

# Chapter 4

## Governing Cross-Border Effects of Disasters in Urbanising Asia: What Do We Know?

Matthias Garschagen

### 4.1 Introduction

Most people working in the field of disaster risk reduction would probably agree that cross-border effects of disasters are of great importance when wanting to understand disasters, their impacts and the responses to them. A number of recent examples such as the 2011 floods in Bangkok or the Tohoku earthquake and tsunami served as a strong reminder that disasters and their impacts are often not contained by national or other jurisdictional boundaries. Firstly, bio-physical hazards such as floods, heat waves, tsunamis or earthquakes show little respect for such boundaries and frequently transcend them. Secondly, even if floods, earthquakes or other hazards strike only within a particular country, they in most cases lead to impacts that are felt far beyond the boundaries of that particular country. This is due to the strong regional and global integration of economies, which are today linked through a complex web of trade, production, migration, travel, information exchange and many other factors. Such linkages materialise particularly in the nodal points of these integrated systems, i.e. in cities which function as hubs of trade, production, mobility, information exchange and decision-making.

In fact, it seems likely that the potential for cross-border disaster and/or disaster which at least has strong cross-border effects will continue to rise over the next years and decades. It is particularly driven by the confluence of three megatrends. First, there is a continuing, probably even intensifying, regional integration and globalisation of economic production, trade, human mobility, infrastructure dependency and information flows. The Asia-Pacific is a particularly dynamic region in this respect, as indicated, for instance, by the current negotiations on a new Trans-Pacific Free Trade Agreement. Secondly, there is a strong ongoing urbanisation, particularly in Asia, leading to a further concentration of services and economic

---

M. Garschagen (✉)

United Nations University – Institute for Environment and Human Security (UNU-EHS),  
Bonn, Nordrhein-Westfalen, Germany

e-mail: [garschagen@ehs.unu.edu](mailto:garschagen@ehs.unu.edu)

activity—in effect making the above-indicated nodal points even thicker and more important, yet also more prone to causing wider system disturbance. Thirdly, disaster risk is driven by environmental change and particularly climate change, which is expected to increase the frequency, intensity and reach of many of the existing natural hazards, particularly in the Asia-Pacific Region which is prone to hydro-meteorological hazards including typhoons, floods and droughts (Intergovernmental Panel on Climate Change [IPCC] 2012).

As a result of these convoluting risk factors and the increasingly connected disaster risk, there will be an equally increased need for improving transboundary disaster risk governance.<sup>1</sup> There will be a need not only for transboundary disaster response, but also for reducing risk in a preventive manner and reducing the vulnerabilities within integrated cross-border systems of social and economic activity.

Neither the acknowledgement of cross-border disaster impacts nor the recognition of transboundary risk governance is entirely new. However, the chain of recent disasters in the Asia-Pacific region as well as the outlook of increased cross-boundary disaster risk call for a thorough stock-taking of the engagement with cross-boundary disasters that can be observed hitherto. The paper therefore aims at reviewing and analysing the state of knowledge on cross-boundary effects of disasters and their governance. The paper will focus particularly on Asia and the Pacific and will pay special attention to the role of urbanisation.

Four fields of information will be covered. Firstly, peer-reviewed scientific publications on the topic will be reviewed, contributing the main pillar of the analysis. Secondly, grey literature is analysed, mainly covering reports by international organisations such as UN-ESCAP as well as NGOs and other civil society organisations. Thirdly, the main global providers of secondary statistical data on disasters are considered and analysed for their relevance and capacity to inform about cross-boundary disasters. Fourthly, key international agreements in the post-2015 agenda are examined for their provisions on cross-border disaster risk governance. The detailed steps but also limits of this methodology are discussed in the individual chapters below. Within the boundaries of this analysis, the paper concludes by synthesising the key achievements that have been made to date but also develops a list of pressing knowledge gaps and research needs.

---

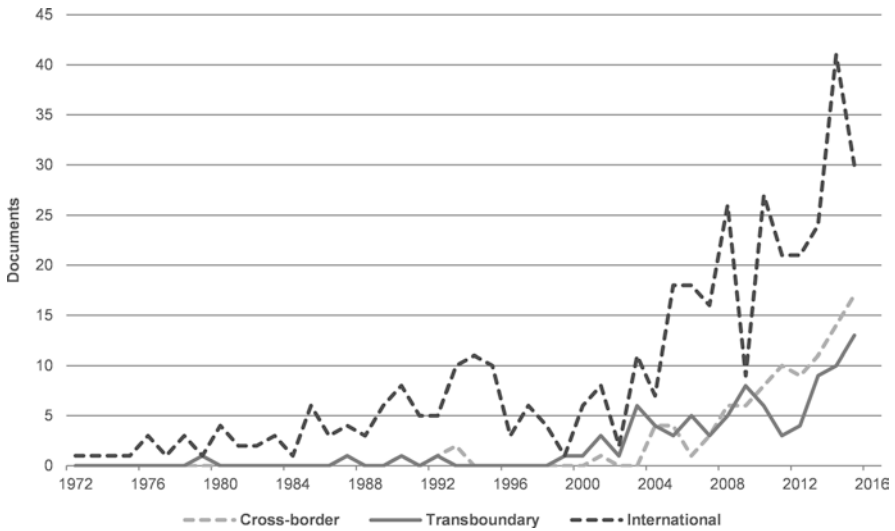
<sup>1</sup>The terms ‘risk management’ and ‘risk governance’ are both used in the literature depending on the context and focus. While ‘risk management’ typically implies a notion of the technocratic manageability of risk—often closely related to state organisations and a top-down approach to administration—the term ‘risk governance’ puts more emphasis on the fact that risk is, and needs to be, negotiated and mediated between different political and social actors within a society, often with very different perspectives and priorities for risk reduction. This chapter uses both terms, depending on the context. Even though the author very much agrees with the emphasis and tenets within the risk governance debate, he uses the term ‘risk management’ here when referring to literature or policy concepts that use it.

## 4.2 Analysis

### 4.2.1 *Peer-Reviewed Scientific Literature*

In order to analyse scientific publications on cross-border disaster impacts and their governance, the two main databases for peer-reviewed literature—i.e. ISI Web of Science and Scopus—have been used as an entry point. Given that Scopus has a wider coverage than ISI Web of Science (also covering major book projects and conference proceedings), only the results of the Scopus searches are explored here. Strategic keyword searches were applied, targeting the title, abstract and keywords of the publications. Three main combinations have been explored: (1) ‘disaster’ and ‘cross-border’; (2) ‘disaster’ and ‘transboundary’ and (3) ‘disaster’ and ‘international’. These searches resulted 99, 89 and 9419 publications, respectively, from the earliest record in each of the categories to the end of 2015. Given the high number in the combination ‘disaster’ and ‘international’, the search for this pair has been limited to both words appearing in the title, still resulting in 394 publications which were considered for the analysis. This selection of search criteria necessarily has its limitations, as a wide range of engagements on cross-border disasters is not captured if the authors use different terms or discuss cross-border implications mostly indirectly. However, the selection is purposeful in that it captures the literature that deals with cross-border, transboundary or international dimensions of disasters in an explicit fashion. It is these explicit engagements that are of most relevance for this review. The analysis suggests however, that the three terms are not—and should not—be taken as synonyms; rather, they carry specific connotations. The term ‘cross-border’ implies that neighbouring countries are affected by the same hazard or disaster in their territory, calling for collaboration of states and their institutions. ‘Transboundary’, in contrast, can apply to state territories but is also applied to a wide range of boundaries, including sub-national administrative entities but also ecological or cultural boundaries. The term is, for instance, often used in the context of river and basin management. The term ‘international’, meanwhile, is applied to a wide range of contexts, including international policy frameworks (such as the International Decade for Disaster Risk Reduction in the 1990s) as well as international aid and relief amongst countries not sharing any territorial borders. Nevertheless, the literature also clearly shows that a good dose of fuzziness remains in the past and current use of the three terms. Throughout this chapter, all three terms are used, depending on the context.

Figure 4.1. shows the number of publications per year for the three searches. For all three categories, a clear increase in publications can be observed from the early 2000s onwards. Measured against the widespread acknowledgement of the importance of cross-border and transboundary disasters (see below) and the heavy increase in publications on disaster risk reduction more generally over the last decades (Garschagen 2014), the number of publications published *explicitly* in this field is remarkably low—especially when considering that some, even though not many, of

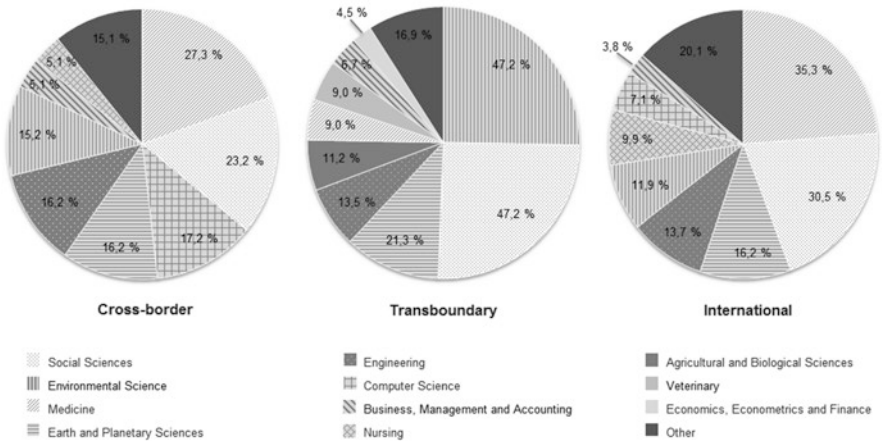


**Fig. 4.1** Published items per year based on Scopus queries on ‘disaster’ and ‘cross-border’, ‘disaster’ and ‘transboundary’, and ‘disaster’ and ‘international’ (Own draft based on Scopus data)

the papers resulting from the three searches are featured in either two or all three of the groups.

Tracking the contributions of different disciplines has become increasingly difficult due to the growing number of multi- and transdisciplinary collaborations and mergers—especially in the field of disaster risk research, with its human-environment focus. Nevertheless, the existing data on the global record of peer-reviewed publications suggest a number of interesting points. In terms of publication numbers, the large contributions have been coming from the social sciences, environmental sciences and earth and planetary sciences. Interestingly, the field of medicine is the single largest contributor in the query using the ‘cross-border’ and ‘international’ terminology (almost one third of all publications in these groups) while only playing a minor role in the publications using the ‘transboundary’ terminology—see below for some interpretation. It is also worth noting that the number of contributions declared as belonging to the field of economics is comparatively low, contributing below 4% of the publications in all search queries. While a number of the papers in the other subject areas address economic dimensions of cross-border and transboundary disasters, of course, Fig. 4.2 still underscores that this field is heavily underemphasised.

While it would be impossible to review all of the articles resulting from this search in detail in this chapter, a number of thematic clusters can be identified from the review. One of the areas receiving the most attention is analysis of geophysical systems that are prone to producing cross-border disasters. Most prominently, these include transboundary river sheds with flood hazards (e.g. Bakker 2009), but also seismic zones (e.g. Parolai et al. 2010). This results in a strong emphasis on



**Fig. 4.2** Subject areas for results of Scopus query on ‘disaster’ and ‘cross-border’ (left) and ‘disaster’ and ‘transboundary’ (center), and ‘disaster’ and ‘international’ (right) (Own draft, based on Scopus data)

cross-border early warning systems and transboundary governance systems in order to mitigate disaster risk in a preventive way, particularly between upstream and downstream countries. Most prominently, this area of research includes the vast field of transboundary watershed governance, for instance, in central Europe (e.g. Janssen 2008) or the Himalayas (e.g. Katel et al. 2015). Many of these studies have close ties to concepts around Integrated Water Resources Management (IWRM).

Interestingly, however, a yet much larger body of literature concentrates not on disaster prevention but on transboundary, cross-border and international dimensions of post-disaster aid and relief. Using selected highlights, Table 4.1 illustrates the breadth and depth of this literature. It addresses organisational, legal, political and administrative layers and spans from arrangements between neighbouring countries all the way to regional or even global international agreements for disaster assistance. Lai et al. (2009), for example, explore current mechanisms for transboundary disaster risk management in ASEAN countries, concluding that the current provisions are not able to deliver the required level of effective risk management. Hence, they call for a new ASEAN disaster response, training and logistics centre and propose main criteria for its institutional design. Along similar lines, the majority of papers emphasise a need for improved institutional cooperation, synchronisation and preparation of cross-border international disaster response. A considerable body of literature even critiques the disaster relief actions of the past and examines their effectiveness as well as negative (unintended) side effects, especially in cases where aid was provided by the ‘global north’ to the ‘global south’ (e.g. Dudasik 1982; Habibzadeh et al. 2008). In principle, the literature on cross-border disaster response and relief includes the review of political frameworks and legal arrangements, e.g. the exchange of remote sensing information for disaster management or Geographic Information Systems for synchronising assistance by non-state humani-

**Table 4.1** Thematic clusters and selected publications with explicit focus on transboundary, cross-border and international aspects of disasters and their governance

Thematic cluster	Examples of publications explicitly focusing on transboundary, cross-border and international aspects
Transboundary hazards	Parolai et al. (2010) on cross-border seismological monitoring networks in Central Asia; Bakker et al. (2009) on a global review of transboundary river floods
Transboundary institutions for disaster prevention and risk reduction	Katel, Schmidt-Vigt & Dendup (2015) on transboundary flood and water management in the Himalayas; Rubert and Beetlestone (2014) on tools for transboundary river management and disaster prevention in Southern Africa; Janssen (2008) on cross-border flood risk governance in Germany and the Netherlands
Cross-border and international disaster response and relief (state as well as non-state organisations; institutions and technology)	Boin et al. (2014) on the potential for transboundary crises management within the European Union; Caron et al. (2014) for a compendium on international law and disaster relief; Petiteville et al. (2014) on the collaboration of space agencies for strengthening national disaster risk reduction; Brattberg and Rhinard (2013) on the effectiveness in international disaster relief of the European Union and the United States; Rose and Kustra (2013) on economic considerations for designing transboundary emergency management institutions; Lai (2012) on cross-border disaster relief in Asia after the 2004 Indian Ocean Tsunami and the 2008 Wenchuan Earthquake; Stefanelli and Williams (2011) on regulatory barriers to effective international disaster assistance within the EU; Ansell et al. (2010) on the administrative capabilities required for managing transboundary crises; Tapia et al. (2010) on cross-border information systems used by NGOs to coordinate their humanitarian relief; Bas et al. (2010) on a Geographical Information System(GIS)-based management for cross-border evacuation in disaster situations in Europe; Edwards (2009) on the general principles of cross-border disaster response; Larsson (2009) on crisis management cooperation within the European Union; Becker et al. (2007) on challenges for transboundary flood management in the Rhine basin; Kapucu (2011) on an analysis of coordination and collaboration of international relief organisations; McCann and Cordi (2011) on international efforts to develop standards for disaster preparedness and response; Jia'nan et al. (2009) on the conceptual framework for a proposed international disaster compensation fund; James (2008), Habibzadeh et al. (2008) and Dudasik (1982) on critiques of international aid in disasters; Xu et al. (2008) on reviewing international cooperation in the case of the Wenchuan earthquake; Rokach et al. (2008) on standard-setting in collaborative search and rescue skills between Turkey, Greece and Israel; Abolghasemi et al. (2006) on lessons learned from the international response to the Bam earthquake in 2003; Lau et al. (2005) on Singapore's contribution to the victim identification effort in Thailand following the Indian Ocean Tsunami; Ito and Martinez (2005) on early lessons from the implementation of the International Charter for sharing remote sensing information for disaster management; Einhaus (1988) on a review of the operations of the Office of the United Nations Disaster Relief Coordinator; Kent (1987) on a review of international relief networks since 1945

(continued)

**Table 4.1** (continued)

Thematic cluster	Examples of publications explicitly focusing on transboundary, cross-border and international aspects
Cross-border impacts of disasters	Oh and Reuveny (2010), Oh (2015) and Gassebner et al. (2010) on the impacts of disasters on international trade; Olivero et al. (2012) on a method for disaster risk assessment of cross-border infrastructure; Yang (2008) on a empirical analysis of the impacts of hurricanes on international financial flows over the last decades
International migration in relation to disasters and climate threats	Pourhasemi et al. (2012) on rights of climate refugees; Kolmannskog and Trebbi (2010) on the protection of cross-border displaced victims of disasters; Cohen and Bradley (2010) on the protection gap in cross-border displacements following disasters
Pandemics and health emergencies	Grier et al. (2011) on information sharing for managing cross-border health emergencies; Fisher (2010) on legal and regulatory challenges in cross-border disaster medicine; Dopson (2009) on cross-border early warning for infectious diseases; Gao et al. (2008) on cross-border health mapping; Jones et al. (2008) on needs within cross-border preparation for health emergencies; Pohl-Meuthen et al. (2006) on obstacles for cross-border medical emergency services; Owens et al. (2005) on the US efforts for installing rapidly deployable assembly shelters and surgical hospital; Post (2004) on regulative barriers to cross-border medical assistance in Belgium, Germany and the Netherlands
Conceptual approaches	Sapountzaki and Daskalakis (2015) on a conceptual discourse on transboundary resilience to water scarcity and drought; Yang and Zhang (2014) on the evaluation of different systems for transboundary disaster management; Lagadec (2009) on new paradigms and concepts for capturing complex transboundary crises
Miscellaneous relevant topics	Engstrom (2013) on the military involvement in international disaster relief in East Asia and the projection of power; Raschky and Schwindt (2012) on a review of types and channels of international disaster assistance; Deebaj et al. (2011) on an analysis of whether airports in Sweden, Great Britain and Finland had been prepared to deal with injured and traumatised travellers returning after the Indian Ocean Tsunami in 2004; Cao et al. (2010) on the role of Chinese rescue teams in the Pakistan floods of 2010; Nelson (2010) on the international politics of aid refusal, providing a global data set of these cases between 1982 and 2006; Margesson (2010) on a review of the US legal framework and budget trends for international humanitarian assistance; Byard and Winskog (2010) on the challenges arising in victim identification during international disasters; Park and Reisinger (2010) on an empirical analysis on the relationship between perceived disaster risk and travel choices; Diaz (2008) on the integration of psychosocial support in the international assistance of the American Red Cross

tarian organisations (e.g. Ito and Martinez 2005), as well as case studies from specific disasters in the past. A considerable number of these examples are from Asia, most notably the Indian Ocean Tsunami (e.g. Lai 2012; Lau et al. 2005), but also Typhoon Nargis (e.g. Kapucu 2011), major earthquakes such as in Bam and Wenchuan or other major disasters (e.g. Abolghasemi et al. 2006; Xu et al. 2008).

An additional thematic cluster gravitates around the assessment of cross-border disaster impacts. These include changes in international trade (e.g. Oh 2015) or

infrastructure disruption (e.g. Olivero et al. 2012). An emerging subset further emphasises (international) migration due to disasters and the expected impacts of global environmental change (e.g. Kolmannskog and Trebbi 2010). A particular focus therein is on the (legal) protection of these migrants (e.g. Cohen and Bradley 2010).

Diseases and other health emergencies constitute another major thematic cluster in the literature—as indicated by the strong contribution of medical sciences (see above). Within this cluster a lot of attention is given to the establishment and evaluation of early warning systems for cross-border spread of diseases (e.g. Dopson 2009; Grier et al. 2011). Secondly, a major focus is on the international institutional arrangements for combating disease outbreaks, covering technical medical assistance (e.g. Owens et al. 2005). The literature shows that a lot of global efforts have been undertaken over the last decades to improve international cooperation in response to disease outbreaks. However, the literature also highlights the many remaining challenges for effective collaboration, spanning institutional, political and legal domains (e.g. Fisher 2010). Interestingly, these barriers for collaboration are not only debated for low-income countries but also within the context of OECD members and high-income nations—for instance, in terms of the barriers for cross-border assistance between Belgium, Germany and the Netherlands (Post 2004). Particular emphasis is also placed on the need for improved ex ante contingency planning and training for medical assistance across borders (e.g. Jones et al. 2008).

Last but not least, an emerging body of literature focuses on theoretically and conceptually framing disasters and their governance (e.g. Lagadec 2009; Sapountzaki and Daskalakis 2015). In addition, a diverse range of other topics are discussed in the literature, illustrated in the bottom part of Table 4.1. These include, for instance, the analysis of the politics behind refusing international assistance in case of disaster (Nelson 2010) or the projection of power through involving military into cross-border disaster assistance in East Asia (Engstrom 2013).

### 4.2.2 *Grey Literature*

The analysis of grey literature was driven by two main components. Firstly, a bottom-up search in PreventionWeb was conducted. This is a comprehensive and widely used online platform in the field of disaster risk governance, with the explicit mandate for ‘serving the needs of the disaster reduction community’ (see UNISDR n.d.). An open word search for ‘transboundary’ within this portal resulted in 972 hits, out of which the largest subset (445) consisted of publications by international organisations, followed by policy plans and statements (198), conference announcements and reports (100) and other categories such as job announcements or news reports. A rough review of this list shows that major thematic clusters can be observed on transboundary flood risk management (around 170 hits) and drought risk management (130 hits), both increasingly debated under climate change perspectives. However, only 67 of the records are linked to the keyword of ‘urban risk



and planning'. In terms of regional focus, entries addressing disaster in Asia make for the largest contribution (295), followed by Europe (206) and Africa (160).

However, given the high number of records in the PreventionWeb portal, it proved impossible to apply a detailed review to the entire body of documents. The detailed analysis therefore, targeted specific reports which have been of high influence in the field of disaster risk reduction over the recent years. These include:

- The biannual Global Assessment Report (GAR) by the United Nations International Strategy for Disaster Reduction (UNISDR),
- The Special Report on Managing Extreme Events (SREX) by the Intergovernmental Panel on Climate Change (IPCC),
- The annual World Disaster Report by International Federation of Red Cross and Red Crescent Societies (IFRC),
- The annual World Risk Report by the Development Alliance Works and the United Nations University Institute for Environment and Human Security (UNU-EHS), and
- Special reports on disaster risk from the United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP).

Overall, the coverage of cross-border disasters and their governance is strikingly shallow in all these reports. While many of the reports are published in series and feature an annual focal topic, none of them has in the past explicitly used cross-border or transboundary disasters as their overall feature topic. However, the reports frequently mention the importance to consider such types of disasters and the need to get a better handle on transboundary risk governance.

The 2013 GAR (UNISDR 2013), which is focused on '[t]he business case for disaster risk reduction', elaborates on the neglect of transboundary risks and their negative effects on economic sustainability. The report argues that '[r]isks are externalised or transferred across space and time to other locations and sectors' (p. 118) due to investments in hazard-prone areas. However, when a disaster materialises, the effects are likely to be transboundary, challenging economic performance at all ends of the system (*ibid.*). Looking ahead, the report further cautions that 'the more long term the perspective is on risk and uncertainty, the more it becomes an international and trans-boundary concern and less a national capacity issue' (p. 228). The GAR of 2011 (UNISDR 2011) also refers to transboundary disasters in a couple of places. In combination, these references open up an interesting tension. On the one hand, a high number of countries are engaged in transboundary risk governance projects and initiatives, run by a wide range of donors and organisations. On the other hand, however, the implementation of transboundary risk governance principles and actual procedures (i.e. the transfer from political agreements on paper to a real practice of transboundary risk governance) is often challenged. The 2011 GAR, for instance, elaborates on barriers around information sharing, political competition and lack of human and financial capacities in the case of transboundary risk governance in South Asia.

The IPCC's SREX report goes a great length in stressing the systemic nature of many risks related to extreme weather events as well as their risk management interventions, which both frequently 'cross national borders and transcend single nation policies and procedure' (IPCC 2012, p. 398). That is, the report explicitly recognises that hazards can 'apply to the contiguous zones of many countries, such as shared basins with associated flood risks' while other '[r]elationships and connections [that can be altered by hazard events] involving the movement of goods (trade), finance (capital flows and remittances), and people (displaced populations) can also have transboundary impacts' (p. 399). The report emphasises that such effects can particularly be triggered by extreme events. These should therefore always be considered as potentially transboundary in reach, irrespective of their original hazard extent. The report therefore calls for increased efforts towards transboundary risk governance. However, it does so by also emphasising the potential that can emerge from such cooperation:

The interdependence of the global economy, the public good, and the transboundary nature of risk management, and the potential of regional risk pooling, can make international cooperation on disaster risk reduction and climate change adaptation more economically efficient than national or sub-national action alone. Notions of solidarity and equity motivate addressing disaster risk reduction and climate change adaptation at the international level in part because developing countries are more vulnerable to physical disasters. (p.396)

Referring to the Rio Declaration and the Charter of the United Nations Framework Convention on Climate Change (UNFCCC), the report further provides a reminder on key legal obligations (in terms of soft laws) around transboundary risk management:

That states have a duty to prevent transboundary harm, provide notice of, and undertake consultations with respect to such potential harms is a soft law norm expressed under international environmental law. The more general duty to cooperate has evolved as a result of the inapplicability of the law of state responsibility to problems of multilateral concern, such as global environmental challenges. [...] From the duty to cooperate is deduced a duty to notify other states of potential environmental harm. This is reflected in Principles 18 and 19 of the Rio Declaration (a non-legal international instrument), that 'States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States' (Rio Principle 18) and 'States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect' (Rio Principle 19). (p. 402)

Thus the report supports its call for increased efforts towards transboundary risk governance by, raising awareness of, first, cross-border risk patterns; second, the opportunities emerging from transboundary risk governance; and third, the already existing obligations within ratified international agreements.

Interestingly, neither the World Disaster Report (annually published by the IFRC) nor the World Risk Report (published annually since 2011 by the Alliance Development Works and UNU-EHS) have in the past explicitly featured the topic of transboundary disaster risk in any of their reports. While the topic is mentioned in various places of these reports, the engagement does not translate into a detailed analysis or conceptual framing.

One of the most explicit engagements with transboundary disasters can be found in UN-ESCAP's 2015 Asia-Pacific Disaster Report, entitled 'Disasters Without Borders—Regional Resilience for Sustainable Development' (UN-ESCAP 2015). As the title suggests, the report includes a strong plea for more stringent transboundary risk management in the region. The report stresses that the region is affected by a number of large-scale and cross-border hazard conditions, including earthquakes, tsunamis, tropical cyclones, transboundary floods, volcanic eruptions and droughts. Single hazard events in these categories can affect multiple countries in the region at the same time, necessitating transboundary efforts to reduce the risk of regional crises. However, a review of its problem analysis, particularly in the section on cross-border threats, also exemplifies one of the general problems in the field: that data for truly analysing the cross-border effects is largely lacking to date (see also the section below). Rather than exploring the cross-border effects in detail, this report has to make do with existing statistical data and rather lists the accumulation of disaster risk in the region. This is undoubtedly relevant but is analytically different from exploring the economic, social, informational and other linkages in cross-border disaster risk.

### 4.2.3 *Secondary Data*

In order to analyse whether and to what extent freely available secondary statistical data can capture cross-border disasters and their impacts, the main databanks of disaster information—EM-DAT and NatCatSERVICE—have been considered for the analysis.

The EM-DAT database, run since 1988 by the Centre for Research on the Epidemiology of Disasters (CRED), is compiled from various sources, including UN agencies, non-governmental organisations, insurance companies, research institutes and press agencies (CRED 2015). It lists the impacts from disasters related to natural hazards in terms of affected people and economic losses. However, despite being one of the most comprehensive databases available, all data is prepared and provided with national resolution, due to the reporting mechanisms in the data sources it uses. Hence EM-DAT data does not allow for tracking cross-border effects of specific disasters in detail.

The NatCatSERVICE, run by Munich Re, provides annual reports on the largest disasters, measured in terms of their humanitarian and economic impact (Munich Re 2015). The figures on overall losses therefore include proxies for cross-border effects. However, given that Munich Re only publishes highly aggregated data out of their NatCatService, it is difficult to track cross-border impacts in specific countries in detail.

#### 4.2.4 *International Agreements in the Post-2015 Agenda*

Disaster risk reduction is a major policy field in the so-called post-2015 arena. The year 2015 is of great importance as it saw four major international initiatives and agreements for fostering sustainable development and risk reduction: the passing of the Sustainable Development Goals (SDGs), the Addis Ababa Conference on Financing for Development, UNFCCC's 21st Conference of the Parties (with the goal of a new global climate agreement), and the 3rd UN World Conference on Disaster Risk Reduction. The latter, held in March in Sendai, has direct relevance for the topic of cross-boundary disaster risk governance. It led to a new intergovernmental agreement on disaster risk reduction, the so-called Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 (UNISDR 2015). Looking back to the lessons learned from the previous agreement, the Hyogo Framework for Action (UNISDR 2007), the Sendai Framework states that:

International, regional, subregional and transboundary cooperation remains pivotal in supporting the efforts of States, their national and local authorities, as well as communities and businesses, to reduce disaster risk. Existing mechanisms may require strengthening in order to provide effective support and achieve better implementation. (p. 10)

Yet the Sendai Framework for Action goes beyond the Hyogo Framework for Action and emphasises international—and specifically transboundary—cooperation as one of the main responsibilities of national governments, anchored in the frameworks first guiding principle:

Each State has the primary responsibility to prevent and reduce disaster risk, including through international, regional, subregional, transboundary and bilateral cooperation. (p. 13)

The framework further goes on to specify that:

To guide action at the regional level through agreed regional and subregional strategies and mechanisms for cooperation for disaster risk reduction, as appropriate, in the light of the present Framework, in order to foster more efficient planning, create common information systems and exchange good practices and programmes for cooperation and capacity development, in particular to address common and transboundary disaster risks.' (p. 18)

While the Sendai Framework does not include binding principles on how to implement these requests, it is worth noting that the level of emphasis put on the topic is higher than in its predecessor framework. However, the below discussion will touch on the question of whether and how these claims on paper are likely to be implemented in action—and which further steps will be needed.

### 4.3 Conclusions: Achievements, Knowledge Gaps and Research Needs

In conclusion, the above review allows for synthesising the main achievements as well as remaining knowledge gaps and research needs in the field of cross-border and transboundary disasters. While the review can by no means be considered complete in covering all literature that has been published on the topic, it shows that considerable attention has been given to the issue. Scientific publications as well as major reports by international organisations working on disaster risk reduction stress the importance of recognising the transboundary and international reach of disasters and their impacts. They therefore agree on calling for strong efforts for improving transboundary and international risk governance efforts. However, the level of specification ranges from loose statements on wishes and visions to concrete suggestions for improved organisational mechanisms—for instance, within ASEAN (Lai et al. 2009). The plea for improved transboundary and international risk governance has also become a central element of the main intergovernmental agreement guiding disaster risk reduction in the post-2015 world, i.e. the Sendai Framework 2015–2030. This is a major advancement from the previous Hyogo Framework for Action 2005–2015, where the issue had received much less attention and was only vaguely mentioned—not transferred forcefully into a guiding principle as is the case in the Sendai Framework. However, whether and how these principles will be translated into action will need to be seen over the next years. The review suggests that despite the increased attention given to the topic, there are multiple barriers in terms of political will, institutional inertia, financial and human capital (reported especially in the scientific literature) and, last but not least, gaps in knowledge and data. The prospects for improved transboundary risk governance will therefore also depend on the whether and how existing knowledge gaps can be closed to allow for guiding policy and practice more effectively.

Along this line, the review brings to light a number of urgent research needs. First, there is a lack of strategic regional and global data collection to allow examination of the size, regional patterns, and sectoral patterns of cross-border disaster impact. The literature features a number of popular case studies for exploring cross-border disaster impacts. Amongst the most prominent examples are the 2011 floods in Bangkok and the Tohoku earthquake and tsunami, alluding to the strong relevance of transboundary disaster perspectives in urban—and urbanising—Asia. However, apart from heuristic analysis in singular case studies, a global approach to capturing the multiple cross-border effects of disasters is largely lacking to date. Neither the peer-reviewed literature nor the international reports provide such a comprehensive approach. In particular, the global databases on disaster impact statistics are to date not designed to capture such cross-border effects in a strategic and coherent manner—including those on migration, trade, economic production or any of the other effects frequently mentioned in the heuristic and conceptual literature on transboundary disasters. A more strategic collection of such data would not only enable a much more stringent and detailed scientific understanding of transboundary

disasters, but would also help to focus political attention on the need for transboundary and cross-border risk governance to avoid these types of impacts and share the costs of their mitigation.

Second, cross-border disasters are often equated with a cross-border spread of hazards such as earthquakes or floods. Much less attention is given to the case where, in an increasingly complex world, even localised disasters such as urban floods can imply massive spillover effects across borders. The capture of these effects is much more complicated, but would be needed for truly understanding the disaster risk in integrated and highly connected systems of global production and social activity.

Third, the gap described in the above two points is particularly wide with regards to the soft impacts of disasters. These reach beyond the pure impacts on economic production, trade, currencies exchange rates, migration etc., which all could, in principle, be measured in hard numbers. Transboundary effects of disasters can also include issues such as teleconnected changes in risk management paradigms and practices. Again, while some illustrative examples are repeatedly reported in the literature (e.g. Germany's decision to exit nuclear power production following the Fukushima triple disaster) the literature lacks a more strategic assessment of these soft effects, including comparative studies or theoretical models for explaining such changes. Subtle transboundary effects at the interface of hard and soft might also include issues such as informal remittance flows or changes in investment decisions. These hybrid effects are also insufficiently captured and examined to date.

Fourth, next to the assessment of hard and soft impacts of transboundary disasters, there is a particular gap in examining and understanding the drivers and root causes of transboundary disaster risk. While most attention has to date been given to questions of transboundary and international cooperation in *ex post* disaster response, relief and recovery, a better understanding of the root causes and drivers is essential for any long-term and preventive risk reduction. This needs to include in particular a better deciphering of the causal structure and complexities driving disaster risk, including not only the currently predominant focus on assessing natural hazards (as one side of the risk equation) but also the risk contribution of socio-economic vulnerability and susceptibility.

Fifth, there is a significant need to account for future trends into the analysis of cross-border risk patterns. As indicated in the introduction, cross-border disaster risk is driven by—amongst other factors—the confluence of three megatrends: environmental and climate change; increasing regional integration and globalisation; and urbanisation. All three of these trends are going to continue or even intensify in the future, particularly in Asia and the Pacific region. However, scientific studies almost exclusively look backwards and examine past disasters. What is urgently needed is to complement these studies with scenario and other futurology approaches to identify and assess potential future trajectories in cross-border disaster risk. This should combine qualitative and quantitative approaches and should serve not only a scientific but especially a practical purpose, thereby leveraging increased action for transboundary risk governance today.

Sixth, there is a lack of institutional analysis on how to incentivise and improve cross-border disaster cooperation in contexts where the benefits might be delayed or uncertain. While all bodies of literature considered for this review agree on the normative call for improved transboundary risk governance, the current case studies on institutional and organisational enablers and barriers, despite being very insightful, only provide highly selective and context-specific accounts. Research over the next years should focus on synthesising and upscaling these accounts and on building abstract models and theoretical representations of the institutional dimensions of cross-border risk governance. Ideally, these can work to inform policymaking and designing institutions for transferring the conceptual claims made in the SFDRR and other documents into concrete policy and action.

Seventh, while the private sector is one of the main agents when thinking about cross-border disasters (both in terms of assessing negative impacts and ways of dealing with them), surprisingly little is known about how private sector actors make decisions to deal with cross-border risk. There is hence a need for an improved understanding of how these actors perceive and act upon the risk from cross-border disasters and whether and how they function as agents of change in wider risk governance constellations.

In sum, research and policymaking on transboundary and cross-border disaster risk reduction can build on a strong foundation and a widely shared set of goals. However, the field will need to receive increased academic and practical effort if it is to transform from a vision to practice.

## References

- Abolghasemi, H., Radfar, M. H., Khatami, M., Nia, M. S., Amid, A., & Briggs, S. M. (2006). International medical response to a natural disaster: Lessons learned from the Bam earthquake experience. *Prehospital and Disaster Medicine*, 21(3), 141–147. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-33748096810&partnerID=40&md5=c079c61468d3eb133f471548680de455>.
- Ansell, C., Boin, A., & Keller, A. (2010). Managing transboundary crises: Identifying the building blocks of an effective response system. *Journal of Contingencies and Crisis Management*, 18(4), 195–207.
- Bakker, M. H. N. (2009). Transboundary river floods: Examining countries, international river basins and continents. *Water Policy*, 11(3), 269–288.
- Bas, I., Zoicas, C., & Ionita, A. (2010). The management of large emergency situations – a best practices case study based on GIS for management of evacuation. *World Academy of Science, Engineering and Technology*, 4(6), 651–654.
- Becker, G., Aerts, J., & Huitema, D. (2007). Transboundary flood management in the Rhine basin: Challenges for improved cooperation. *Water Science and Technology*, 56(4), 125–135.
- Boin, A., Rhinard, M., & Ekengren, M. (2014). Managing transboundary crises: The emergence of European Union capacity. *Journal of Contingencies and Crisis Management*, 22(3), 131–142.
- Brattberg, E., & Rhinard, M. (2013). Actorness and effectiveness in international disaster relief: The European Union and United States in comparative perspective. *International Relations*, 27(3), 356–374. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84883384104&partnerID=40&md5=1cb4e63e78386b6c58d0fa687204e8e3>.

- Byard, R. W., & Winskog, C. (2010). Potential problems arising during international disaster victim identification (DVI) exercises. *Forensic Science, Medicine, and Pathology*, 6(1), 1–2. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-73949101827&partnerID=40&md5=5960060f076a4ace89e2d99cdee2eaa>.
- Cao, L., Peng, B.-B., Wang, F., & Zhang, L.-Y. (2010). Medical rescue and relief work of the Chinese international rescue team in Pakistan flood disaster. *Chinese Journal of Emergency Medicine*, 19(11), 1143–1145. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-78650754504&partnerID=40&md5=2caf9d066b995769caf7c61bd6a52e6a>.
- Caron, D.D., Kelly, M.J., Telesetsky, A. (2014). The International Law of Disaster Relief, <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84953717325&partnerID=40&md5=b360ba4793b79d3b2f32e1ea583da788>.
- Cohen, R., & Bradley, M. (2010). Disasters and displacement: Gaps in protection. *Journal of International Humanitarian Legal Studies*, 1(1), 95–142. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84906730020&partnerID=40&md5=18fa714097212a95520524551d422828>.
- CRED (Centre for Research on the Epidemiology of Disasters). (2015) EM-DAT International Disaster Database, viewed 29 April 2015, <http://www.emdat.be>.
- Deebaj, R., Castrén, M., & Öhlén, G. (2011). Asia tsunami disaster 2004: Experience at three international airports. *Prehospital and Disaster Medicine*, 26(1), 71–75. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-80052383316&partnerID=40&md5=75457fa5f53cb9b387dd7e87c66ea6d3>.
- Diaz, J. O. P. (2008). Integrating psychosocial programs in multisector responses to international disasters. *American Psychologist*, 63(8), 820–827. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-56849096614&partnerID=40&md5=e88981e658a67e1ec7828cd27761f246>.
- Dopson, S. A. (2009). Early warning infectious disease surveillance. *Biosecurity and Bioterrorism*, 7(1), 55–60. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-65349087288&partnerID=40&md5=b3c4d0ffe94571d2fae43cdf1242849>.
- Dudasik, S. (1982). Unanticipated repercussions of international disaster relief. *Disasters*, 6(1), 31–37.
- Edwards, F. L. (2009). Effective disaster response in cross border events. *Journal of Contingencies and Crisis Management*, 17(4), 255–265. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-70849087035&partnerID=40&md5=4715447d49f03be1b78dcb86dcc0d186>.
- Einhaus, H. (1988). Emergency planning and management for disaster mitigation at the international level. *Regional Development Dialogue*, 9(1), 1–12. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-0024162586&partnerID=40&md5=bb2d666694f6a70062f8f3169d983d10>.
- Engstrom, J. (2013). Taking disaster seriously: East Asian military involvement in international disaster relief operations and the implications for force projection. *Asian Security*, 9(1), 38–61. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84875304234&partnerID=40&md5=618bd0d0e395903f0fcb706aca77c399>.
- Fisher, D. (2010). Regulating the helping hand: Improving legal preparedness for cross-border disaster medicine. *Prehospital and Disaster Medicine*, 25(3), 208–212. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-77957001865&partnerID=40&md5=d4e19dd8ba83ba8f701a46bf63d85f62>.
- Gao, S., Mioc, D., Yi, X., Anton, F., Oldfield, E., Coleman, D.J. (2008). The Canadian geospatial data infrastructure and health mapping, CyberGeo 2008, <https://www.scopus.com/inward/record.uri?eid=2-s2.0-67650911596&partnerID=40&md5=4521e1e5d27284a84beb5f68aa268a81>.
- Garschagen, M. (2014). *Risky change? Vulnerability and adaptation between climate change and transformation dynamics in Can Tho City, Vietnam*. Stuttgart: Steiner.
- Gassebner, M., Keck, A., & Teh, R. (2010). Shaken, not stirred: The impact of disasters on international trade. *Review of International Economics*, 18(2), 351–368. <https://www.scopus.com/>



- [inward/record.uri?eid=2-s2.0-77954400835&partnerID=40&md5=60dc48cd304689cca66ed228c4e5aba7](http://inward/record.uri?eid=2-s2.0-77954400835&partnerID=40&md5=60dc48cd304689cca66ed228c4e5aba7).
- Grier, N. L., Homish, G. G., Rowe, D. W., & Barrick, C. (2011). Promoting information sharing for multijurisdictional public health emergency preparedness. *Journal of Public Health Management and Practice*, 17(1), 84–89. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-78650812097&partnerID=40&md5=0a1b031319cd4bda862dd5a7202e7bf3>.
- Habibzadeh, F., Yadollahie, M., & Kucheki, M. (2008). International aid in disaster zones: Help or headache? *The Lancet*, 372, 374.
- IPCC (Intergovernmental Panel on Climate Change). (2012). In C. B. Field, V. Barros, T. F. Stocker, D. Qin, D. J. Dokken, K. L. Ebi, M. D. Mastrandrea, K. J. Mach, G.-K. Plattner, S. K. Allen, M. Tignor, & P. M. Midgley (Eds.), *Managing the risks of extreme events and disasters to advance climate change adaptation, A special report of working groups I and II of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press.
- Ito, A., & Martinez, L. F. (2005). Issues in the implementation of the international charter on space and major disasters. *Space Policy*, 21(2), 141–149. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-20444427963&partnerID=40&md5=6f0fba88957d3b58c6c9c710a263c576>.
- James, L. (2008). International aid in disasters: A critique. In L. Dominelli (Ed.), *Revitalising communities in a Globalising world* (pp. 281–293). Burlington: Ashgate.
- Janssen, J. A. E. B. (2008). On peaks and politics; governance analysis of flood risk management cooperation between Germany and the Netherlands. *International Journal of River Basin Management*, 6(4), 349–355. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-65849526443&partnerID=40&md5=0282900fffb9bd8f58743ceb54869b9d>.
- Jia'nan, L., Yan, S., & Qin, T. (2009). International disaster compensation fund: A new international financial aid mechanism. *Transition Studies Review*, 16(2), 479–483. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-70349998890&partnerID=40&md5=b237a7c87ef1476b7ae0bb38047aa963>.
- Jones, M., O'Carroll, P., Thompson, J., & D'Ambrosio, L. (2008). Assessing regional public health preparedness: A new tool for considering cross-border issues. *Journal of Public Health Management and Practice*, 14(5), E15–E22. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-56149125434&partnerID=40&md5=d7373353bdec0a30b07697866ecf3c96>.
- Kapucu, N. (2011). Collaborative governance in international disasters: Nargis cyclone in Myanmar and Sichuan earthquake in China cases. *International Journal of Emergency Management*, 8(1), 1–25. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-79957615528&partnerID=40&md5=ae0ed6ab4c922219a30233c8f3d07196>.
- Katel, O. N., Schmidt-Vogt, D., & Dendup, N. (2015). Transboundary water resources management in the context of global environmental change: The case of Bhutan Himalaya. In S. Shrestha, A. K. Anal, P. A. Salam, & M. van der Valk (Eds.), *Managing water resources under climate uncertainty: Examples from Asia, Europe, Latin America, and Australia* (pp. 269–290). Switzerland: Springer International Publishing.
- Kent, R. C. (1987). *Anatomy of disaster relief: The international network in action*. New York: Pinter Publishers.
- Kolmannskog, V., & Trebbi, L. (2010). Climate change, natural disasters and displacement: A multi-track approach to filling the protection gaps. *International Review of the Red Cross*, 92(879), 713–730. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-79956333612&partnerID=40&md5=9b39ecc6a4e7e388f42aa666855b2a57>.
- Lagadee, P. (2009). A new cosmology of risks and crises: Time for a radical shift in paradigm and practice. *Review of Policy Research*, 26(4), 473–486.
- Lai, A. Y. H. (2012). Towards a collaborative cross-border disaster management: A comparative analysis of voluntary organizations in Taiwan and Singapore. *Journal of Comparative Policy Analysis: Research and Practice*, 14(3), 217–233.
- Lai, A. Y. H., He, J. A., Tan, T. B., & Phua, K. H. (2009). A proposed ASEN disaster response, training and logistic centre enhancing regional governance in disaster management. *Transition Studies Review*, 16(2), 299–315.

- Larsson, P. (2009). The crisis coordination arrangements (CCA). In S. Olsson (Ed.), *Crisis Management in the European Union: Cooperation in the face of emergencies* (pp. 127–138). Berlin: Springer. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84892825167&partnerID=40&md5=122618d9ecec338b38d3bb0f475084>.
- Lau, G., Tan, W. F., & Tan, P. H. (2005). After the Indian Ocean tsunami: Singapore's contribution to the international disaster victim identification effort in Thailand. *Annals of the Academy of Medicine Singapore*, 34(5), 341–351. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-22544462223&partnerID=40&md5=f7cef9da949b6d5c9df534f44243cfc0>.
- Margesson, R. (2010). International crises and disasters: U.S. humanitarian assistance, budget trends, and issues for Congress. In J. C. Parish (Ed.), *U.S. Foreign assistance: Background, role and future* (pp. 217–234). Washington, DC: Nova Science Publishers. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84892053861&partnerID=40&md5=1ce804eb6873aabca52e6503022e4b06>.
- McCann, D. G. C., & Cordi, H. P. (2011). Developing international standards for disaster preparedness and response: How do we get there? *World Medical and Health Policy*, 3(1), 1–4. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-79959564366&partnerID=40&md5=b22572122690c67f7cbda0c8744bc9c5>.
- Munich, Re. (2015). NatCatSERVICE, Munich Re, Munich, viewed 30 April 2015, <http://www.munichre.com/de/reinsurance/business/non-life/georisks/natcatservice/default.aspx>.
- Nelson, T. (2010). Rejecting the gift horse: International politics of disaster aid refusal. *Conflict, Security and Development*, 10(3), 379–420. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-79956243743&partnerID=40&md5=197e3e8276671563317ca6345454b167>.
- Oh, C. H. (2015). How do natural and man-made disasters affect international trade? A country-level and industry-level analysis. *Journal of Risk Research*, online first. doi:10.1080/13669877.2015.1042496.
- Oh, C. H., & Reuveny, R. (2010). Climatic natural disasters, political risk, and international trade. *Global Environmental Change*, 20(2), 243–254. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-77951255135&partnerID=40&md5=d4bc4ec21c68320a8048bd4a67e5a6dc>.
- Olivero, S., Migliorini, M., Stirano, F., Calandri, F., Fava, U. (2012). Cross-border strategic infrastructures: From risk assessment to identification of improvement priorities. The experience gained in PICRIT Project. In *Proceedings of the 4th International Disaster and Risk Conference: Integrative Risk Management in a Changing World—Pathways to a Resilient Society*. IDRC Davos 2012, pp. 539–541, <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84925017906&partnerID=40&md5=7670b3a841638c426562b1cff73b6c07>.
- Owens, P. J., Forgione, A., Jr., & Briggs, S. (2005). Challenges of international disaster relief: Use of a deployable rapid assembly shelter and surgical hospital. *Disaster Management and Response*, 3(1), 11–16. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-12144260518&partnerID=40&md5=7e8b0de4f9054011e04fd41e679eef22>.
- Park, K., & Reisinger, Y. (2010). Differences in the perceived influence of natural disasters and travel risk on international travel. *Tourism Geographies*, 12(1), 1–24. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-77949344871&partnerID=40&md5=629c293e581c0cd7d21359be06662a4e>.
- Parolai, S., Orunbaev, S., Bindi, D., Strollo, A., Usupaev, S., Picozzi, M., Di Giacomo, D., Augliera, P., D'Alema, E., Milkereit, C., Moldobekov, B., & Zschau, J. (2010). Site effects assessment in Bishkek (Kyrgyzstan) using earthquake and noise recording data. *Bulletin of the Seismological Society of America*, 100(6), 3068–3082. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-78650084514&partnerID=40&md5=a9e14c3c3960ab6f2f61fa5b2b5fe63f>.
- Petiteville, I., Ishida, C., Eddy, A., Frye, S., Steventon, M., Jones, B. (2014). International collaboration of space agencies to support disaster preparedness and response and country risk management. In *Proceedings of the 5th International Disaster and Risk Conference: Integrative Risk Management—The Role of Science, Technology and Practice*, IDRC Davos 2014, pp. 572–575,

- <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84924973551&partnerID=40&md5=37adc7349fc7715e60ae7dba2cd06c9d>.
- Pohl-Meuthen, U., Schlechtriemen, T., Gerigk, M., Schäfer, S., & Moecke, H. (2006). Cross-border emergency medical services: Hopes and reality. *Notfall und Rettungsmedizin*, 9(8), 679–684. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-33845327181&partnerID=40&md5=a1f67d07c6dff89186a3676248aedc29>.
- Post, G. B. (2004). Building the tower of Babel: Cross-border urgent medical assistance in Belgium, Germany and the Netherlands. *Prehospital and Disaster Medicine*, 19(3), 235–244. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-16544388613&partnerID=40&md5=5272a0c6d33a423f7984db13fcaa810>.
- Pourhashemi, S. A., Khoshmaneshzadeh, B., Soltanieh, M., & Hermidasbavand, D. (2012). Analyzing the individual and social rights condition of climate refugees from the international environmental law perspective. *International Journal of Environmental Science and Technology*, 9(1), 57–67. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84857279467&partnerID=40&md5=d2936429bf3c99911d54f94d7f7f41b2>.
- Raschky, P. A., & Schwindt, M. (2012). On the channel and type of aid: The case of international disaster assistance. *European Journal of Political Economy*, 28(1), 119–131. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84855195394&partnerID=40&md5=641eb1d8d8fa5ab17191d1f382890a37>.
- Rokach, A., Pinkert, M., Nemet, D., Goldberg, A., & Bar-Dayana, Y. (2008). Standards in collaborative international disaster drills: A case study of two international search and rescue drills. *Prehospital and Disaster Medicine*, 23(1), 60–62. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-46349101984&partnerID=40&md5=eeb5f940b5ffa6efbed1274e80dddb6b>.
- Rose, A., & Kustra, T. (2013). Economic considerations in designing emergency management institutions and policies for transboundary disasters. *Public Management Review*, 15(3), 446–462.
- Rubert, A., & Beetlestone, P. (2014). Tools to improve the management of transboundary river basins for disaster risk reduction. *Water Science and Technology: Water Supply*, 14(4), 698–707.
- Sapountzaki, K., & Daskalakis, I. (2015). Transboundary resilience: The case of social-hydrological systems facing water scarcity or drought. *Journal of Risk Research*, pp. 1–18.
- Stefanelli, J. N., & Williams, S. (2011). Disaster strikes: Regulatory barriers to the effective delivery of international disaster assistance within the EU. *Journal of International Humanitarian Legal Studies*, 2(1), 53–83. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84905504404&partnerID=40&md5=c27c56b2017172bc66638ae302f55c0e>.
- Tapia, A.H., Maldonado, E., Tchouakeu, L.-M.N., Maitland, C., Zhao, K., Bajpai, K. (2010). Crossing borders, organizations, levels and technologies: IS collaboration in humanitarian relief. In *16th Americas Conference on Information Systems 2010, AMCIS 2010*, vol. 1, pp. 301–311. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84870384019&partnerID=40&md5=1acb824123279badf4cc5412abf43f70>.
- UN-ESCAP (United Nations Economic and Social Commission for Asia and the Pacific). (2015). *Disasters without Borders: Regional resilience for sustainable development*. Bangkok: UN-ESCAP.
- UNISDR (United Nations International Strategy for Disaster Reduction). (2007). *Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters*. Geneva: UNISDR.
- UNISDR (United Nations International Strategy for Disaster Reduction). (2011). *Global assessment report on disaster risk reduction: Revealing risk, redefining development*. Geneva: UNISDR.
- UNISDR (United Nations International Strategy for Disaster Reduction). (2013). *Global assessment report on disaster risk reduction: From shared risk to shared value—the business case for disaster risk reduction*. Geneva: UNISDR.
- UNISDR (United Nations International Strategy for Disaster Reduction). (2015). *Sendai framework for disaster risk reduction 2015–2030*. Geneva: UNISDR.

- UNISDR (United Nations International Strategy for Disaster Reduction). (n.d.). PreventionWeb. <http://www.preventionweb.net>.
- Xu, J., Gong, A. D., & Li, J. (2008). An understanding of international cooperation in disaster reduction in view of great Wenchuan earthquake. *Journal of Natural Disasters*, 17(6), 139–141.
- Yang, D. (2008). Coping with disaster: The impact of hurricanes on international financial flows, 1970–2002. *B.E. Journal of Economic Analysis and Policy*, 8(1), 1–43. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-46749086346&partnerID=40&md5=c933dff330391370b09e387ad295f4d2>.
- Yang, A., & Zhang, H. (2014). The study on evaluation system of transboundary disasters emergency management ability based on synergetic model. *International Journal of Earth Sciences and Engineering*, 7(6), 2400–2406. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84938335429&partnerID=40&md5=e8c42f5452edbc7c2ba89bc33d0e515d>.