderly, the poor or people with medical needs, among others, are now considered explicitly in emergency plans, educational campaigns, resource allocation and more (Bonvicini et al. 2012; Cutter and Finch 2008; Pascale et al. 2010).

Remaining Challenges

Existing knowledge on vulnerability and resilience, especially produced by vulnerability assessments, is often not used to inform development decision-making. For example, vulnerability assessments are generally spatial in nature and offer critical information for better land use planning and zoning, crucial tools in reducing exposure by avoiding the development of hazardous areas in the first place (Ahammad 2011; Becken and Hughey 2013; Hutton and Haque 2003). However, vulnerability assessments or broader disaster risk reduction strategies are generally not

integrated into local or national land use planning (Guo 2012; Mahany and Keim 2012; Wamsler 2006). As a result, risk reduction considerations are neither a priority nor a requirement for development planning in many communities. When competing with societal goals such as job creation, affordable housing, improved infrastructure and more, these economic, political and societal objectives tend to out-compete risk concerns. As a result, community planners are unaware of the vulnerabilities or maladaptation they create by allowing development that ultimately increases exposure. While land use planning has transformative potential in shaping the social and economic development of a community, the lack of integrated land use planning circumvents more sustainable development. In order for land use planning to become a transformative tool, planners must be trained and educated (i.e., increase local planning capacity) and community leaders must be held accountable for reckless development decisions (Gero et al. 2011; Ginige et al. 2010), or what Burby (2006) calls the local government development paradox.

Furthermore, vulnerability research continuously identifies systemic challenges to disaster risk reduction, such as poverty, economic inequality and alienation among others (Becken et al. 2014; Gaillard et al. 2013; Tschakert et al. 2013; Wisner et al. 2004). These are widespread and pervasive issues in today's societies—both rich and poor—and are normally viewed as outside the remit of disaster risk reduction, despite the fact that they are driving factors of vulnerability. It is generally presumed that remedying these underlying causes of vulnerability will reduce vulnerability. However, such an assumption is premature and without substantive empirical support at present. For example, reducing poverty measured as increase in GDP is unlikely to automatically translate into lower vulnerability. While the connection between vulnerability and poverty reduction seem obvious, there is limited empirical evidence on the conflicts as well as synergies between disaster risk reduction and millennium development goals/sustainable development goals and additional research is needed (Cannon and Müller-Mahn 2010; Klein et al. 2007; Lei et al. 2014).

2. Technical and Adaptive Elements of Social Learning: Participation, Representation and Integration

What is Known

Disaster risk reduction transforms existing development strategies through participation, representation, and integration. Research and practice has shown that a top-down, emergency-centric approach is only marginally successful when it comes to risk reduction, advocating instead that more participatory approaches are needed (IPCC 2012; UNISDR 2005; UNISDR 2011). In order for disaster risk reduction to realise its transformative potential it has to be integrated into all aspects: communities, governance, planning and development, among others.

Disaster governance has emerged in recent years as an avenue for transformative disaster risk reduction due to its call for broader participation and better representation of stakeholders (Ammann et al. 2006; Johnson and Mamula-Seadon 2014; Pelling 2011; Renn 2008). Disaster governance encourages collective actions and expands the stakeholder coalition (e.g., governmental, private businesses, non-governmental entities, academia) across all scales—from local to global. In addition, disaster governance aims at re-organising government functions (e.g., administrative, managerial, regulatory) across a variety of state and non-state actors to facilitate vertical as well as horizontal disaster risk management and to foster and increase local capacities, establish trust and enhance cooperation (Boyer-Villemaire et al. 2014; Chen et al. 2013; Tompkins et al. 2008). Thus, good disaster governance is a key contributor to social learning and institutional change (Figure 1). For more information on governance and disaster risk management see Gall, Cutter, et al. (2014a).

The research focus on disaster governance as a vehicle for transformation is paralleled by research on the integration—also called mainstreaming—of disaster risk management into development planning. Despite repeated and long-standing calls for such mainstreaming (Ireland 2010; World Bank and GFDRR 2012) to avoid maladaptation and the unintentional creation of vulnerabilities (Schipper 2009), success stories and effective integration are spotty (Dittmar 2014). Most of the research discussing integration of disaster risk reduction and planning focuses on poverty reduction (Ahammad 2011; Chuku 2010; Dasgupta and Baschieri 2010; Davies et al. 2008), diversification of livelihoods (Cinner and Bodin 2010; Ketlhoilwe 2013; Pouliotte et al. 2009), and improvements to infrastructure such as housing (Boano and Garcia 2011; Kiunsi 2013; Wang 2014).

Remaining Challenges

Conclusive empirical evidence of the benefits (and subsequently transformative capacity) of disaster governance is lacking (Gall, Cutter, et al. 2014a). Good disaster governance requires a delicate balance between engaging and empowering non-governmental stakeholders and building local capacities without "hollowing out of the state" or "glocalization" (Gaillard and Mercer 2012; Swyngedouw 1997). Despite the lack of expertise, capacity and resources in many governments, the fear of loss of power is a key determinant in blocking or constraining change/transformation (Djalante 2012; Pelling and Manuel-Navarrete 2011).

Aside from engrained government powers and structures, the generation and use of knowledge is an additional obstacle to social learning and therefore transformative disaster risk reduction (Vogel et al. 2007). Experts and expert knowledge dominate disaster governance platforms as well as public-private partnerships. Research exists that points to the difficulties of implementing expert solutions, which often lack an understanding of local knowledge and culture (Mercer et al. 2012). However, some research promises that the gap between expert and local knowledge can be bridged by participatory strategies (Gaillard et al. 2013; Gaillard and Mercer 2013).

As mentioned earlier, not every improvement to the vulnerability, resilience or social learning result in disaster risk reduction (Eriksen et al. 2011). There is a lack of understanding about causality but also in comprehending complex systems and the fundamental differences between disaster risk reduction and climate change adaptation (Collier et al. 2009). Studying the transformative character of disaster risk reduction on development pathways equates to research on a sub-set of external shocks to the social-ecological system. Focusing solely on a sub-set of risks (e.g., natural hazards) and aiming to improve the resilience of this sub-system, rather than the resilience of the entire socio-ecological system, may enhance the former but weaken the resilience of the latter (Carpenter et al. 2001). Thus, transformation through disaster risk reduction needs to be examined in a broader context such as climate change or sustainable development. To do so the synergies, conflicts and feedbacks between disaster risk reduction, climate change adaptation and sustainable development require further investigation. Some research exist that points to differences in the value system, knowledge as well as spatial and temporal scales (Birkmann and Teichman 2010; Lei and Wang 2014; Mercer 2010; Romieu et al. 2010; Thomalla et al. 2006).

3. Case Studies on Transition

What is Known

Mainstreaming disaster risk reduction is not solely a consideration for governmental planning. Resilience and social transformation can only be achieved when everyone including businesses and non-governmental entities, harmonise their development strategies with disaster risk reduction strategies. For example, non-governmental organisations active in humanitarian assistance (Innocenti and Albrito 2011) and development work have long advocated for integrated disaster risk reduction into their activities (Christoplos et al. 2001; Wamsler 2006; World Bank and GFDRR 2012).

In contrast, disaster risk considerations enter the for-profit world only in business continuity planning (Hyslop and Collins 2013; Parape et al. 2013), which is adaptive but not transformative planning. At present, adverse effects to the bottom-line and profitability are forcing some economic sectors in select locations into transformative behavior. Those sectors are agriculture (Esham and Garforth 2013) and tourism (Scott et al. 2011). In areas susceptible to disasters and climate change, their adverse impacts directly threaten the livelihoods of people and businesses engaged in agriculture and tourism. It is therefore not surprising that these economic sectors are at the leading edge of transformation.

Transformation is a process. Part of this process are incremental steps—termed transition (Folke et al. 2010; Pelling 2010)—toward transformative disaster risk reduction. Transitions in the agricultural and tourism sectors are largely induced by changes in water availability (e.g., droughts, floods, reduction in snow cover), saltwater intrusion due to sea-level rise, shifting cultivation seasons, new pests and diseases as well as (coastal) erosion. At present the majority of research discusses the adverse effects of disasters and future challenges faced by those sectors such as the need for livelihood diversification, private sector investments into adaption, and even migration (Adler et al. 2013; Banerjee 2007; Becken et al. 2014; Bronen and Chapin 2013; Eakin and Appendini 2008; Han and Kasperson 2011; Larsen et al. 2011; Turton et al. 2010). Some research exists on innovative solutions such as crop insurance, crop diversification, new crop varieties resistant to droughts, diseases, or salinity, and agroforestry (land use of crops or livestock with shrubs and forest) to improve soil moisture, nutrient content and/or reduce landslide risk combined with water (e.g., rainwater harvesting, grey water use) and fertiliser (e.g., bio-pesticides, manure) conservation techniques (Biggs et al. 2013; Esham and Garforth 2013; Ibarra and Skees 2007). Examples of adaptive transitions in the tourism industry are the use of climate services (Scott et al. 2011), environmental conservation and protection, diversification to year-round tourism, hardening of infrastructure and shorelines, as well as new technologies, for example, for snowmaking (Hopkins 2014; Morrison and Pickering 2013).

The use of a common property resource, i.e. water, and the need to preserve and distribute it fairly, forces stakeholders to address the problem collectively. It is such local connectedness in either formal (e.g., through cooperatives) or informal settings where local knowledge, networks, social capital, and good governance thrive in shaping local production and management practices (Biggs et al. 2013; Esham and Garforth 2013).

Remaining Challenges

The adaptive strategies employed in the agricultural and tourism sectors represent small, incremental and conservative steps without an overarching guiding strategy to transformation. As a result, stakeholders can easily find themselves in a position characterised by competing and conflicting interests such as water use for snowmaking vs. water conservation. Such an "experimentation" approach is ill-suited for strengthening livelihoods in the short or long terms. Additional financial support and training are necessary to explore and develop truly innovative but culturally sensitive techniques and solutions (Biggs et al. 2013). Adaptation strategies that involve complex technological and resource-intensive solutions require long-term maintenance and management strategies to avoid mismanagement and disrepair (Eriksen et al. 2011).

4. Knowledge Gaps

1. Learning Processes

Beyond the context of disaster governance, there is limited, explicit research on learning processes in disaster risk reduction (Amundsen 2012; Bierbaum et al. 2012; Eriksen et al. 2009), especially the processes leading to institutional change and social transformations (Figure 1). More than a decade ago, White et al. (2001) pointed out that our knowledge in disaster risk management has increased drastically though losses continue to rise exponentially. Both of these trends have continued: scientific knowledge has expanded both vertically and horizontally while losses have skyrocketed. Thus, we know more but have either learned little, failed to apply lessons learned, were ineffective or were not able keep up with global changes elsewhere. In their critique, White et al. (2001) raised five questions that are still pertinent today and could, if answered, move transformative research forward.

1. "To what extent is it that knowledge is lacking and that management of natural hazards continues to be flawed by significant areas of ignorance?
2. To what extent is it that knowledge is available but not used?
3. To what extent is it that knowledge is used, but in an ineffective manner and even with results contrary to those planned or expected?
4. To what extent is it that knowledge is available; is used effectively, but that it simply takes time for knowledge to be applied and take effect?
5. To what extent is it that knowledge is available; is used effectively; and produces positive results, but that the best efforts have simply been overwhelmed by the scale and speed of the processes that lead to the increase in vulnerability for some people and places through population growth, economic expansion, and greater material wealth and through greater poverty and lack of empowerment elsewhere?" (White et al. 2001, 89).

2. Thresholds and Limits of Disaster Risk Reduction

There is a lack of knowledge and empirical evidence on thresholds to adaptation and disaster risk reduction. Much is known about tipping points, regime shifts and transformations in nature (Biggs et al. 2009; Scheffer 2009), but a similar understanding of the boundaries of the social system is absent (Alexander 2013). Some even argue that conventional assessment approaches are not equipped to capture these system dynamics adequately and instead call for new methodologies, which, for example, consider transformation barriers as well as social learning (Tschakert et al. 2013). Thus, our present knowledge is unlikely to enable monitoring or detection of transformation or regime shifts in community resilience.

The problem is aggravated by limitations of data availability and quality capturing vulnerability and resilience. Static baseline assessments or temporal snap-shots of community resilience or community vulnerability are a common tool in disaster risk reduction research and practice (Gaillard and Mercer 2013). In the absence of assessment standards, the underlying methodologies vary widely ranging from participatory approaches and interviews to sophisticated computational modeling (Preston et al. 2011; Tschakert et al. 2013). The accuracy of any resilience or vulnerability assessments depends on the quality of the selected indicators as well as their representativeness (Gall et al. 2014b). Moreover, measures must be sensitive enough to detect change and to track change in resilience or vulnerability, thus indicators must be frequently collected. This, however, is a major obstacle since most vulnerability assessments rely on census data, which are generally collected every 10 years or more. Thus, monitoring change (system transition) induced by disaster risk reduction efforts or evaluating adaptation strategies is challenging if not impossible (Bierbaum et al. 2012; Chapin et al. 2010). This data issue cuts across multiple themes of disaster risk reduction such as disaster governance, and applies to many progress/evaluation measures in disaster risk

reduction.

3. Incentives, Barriers and Power Structures

Transformative disaster risk reduction and climate change adaptation is not necessarily in the interest of powerful stakeholders since it challenges the practice (and winners) of development (Cannon and Müller-Mahn 2010). Pelling (2014, 4) notes that "transformation has threatening and awkward connotations for the status-quo" because it challenges engrained policies, practices, institutions and governments. The consequence is that social systems are less amenable to rapid change and somewhat locked-in (Han and Kasperson 2011; Pelling and Manuel-Navarrete 2011). For example, Pelling and Manuel-Navarette (2011, 1) found in a case study on two coastal communities in Mexico that "a set of reinforcing institutions and actions […] support the status quo while simultaneously undermining long-term flexibility, equitable and sustainable development."

Furthermore, initiating deliberate transformation appears risky because the outcomes and benefits cannot be predicted with certainty. Who will engage voluntarily in a radical transformation of existing development trajectories without knowing the end game and why? Some research predicts that engagement is possible when current conditions are persistently undesirable, and more desirable alternatives exist (Amundsen 2012; O'Brien 2012). However, unacceptability of the existing state or desirability means different things to different people, particularly powerful stakeholders. According to Pelling and Manuel-Navarette (2011, 2) "understanding how power is held and used is key to understanding how transformation is blocked or may be facilitated." In other words who will be the winners and losers of transformative disaster risk reduction and new development pathways (O'Brien and Leichenko 2003)?

4. Systemic Shortcomings in Transformative Disaster Risk Reduction Research

The focus on drivers of transformative disaster research is mirrored in the authorship of the 245 analysed journal articles (Appendix). The disciplines of geography, environmental studies, planning and development, economics and engineering dominate the research landscape (Figure 3)—similar to research on disaster governance (Gall, Cutter, et al. 2014a) and incentives in disaster risk management (Gall, Cutter, et al. 2014b). These disciplines engage predominately in assessing resilience and vulnerability and modeling impacts. Disciplines that could contribute knowledge on sector-specific transformation (e.g., business administration) or organisational and institutional learning (e.g., sociology, psychology) are far less involved. Surprisingly there are low numbers of sociologists, political scientists or public administration academics investigating innovative or transformative aspects of disaster risk management. Engaging these disciplines and striking collaborations between, for example, planning and public administration, is critical to understanding the gap between knowledge and action/implementation.

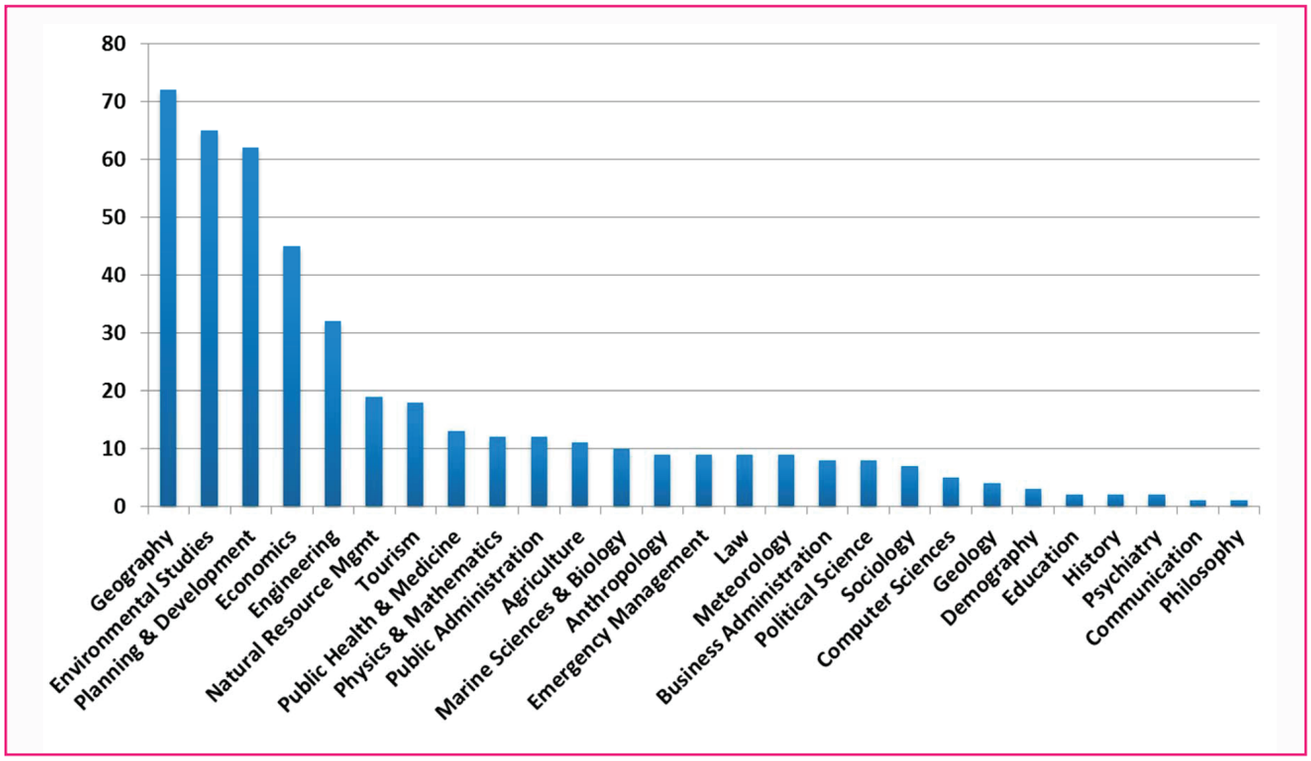


Figure 3: **Disciplinary engagement in research on transformative disaster risk reduction.**

In addition, out of the 245 analysed publications, the majority of the research was either theoretical/conceptual in nature (n=109) or focused on Asian countries and countries with past disaster failures or future climate adaptation challenges (Figure 4). This reflects the infancy of this new topic in disaster risk management. In addition, research on transformative approaches to disaster risk management in richer nations is largely absent with the exception of the U.S. and Australia. While research on incremental steps on the transformative capacity of disaster risk management and its implication for economic and social development is emerging, "radical" interventions or approaches are missing.

This may be due to the fact that disaster risk reduction or climate adaptation planning is generally not integrated with other planning activities or other issues at local, regional or national levels. It is therefore imperative to create research capacity as well as research partnerships to investigate the effectiveness of transformative disaster risk management to trigger change and social learning.

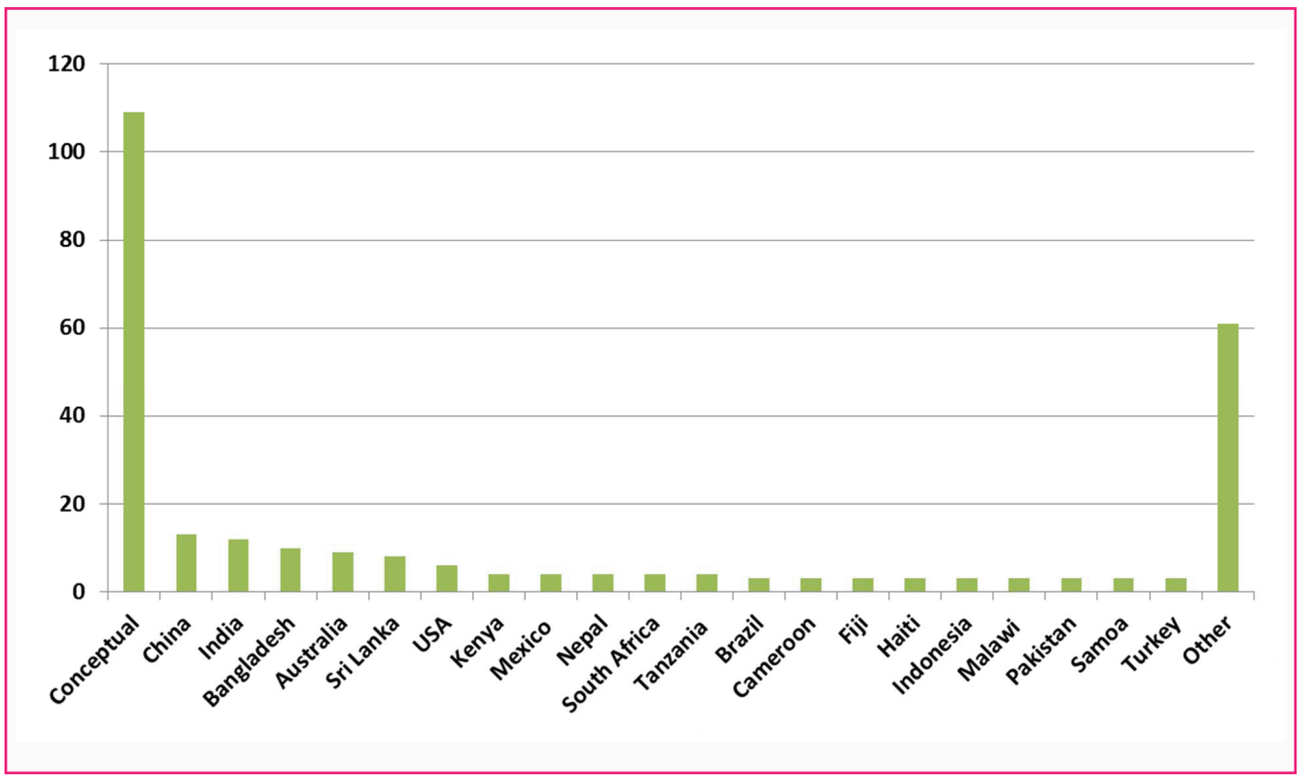


Figure 4: **Research related to transformative disaster risk reduction is largely conceptual in nature.**

Conclusion

Although knowledge on vulnerability, adaptation and resilience has expanded significantly in recent years, a rift between knowledge and action/change persists. In fact, the combined effects of transformation barriers such as institutional structures that resist learning, lack of accountability, and rising vulnerabilities continue to thwart efforts for new ways to reduce the excessive disaster losses especially among the most vulnerable.

Transformative development and disaster risk reduction needs actionable research. However, transforming the status quo of development approaches and objectives is a tall order for disaster risk management, particularly in the absence of any measurable and significant progress toward sustainable development over the past decades (Dittmar 2014). Some argue that existing power relations have blocked a transformation of development over the past 40 years and that disaster risk reduction and climate change adaptation efforts should learn from these experiences (Cannon and Müller-Mahn 2010). Although disaster risk management has transformative potential, it is presently unclear what such a transformation should look like. What is the future direction or state that is desirable and for whom?

Thus far, observed transitions in, for example, the agricultural and tourism sectors are the product of forced transition and immediate threats to livelihoods. Incremental steps tend to be conservative. Comprehensive and radical transformations in high-risk areas such as coastal zones are missing and, as a result, conflicting and competing adaptation strategies are omnipresent. Surprising is the lack of research on transformative efforts in rich countries, which should be well-resourced to develop innovative solutions. Notable exceptions are countries such as The Netherlands where transition management is part of a broader climate mitigation policy rather than disaster risk reduction (Rotmans et al. 2001; Smith and Kern 2009).

In order for transformation not to become the next buzzword, there must be some caution against the diminution of the term *transformation* in the context of disaster risk management by undermining its "radical potential" (Pelling 2014). However, maintaining an idealistic notion of *transformation* as radical change may exceed practicality and overstate what transformative disaster risk reduction can truly achieve. Shove (2010) even questions the suitability of social sciences research in tackling these issues given their focus on what she calls "the paradigm of 'ABC'—attitude, behaviour, and choice." Instead she advocates societal innovation and fundamental social changes.

What is needed are honest and comprehensive assessments providing concrete evidence of the capacity and advancements in disaster risk reduction at all scales to determine the current status along the adaptation continuum and the feasible progress toward transformation. The necessity is clear, but the barriers may be difficult to overcome.

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About IRDR

Over recent decades, our knowledge and understanding of natural hazards has grown rapidly. Scientists can now characterise more accurately the possible magnitude of hazard events and can better estimate their probability; and forecasting capacity has significantly improved especially for weather-related events. Far more is now also known about the socio-economic dimensions of disasters, such as exposure and vulnerability, conditions for resilience, and the causal links between disasters, development paths and other factors that determine the scope and distribution of losses.

Despite this growth in knowledge, losses associated with environmental hazards have risen dramatically with hundreds of thousands of people killed and millions injured, affected or displaced each year because of disasters. Also the value of property damage has been doubling about every seven years over the past 40 years, with spectacular increases witnessed in the 2000s.

Recognising the related science needs, the International Council for Science (ICSU), the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UNISDR)—the programme's Co-Sponsors—created "Integrated Research on Disaster Risk" (IRDR) as a global, trans-disciplinary and intersectoral research programme to address the major challenges of natural and human-induced environmental hazards. The complexity of the task is such that it requires the full integration of research expertise from the natural, socio-economic, health, engineering and cultural sciences, encompassing also areas of inquiry and practice such as policy-making, the role of communications, and public and political perceptions of and responses to risk.

Three research and action objectives have been suggested for the programme:

1. Characterising hazards, vulnerability and risk.
2. Understanding decision-making in complex and changing risk contexts.
3. Reducing risk and curbing losses through knowledge-based actions.

Three cross-cutting themes support IRDR's work towards these objectives:

1. Building capacity, including mapping capacity distribution, for disaster risk reduction at different levels and across multiple hazards.
2. Development and compilation of case studies and demonstration projects.
3. Advancing assessment, data, and monitoring tools of hazards, risks and disasters

It is envisaged that a successful programme will lead to a better understanding of hazards, vulnerability and risk; an enhanced capacity to interpret and deal with disaster risk; improved insights into decision-making that may increase risk exposure, as well as how such choices may be influenced; and proposals for how new knowledge can more effectively guide disaster risk reduction efforts at all levels.

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