Chapter 4
Recovery, Development Programs, and Place-Based Reconstruction Policy: The Instrumental Role of Insurance

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Abstract When natural disasters occur, it is the system's ability to bounce back and recover afterward that defines their resilience. In preparing and responding to disasters of such a nature, different types of collaboration and collaborative systems are critical. For example, mitigation approaches require the coordination of multiple stakeholders with actions adjusted for the local circumstances and events. This chapter aims to explore the instrumental role of insurance in the place-based public-private partnership models. This includes the pre- and post-crisis policies, development, recovery, and risk transfer funding mechanisms. In doing so, the chapter goes beyond normal socio-economic resilience analysis by highlighting more operational aspects for policy-making. The paper draws on a wide range of examples from pre-, during-, and post-event approaches that have been developed to mitigate and/or cope with crises from natural disasters which highlight the role of insurance. The discussion ties into the underlying rationale that developing countries are the most exposed to natural disasters with the most to gain through mitigation and preparedness with insurance playing an important role in reducing the reliance on aid. However, it also ties to the concept of insurance protection gap, or underinsurance, in the case of high flood risk zones in the United Kingdom. The findings suggest that solutions needed to be place-based, taking into account local, national, and/or regional economic, social, and environmental conditions. The findings are of relevance for academia, policy-makers, and other stakeholders enabling further study with the potential to influence actions that can address the crisis management through collaborative coordination. Additionally, it reveals the insurance protection gap that needs to be addressed.

Keywords Collaboration · Crises management · Insurance · Natural disaster · Public-private partnership · Resilience · Recovery program

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1 Introduction

When natural disasters occur, the resilience is the determining factor of the ability of systems to bounce back and recover (Martinez-Diaz, 2018). More specifically, the Intergovernmental Panel on Climate Change (IPCC) defined the resilience as "the ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (IPCC, 2012, p. 563)." In this case, systems can both be natural and manmade. This paper deals with the impacts on manmade systems, such as communities and societies, and their ability to "resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner." This includes the maintenance and rebuilding of basic and crucial functions and structures (UNDRR, 2020; UNISDR, 2015, p. 9).

Resilience is an umbrella concept that considers the different ways that systems respond to external shocks, major disturbances, and new conditions (Tiernan et al., 2019). Three main resilience themes since 2012 have been identified in a review of the disaster resilience literature. These are: "(1) socialization of responsibility for resilience; (2) ongoing interest in risk management with an emphasis on public-private partnerships as enabling mechanisms; and (3) a nuanced exploration of the concept of adaptive resilience" (Tiernan et al., 2019, p. 68). This review also highlights the different resilience domains. These being individuals, physical, community, hazards research, ecological system, social and city levels (Tiernan et al., 2019).

Three climate-resilience pathways for development have been identified by the IPCC, namely adaptation, mitigation, and sustainable development. These pathways include "strategies, choices, and actions that reduce the climate change and its impacts" (Denton et al., 2014, p. 1104). Furthermore, the climate-resilient pathways include the elements of awareness about climate change risk and capacity. These can include risk management and leadership for sustainable development. Essential resources include expertise in the field of science and technology, finance in addition to the practices based on most recent information. Monitoring impacts of climate change that are emerging, or the frameworks (policy, legal and regulatory) and programs/systems can help to assist those that are most vulnerable to the impacts of climate change (Denton et al., 2014). Building adaptation capacity to climate impacts of "individuals, communities, and governance systems include addressing the deficit-related development such as poverty, famine, and food insecurity whilst making essential risk management improvements. This includes the insurance and "insurance-linked social safety nets," disaster relief and alert systems (Denton et al., 2014; Martinez-Diaz, 2018, p. 71; Warner et al., 2012).

Various forms of public-private partnership (PPP) development models and programs are used to address recovery, strengthen resilience, and place-based reconstruction policy. PPPs can be seen "as a rubric for describing the cooperative ventures between the state and private businesses" (Linder, 1999, p. 35). Furthermore, PPP has to include the provision of public service or infrastructure as well as a risk

transfer between partners. It should build "on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks, and rewards" (The Canadian Council for Public Private Partnerships, 2004). It furthermore may relate to management reform, problem conversion, moral regeneration, risk shifting, restructuring public service, and power-sharing (Linder, 1999). A study has, however, shown "that practice tends to be less ideal than the idea," in terms of accomplishing the joint added value and less risk by reasons of institutional characteristics such as behavior rules, perception, and role attitude (Klijn & Teisman, 2002, p. 1). Risk factors identified for the PPP projects include political, constructional, operational, legal, market, economic, and other types of risks, each with a subset of risk factors. Some of these risk factors are shared solely or mostly by the public sector with some allocated to the private sector or equally between both parties. Risk factors shared by the government include a change in legislation, land acquisition, approval, and permits. In the case of the private sector, the risk factors consist of the financial and technology risks, the inability of the consortium, organizational and coordination risk, and a delay in supply. Shared risk comprises for instance of force majeure, payment risk, inflation and interest rates, and weather conditions (Ke, Wang, Chan, & Lam, 2010). Many of the PPP projects have been carried out in the construction industry (LiYaningTang, Shen, & Cheng, 2011), but also in case of catastrophe risk and resilience, such as in relations to the 9/2011 terrorist attacks, Hurricane Katrina, and the US-Canada power-distribution system failure, and the 2004 Indian Ocean earthquake and tsunami. However, in case of economic losses, people are often left without insurance since private and public insurance only cover the parts of the loss (Michel-Kerjan, 2008). Given the scale of risks, the new risk features have been proposed: growing interdependences due to globalization, change in risk scales from local to the global, confusing distribution of the role and responsibilities with regard to preparedness, a rapid movement towards a just-in-time society, and uncertainty or even ignorance (Michel-Kerjan, 2008). The fourth P, people or the end-user, has also been added to the PPP relationship, mainly local communists and non-governmental organizations (NGOs) in case of post-disaster reconstruction situations (Kumaraswamy, Zou, & Zhang, 2015).

The insurance industry plays a critical role in terms of understanding and reducing risks, but also as a risk transferring mechanism on "individual, national, and international levels (Jóhannsdóttir, 2012; Jóhannsdóttir, Wallace, & Jones, 2012; Naheed & Eslamian, 2021, UNEP Finance Initiative, 2015, p. 5)." Through risk transferring mechanism, the insurance industry protects against shocks that "would otherwise be borne by households, businesses and governments (Jóhannsdóttir, 2012; UNEP Finance Initiative, 2015, p. 5)." As a part of integrated disaster risk management, both "physical risk reduction measures and financial risk transfer instruments (Jóhannsdóttir et al., 2012; UNEP Finance Initiative, 2015, p. 5)" play a role. With regard to disaster risk management five categories are critical: (1) understand and assess disaster risk, (2) prevent and reduce disaster risk, (3) disaster response and relief, (4) disaster recovery, and (5) disaster risk financing, and four

partnership models articulated (UNEP Finance Initiative, 2015): (1) resource mobilization, (2) implementation, (3) innovation, and (4) engagement and advocacy.

The concept of underinsurance, or the insurance protection gap, is an underlying issue when discussing the collaborative PPP systems for crises management. In this case insurance can, or should, provide "vital support to societies and businesses through the financial compensation for the effects of misfortune disasters or pandemics, for instance, in many emerging and developing economies (Geneva Association, n.d.)." The insurance protection gap is defined as "the difference between the amount of insurance coverage that is economically beneficial and what is purchased for disasters, and pandemics, for instance in many emerging and developing economies (Geneva Association, n.d.)." The insurance protection gap is seen as a pressing societal issue, as it has an impact on the resilience of societies since insurance is not playing its role in mitigating impacts (Geneva Association, n.d.). Although the global trend for the protection gap associated with natural catastrophes has been narrowing since 1989, it is still enormous given that "only about 30% of catastrophe losses [are] insured," and that the narrowing of the gap is mainly taking place in "high- and upper middle-income countries" where the gap is more than 95% in "lower middle- and lower-income countries" (Schanz, 2018, p. 1). This, therefore, highlights the importance of micro solutions, such as micro-insurance (Microinsurance Network, 2018b), discussed in Sect. 3.4.

This chapter aims to explore the instrumental role of insurance in the place-based public-private partnership models for pre- and post-crisis policies, development, and recovery, including discussing risk transfer and funding mechanisms for crisis management, and resilience. Owing to the complexity of the resilience domains, and local place-based conditions and circumstances in case of natural hazards there is a need for the various types of collaborative systems for crisis management, customized to the different circumstances in different locations around the globe. Therefore, one size fits all in suggesting appropriate solutions is therefore not feasible, but rather to point out a portfolio of potential solutions (UNEP Finance Initiative, 2014). To address this issue, the diverse cases of solutions are presented, structured around two focal points: (a) projects and/or collaborations for crisis management with strong elements of public-private partnerships, and (b) risk transfer and funding mechanisms for crisis management and resilience.

2 Public-Partnership Projects and/or Collaborations for Crises Management

Collaborative systems for crisis management take various forms depending upon location and the stakeholders involved. In each case discussed in this section, there are the strong elements of public-private partnerships where the insurance industry provides support to mitigate the impacts of natural catastrophes and other negative issues. The cases discussed in this section are the Sendai framework for disaster risk

reduction, the global resilience project of the principles for sustainable insurance, the AON's global rapid response, the city innovation platform (CIP), the Australian business roundtable for disaster resilience and safer communities, and the flood re insurance partnership model.

2.1 The Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Risk Reduction (Sendai Framework for short) is the first main agreement focusing on disaster risk reduction in the period of 2015–2030. It was approved by the United Nations (UN) General Assembly after the 2015 third UN World Conference on Disaster Risk Reduction (WCDRR) (UNISDR, n.d.). This is a non-binding voluntary agreement, supported by the UN Office for Disaster Risk reduction, and endorsed by the UN General Assembly (UNISDR, 2015, n.d.). It recognizes the role of States in reducing disaster risks, but also that other stakeholders, such as local governments and the private sector, should share the responsibility (UNISDR, n.d.). The Sendai Framework aims for a specific outcome:

> The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries (UNISDR, n.d.).

The scope and purpose of the Sendai Framework, its goals, and guiding principles, have been defined, in addition to seven specific targets and four priority areas (UNISDR, n.d.). The Sendai Framework helps to contextualize the role of insurers in improving preparedness and response in the event of a natural disaster. This is first and foremost stated in Priority 3, *Investing in disaster risk reduction for resilience* (Pearson & Pelling, 2015), but to achieve Priority 3 it is considered to be important to "promote mechanisms for disaster risk transfer and insurance, risk-sharing and retention and financial protection, as appropriate, for both public and private investment to reduce the financial impact of disasters on Governments and societies, in urban and rural areas (UNISDR, 2015, p. 19)." Implementation of the Sendai Framework is measured, highlighting the worldwide results of achieved targets related to mortality, people affected, economic loss, critical infrastructure and services, disaster risk reduction strategies, international cooperation, and early warning and risk information (UNDRR, 2019).

The Sendai Framework agreement was unique as for the first time there was a widespread insurance industry support to signal the willingness and capacity to support governments in disaster resilience and acceptance from inter-governmental organizations where the insurance industry can play a supportive and valuable role. The economic argument was also brought to the light suggesting that it is more cost-effective to spend on disaster risk reduction, rather than response and recovery, although insurance can support both aspects. To shift countries over-reliance on aid which is subject to donor generosity is regarded particularly appealing (UNISDR,

2015). The essential role of insurance in this regard is to offer business interruption insurance, transfer residual risk to the private sector, take part in public-private risk assessment, offer information on disaster loss data, and more. Additionally, new opportunities are claimed to exist for insurers, namely in strengthening the resilience of the private sector (Haraguchi, Lall, & Watanab, 2016).

2.2 The Global Resilience Project of the Principles for Sustainable Insurance

The Global Resilience Project (GRP) of the Principles for Sustainable Insurance (PSI), under the auspices of the United Nations Environment Programme Finance Initiative (UNEPFI), offers examples of collaboration, partnership, and tools with regard to disaster-resilience economies and communities (UNEP Finance Initiative, 2015). The project is led by Insurance Australia Group Limited (IAG), and has three phases: (1) to report on how to build disaster-resilience communities and economies, (2) to provide a global risk map comprising of historical coverage (115 years) of all main natural disasters, and (3) to offer tools for engaging with global stakeholders to gain support for disaster risk reduction investment (UNEP Finance Initiative, 2015). The vision of the PSI initiative is stated in the following way:

> … risk aware world, where the insurance industry is trusted and plays its full role in enabling a healthy, safe, resilient and sustainable society. Its purpose is to better understand, prevent and reduce environmental, social and governance risks, and better manage opportunities to provide quality and reliable risk protection (UNEP Finance Initiative, 2015, p. 4).

The PSI offers a roadmap towards developing the pioneering insurance and risk management solutions that will improve disaster resilience in communities. There are four guiding principles where (1) environmental, social and governance (ESG) issues are integrated into the insurance business decision-making; (2) where insurers work with relevant stakeholders, i.e., clients and business partners, to enhance the awareness of ESG issues and risk management, besides developing solutions; (3) where insurers work with other key stakeholders, i.e., governments and regulators to advocate extensive actions on the ESG issues; and (4) where insurers emphasize accountability and transparency by reporting regularly on the progress towards PSI implementation (UNEP Finance Initiative, 2015).

The PSI global resilience project draws on a range of international insurance industry stakeholders in developing the global resilience map and overview of the issues (UNEP Finance Initiative, 2014). The first phase of the project resulted in a report titled:

Building disaster-resilient communities and economies (United Nations Environment Programme, 2014). Across three types of natural disasters, cyclones, earthquakes, and flooding, three measures of risk reduction are of significance (UNEP Finance Initiative, 2014):

- Developing more risk-aware communities through education and communication.
- Understanding hazard exposure through risk mapping.
- Robust warning systems and emergency evacuation.

Obstructing effective disaster risk reduction falls mainly into two categories: (1) inadequate data and assessment tools and (2) the absence of standardized decision-making frameworks (UNEP Finance Initiative, 2014). What is increasingly clear in case studies carried in relation to the project is that collaboration for the specific risks often takes place at a local level where people are exposed to the same risk. For example, a dialogue on fires with policy-makers was established in Australia to understand the increasing risk, convene the exposed stakeholders, and agree on a collaborative way forward to mitigate the impact on society (UNEP Finance Initiative, 2014).

2.3 AON's Global Rapid Response

AON is an example of how a global service provider, operating with 1800 risk experts in 50 countries around the globe, can offer pre- and post-loss services to mitigate risk and prepare for natural disasters, such as in case of flooding. The purpose of the AON's Global Rapid Response is to help companies carry out mitigation efforts by sending experts to locations that are impacted so that guidance on loss mitigation can be clear and concise. Different expertise is available around the globe, such as consultants in loss mitigation, remediation, construction, and risk engineering, security, and forensic (Aon Property Risk Consulting, 2020).

The AON's Global Rapid Response includes a thorough checklist for the organization to assess and apply the strategies for hurricane and flood preparedness. The purpose of the checklist is to help businesses recover in case of flooding events. This may then protect both people and business properties (Aon Property Risk Consulting, 2018). Flood preparedness categories include preparedness before, during, and, after the flood, for employees, suppliers, and business clients. Before flood events, it is, for instance, important to formulate an evacuation plan, ensure that toxic chemicals are not released in case of flood events, discuss insurance flood-related policy coverage, create communications plans to stakeholders to name only some of the critical elements (Aon Property Risk Consulting, 2018).

During a flood event saving lives is the most important aspect. This is followed by the operationalization of the business continuity plan. Employees that are not essential during the event are sent home or advised not to come based on the crisis communications plan. Other critical stages include the protecting equipment, following media coverage, ensuring that the business can service or respond to customers, and if necessary evacuate the business if it is required (Aon Property Risk Consulting, 2018).

After the flood, it is important to learn if the water is safe to drink or if it is contaminated. Roads and other infrastructure may have been weakened causing risk related to driving. Other cautions include cleaning and disinfecting everything that became wet or covered in mud, due to potential contamination of sewage or toxic chemicals. The recovery plan of the business is also implemented, and communication of local authorities monitored. Relevant stakeholders, for instance, employees, and insurance agents are contacted (Aon Property Risk Consulting, 2018). Contact information of employees, suppliers, and clients should be available. In case of evacuation central point for all employees needs to be identified, so that location of employees can be determined. Based on damage following the flood key employees need to be notified about the next step in the continuity of the business (Aon Property Risk Consulting, 2018).

Similar lists are available for other types of events, such as hurricanes. This guidance from the risk manager to the client is vital to support when disaster strikes, but collaboration plays a critical role throughout. The insurance company guidance is based on information from the government or local authority on emergency response procedures and available support. In many countries, insurers will be actively involved in disaster drill scenarios as they will often be on-site to support the impacted customers following an event to look after them. Knowledge is obtained from the event based on exposure in terms of severity and geography, this, in turn, impacts the pricing of future premiums and can help to signal to governments where action or spending is needed to protect the exposed customers to ensure insurance remains affordable (Aon Property Risk Consulting, 2018).

2.4 The City Innovation Platform

The City Innovation Platform (CIP) is a multi-stakeholder collaboration on resilience (University of Cambridge Institute for Sustainability Leadership (CISL), 2017). It explores the public-private collaboration between stakeholders such as city officials, the finance sector, including asset managers and representatives from the insurance sector, and other relevant stakeholders from the private sector (University of Cambridge, 2019). This platform has issued a guide on multi-sector collaboration focusing on resilience. Partners to this platform include the University of Cambridge, ClimateWise,[1] in addition to other partners (University of Cambridge Institute for Sustainability Leadership (CISL), 2017).

The focus of CIP is on cities in emerging economies, but the guide is based on a pilot project and a workshop taking place in Dar es Salaam, Tanzania in 2016. The project was stimulated by a widening gap between climate risk protection, evident in the gap between economic and insured losses. This gap is of concern both for

[1] ClimateWise is organized by the CISL. It supports the insurance industry to disclose, respond to, and communicate about opportunities and risks related to the climate risk protection gap.

societies that are faced with economic and physical risks associated with climate change and for the insurance sector which may lose market share and status as important risk managers in the society (University of Cambridge Institute for Sustainability Leadership (CISL), 2017). A (University of Cambridge, 2019) successful CIP platform includes 16 key elements. These are time-related boundaries (start-to-finish), representation of relevant stakeholders, local customs and protocols, the political context, individual and industry expertise and constraints, seniority of partners, the leadership of the project, alignment of objectives, rules of engagement, relevant tools and resources, and having an executive from the insurance industry as one of the lead coordinators. Besides, success factors include experimentation and uncertainty, communication, independent facilitation, contextual information about the city and knowledge capacity in question, and workshop preparation, and relevant materials (University of Cambridge Institute for Sustainability Leadership (CISL), 2017).

The role of insurance is enhancing cities inadequate financial, human, such as in relations to access to the data related to infrastructure projects, since insurers may be in a position to organize academic research, given that insurers would finance the data collection of the city, for instance, number of houses damaged by flooding. Such data collection would have mutual benefits for cities and insurers in terms of decision-making (City Innovation Platform, 2016). This very much aligns with the recognized role of insurers in bridging the gap between the climate change science and heterogeneous actors, whereas gaps identified are between scientific knowledge, policy-making, and public awareness, between North and the South, the rich and the poor, and between the global and local knowledge (Johannsdottir & Wallace, 2018).

2.5 The Australian Business Roundtable for Disaster Resilience and Safer Communities

Engagement with policy-makers is critical so as to involve and activate all participants. Insurance Australia Group Ltd. (IAG) is a multinational insurance company headquartered in Sydney, Australia. It is a founding member of the Australian Business Roundtable for Disaster Resilience and Safer Communities, established in 2012, where the focus is on harmonizing national approach that may ensure the resilient communities in case of natural disasters and the safety of the Australian population (IAG, n.d.). It was founded after exceptionally many bushfires, floods, and storms. Members of the Roundtable include, in addition to IAG, the Australian Red Cross, Investa Property Group[2], Munich Reinsurance Company (Munich Re),

[2] Commercial real estate company.

Optus[3] and Westpac Group[4] (IAG, n.d.; The Australian Business Roundtable, 2019). In collaboration with governments and other stakeholders, the members of the Roundtable effetely initiate the research that can inform public policy, increase resilient communities' types of investments, and improve the ability of businesses and communities to tolerate natural disasters (IAG, n.d.).

The purpose of the research carried out on behalf of the Roundtable is to provide policy-makers with evidence that can feed into policy development. Examples of these types of research include a White Paper released in 2012, titled *Building our Nation's Resilience to Natural Disasters.* The report highlights the great emotional and financial burden of natural disasters in Australia, and that costs associated with extreme weather events are on the rise. It furthermore investigates the financial side of mitigating the disaster risks challenging local communities (Deloitte Access Economics, 2013). The following report, Building an Open Platform for Natural-disaster Resilience, released in 2014 (Deloitte Access Economics, 2013). The report highlights the importance of research and data (foundational, hazard, and impact data) input for decision-making of end-users that includes the Commonwealth, state, and local governments, businesses, community groups, as well as individuals (Deloitte Access Economics, 2013).

In 2016, a report titled *Building resilient infrastructure* was published. The focus of the report was on critical infrastructure that is costly and difficult to repair or replace, thus intensifying the impact of communities affected by natural disasters (Deloitte Access Economics, 2016a). The same year another report was published, or *The economic cost of the social impact of natural disasters* (Deloitte Access Economics, 2016b). The analysis carried out demonstrated three types of costs associated with natural disasters: deaths and injuries, tangibles (e.g., infrastructure, private properties, and business and network disruptions), and intangibles (i.e., meaning costs that cannot easily be monetized), for instance, health and well-being and connectedness of communities (Deloitte Access Economics, 2016b). What is of importance is that the intangible costs identified in the report are no less than the tangible costs, and they may carry on over peoples' lifetime having a severe effect on communities. Therefore, studies on how to quantify such medium- and long-term cost of social effects need to be carried out (Deloitte Access Economics, 2016b). The success of the roundtable has led to an establishment of a similar body in New Zealand, supported by IAG (n.d.).

[3] Telecommunications company.

[4] Financial services company.

2.6 Flood Re Insurance Partnership Model

Public-private partnerships can be used as a method to incentivize the flood risk reduction and to provide affordable insurance coverage. A study has been carried out to analyze the flood insurance mechanism in the United Kingdom (UK). It highlights that the national government and the insurance industry are not fully in a position to cope with flood risks, meaning that other actors have to engage so that risk reduction can be incentivized (Crick, Jenkins, & Surminski, 2018). In this case, a new insurance partnership model, Flood Re, was established based on a previous partnership between the Association of British Insurers (ABI) and the UK government (Crick et al., 2018), and the Water Act 2014 (Flood Re, 2018). It is authorized by the Prudential Regulation Authority and regulated by the Prudential Regulation Authority and Financial Conduct Authority (FRN 706046), and started formally to operate in 2016 (Flood Re, 2018).

The main actors of the Flood Re scheme include the customers that buy home insurance, the insurance industry that evaluates both high- and low-risk homes, and decides what policies are transferred to Flood Re which then transfers risks to the re-insurance industry. Additionally, the insurance industry also encourages the government investments in flood defense, but the links between the government and Flood Re include sharing of risk data, and oversight by the government which reviews the process every 5 years (Crick et al., 2018). An overview of key actors identified in this agent-based model (ABM) includes house owners, building contractors, insurers, and the local government. Other actors are recognized, such as architects, house developers, loan providers, planning officers, the Environment Agency, and water companies, although they were excluded from the analysis (Crick et al., 2018).

This structure was aimed at addressing the insurance protection gap as around half a million households, that did not have access to affordable flood insurance given the location of properties in high flood risk areas and were able to obtain coverage (GOV.UK, 2016). The extra cost of the high-risk properties is transferred onto Flood Re, but this is then funded by a charge on the insurance industry, but not passed onto other customers. Owners of properties in high-risk areas will receive an affordable fixed-price premium. The price is based on different premium thresholds that are related to certain council tax bands of properties (Flood Re, 2018; GOV.UK, 2016). For instance, in 2018 the Council Tax band on building policy ranged between £134 and £812, and between £70 and £406 for content policy. Insurers, furthermore, pay an annual levy which funds Flood Re (Flood Re, 2018). Furthermore, the Flood Re structure will last until 2039, as it is expected that a vast majority of household in the UK will already have access to affordable flood insurance by that time, and other measures have been undertaken, including house development taking flood risk into account, and investments made in flood risk management and defense (Flood Re, 2018). In this collaboration, there is a recognition that building has occurred in the wrong location with some exposed properties no longer being affordable to insure. The long-term perspective until 2039 allows

greater flexibility and to ensure the building regulations better accommodate future housing development or renovation with flood resilience in mind (Flood Re, 2018). It will be interesting to see if the political will enable the completion of these aspirations.

3 Risk Transfer and Funding Mechanisms

In this section, several case studies on risk transfer and funding mechanisms for crisis management and resilience are introduced. These are the ARC platform, the Caribbean Catastrophe Risk Insurance Facility, Africa Disaster Risk Financing Initiative, and Micro-Insurance Solutions.

3.1 The ARC Platform

The African Union's (AU) ARC is a platform that enables resilience-building and risk management, offering the member states of the African Union with capacity, infrastructure, and tools, that are needed to climate change adaptation and management of natural-disaster risks. The main solutions include (1) early warning, (2) contingency plan, (3) climate risk insurance, and (4) climate adaptation finance (UNEP Finance Initiative, 2015). Furthermore, ARC established a mutual insurance company, ARC Insurance Company Limited (ARC Ltd), in 2013 issuing to governments the parametric weather insurance policies. It uses an Africa RiskView (ARV) platform to assess weather event impacts on exposed inhabitants and the costs of dealing with weather-related impacts before hazard seasons.

Index-based pay-outs occur immediately following weather disasters, i.e., cyclones, droughts, or severe floods (UNEP Finance Initiative, 2015). This is achievable as members of the ARC platform can take advantage of diversification of weather risk throughout the whole continent in a single insurance pool, thus enabling ARC to gain insurance coverage from the private sector international insurance markets and to reduce insurance premiums and the transaction cost (UNEP Finance Initiative, 2015). Paying out immediately after an event-threshold defined by the index occurs, not only helps in the case of climate resilience and in supporting the UN Sustainable Development Goal 2 (SDG2) of zero hunger and food security (Dubreuil & Tabegna, 2018). A systemic literature review reveals that those that benefit most from climate risk insurances in case of extreme weather events are farmers who need to protect both their farms against crop failures and their livelihoods (Awojobi, 2018).

3.2 Caribbean Catastrophe Risk Insurance Facility

Caribbean Catastrophe Risk Insurance Facility (CCRIF) is an example of a regional risk pool and insurance solution. It has developed parametric policies to limit the financial impact of natural disasters, i.e., earthquakes, excess rainfall, and tropical cyclones and hurricanes, on national governments in the Caribbean and Central America (UNEP Finance Initiative, 2015). The World Bank offered technical leadership, the Japanese government contributed with a grant, in addition to multiple donations from other sources such as the European Union, Bermuda, France, Ireland, United Kingdom, and others. The purpose of CCRIF is to reduce socio-economic and environmental impacts of natural disasters, by offering a range of reasonably priced insurance solutions, tools, and services, and by engaging in beneficial partnerships. Payments are made within 1–2 weeks of the event, thus ensuring a short-term cash flow in the wake of a major natural disaster (UNEP Finance Initiative, 2015).

3.3 Africa Disaster Risk Financing Initiative

Disaster Risk Finance (DRF) in Kenya is an example of coordination between various development actors, engaging through the Africa Disaster Risk Financing Initiative (ADRF), funded by the European Union, and the Disaster Risk Finance Analytics (GIZ, n.d.), which is a part of the Disaster Risk Finance and Insurance Program (DRFIP), supported by the World Bank Group (WBP) (Mahul & Cooney, n.d.). The purpose is to bridge "the gap between disaster risk data and risk-informed decision-making," by focusing on macro-economic, fiscal, and loss data, offer economic and fiscal analysis, and analysis on financial capacity building tools and impact analysis, thus offering information for capacity building, decision-making, and monitoring and evaluation (Mahul & Cooney, n.d.). Through this collaboration, the DRF supported the implementation of a "Disaster Risk Finance and Insurance strategy in the Philippines in 2015," that enabled the World Bank to offer a contingent line of credit (CAT DDO), that provides the country with a US$500 million CAT DDO in case of a disaster, as well as the development of a sub-national insurance scheme in the Philippines (Mahul & Cooney, n.d.). Another, DRF example is the development of a livestock insurance scheme in Kenya for farmers. It offers, for instance, coverage for around 14,000 farmers, compensating for droughts (Mahul & Cooney, n.d.), thus having an impact on headers, their families, and local communities. The Kenya Livestock Insurance Program (KLIP) was in 2015, as the first insurance scheme in Africa offered by the government, and supported by Dr. Andrew Mude, from the International Livestock Research Institute (ILRI), Swiss Re, and the World Bank (Swiss Re, 2019).

3.4 Micro-insurance Solutions

Micro-insurance solutions are also of critical importance when dealing with natural disasters. The International Association of Insurance Supervisors (IAIS) defines a micro-insurance as an "insurance that is accessed by low-income populations, provided by a variety of different entities, but run in accordance with generally accepted insurance practices" (International Association of Insurance Supervisors, 2012, p. 11). The protection is against certain perils, and the premium paid regularly as a proportion to the probability and the estimated cost of the risk (Microinsurance Network, 2018a). There are many types of micro-insurance solutions available, such as life and health insurance, property insurance, agricultural insurance, bundle, composite products and reinsurance (Microinsurance Network, 2015, 2018c). In case of micro-insurance customers, they fall under a category of high-risk exposure/high-vulnerability and weak insurance infrastructure, the insurance solutions are sold to insurance clients, with limited insurance experience, by non-traditional intermediaries such as NGOs, retailers, churches utilities, or cell phone providers, and insurance terms and conditions are put forth in simple language, with few, or no exclusions (Lloyd's, and Micro Insurance Centre, n.d.). Other characteristics include, in case of premium calculation, limited historical data, group pricing, price-sensitive market, and higher premiums to cover ratios. Premium payments from clients are irregular and frequent, given the volatility of clients' cash flow. Payments are, furthermore, often tied to other deals, such as repayments of loans. The claims process is simple, and small amounts are paid out quickly. Additionally, there is an efficient fraud control process (Lloyd's, and Micro Insurance Centre, n.d.).

Microinsurance Catastrophe Risk Organisation (MiCRO) is a project operated in the alliance between the "Swiss Agency for Development and Cooperation (SDC), the Multilateral Investment Fund (FOMIN) managed by the Inter-American Development Bank (IADB), Swiss Re and Mercy Corps" (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2018). It was established following the Haiti earthquake in 2010, and the first product offered in Central America was a bundled index-based solution, including protection against earthquakes, excess rainfall, and droughts. The solution was introduced to the Guatemalan market in 2016, and the El Salvador market in 2018 (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2018).

An example of an "insurance-linked social safety net" is parametric insurance mechanisms, but such mechanisms allow for quick transfer of money (within days) in an aftermath of a disaster when pre-defined conditions have materialized (Martinez-Diaz, 2018, p. 71). These include a certain "amount of rainfall in a given region, or the height of storm surge in a given location (Martinez-Diaz, 2018, p. 70)." These risk transfer tools are not solely for post-disaster recovery or response but are the common basis for micro-insurance schemes in developing markets for farmers with adverse weather conditions impacting crops (Allianze, 2018).

4 Summary and Conclusions

The chapter aimed to explore the instrumental role of insurance in place-based public-private partnership models for the pre- and post-crisis policies, development, and recovery, including discussing risk transfer and funding mechanisms for crisis management, and resilience. In preparing and responding to disasters of such nature, and strengthening resilience (e.g., IPCC, 2012; Martinez-Diaz, 2018; Tiernan et al., 2019) different types of collaboration and collaborative systems are critical. In many cases, collaborative systems are established around public-private partnership models or projects (Linder, 1999), in some cases build around the allocation of resources and rewards (The Canadian Council for Public Private Partnerships, 2004) or interest in risk management (Tiernan et al., 2019), such as in case of models of interests to insurers where the aim might be to reduce climate change impacts (Denton et al., 2014). The aim of such systems can be to assist those most vulnerable to the impacts, by building capacities in different resilience domains, for instance at individual, community, or governance levels (Denton et al., 2014; Tiernan et al., 2019). With regard to disaster risk management insurance expertise is in many categories relevant, including understanding and assessing disaster risk, preventing and reducing disaster risk, offering disaster response and relief, disaster recovery, and disaster risk financing (UNEP Finance Initiative, 2015) all of which are of relevance for strengthening the ability of manmade systems to bounce back and recover (Martinez-Diaz, 2018) after disaster events.

A successful response or mitigation approach to natural disasters requires the coordination of multiple stakeholders adjusted for the local circumstances and types of events. Examples can be drawn from pre-, during-, and post-event approaches, but the paper focused both on public-partnership projects and collaborations for crisis management and risk transfer and funding mechanisms for crisis management and resilience. In the former case, the following frameworks were introduced: The Sendai Framework was introduced (Pearson & Pelling, 2015; UNDRR, 2019; UNISDR, 2015, n.d.), the Global resilience Project (UNEP Finance Initiative, 2015), the AON's Global Rapid Response (Aon Property Risk Consulting, 2020), the City Innovation Platform (University of Cambridge Institute for Sustainability Leadership (CISL), 2017), the Australian Business Roundtable for Disaster Resilience and Safer Communities (IAG, n.d.; Deloitte Access Economics, 2013), and the Flood Re insurance partnership model (Crick et al., 2018; Flood Re, 2018; GOV.UK, 2016). In the latter case, the following solutions were presented: the ARC platform and the Caribbean Catastrophe Risk Insurance Facility (UNEP Finance Initiative, 2015), the Africa Disaster Risk Finance Initiative (GIZ, n.d.; Mahul & Cooney, n.d.; Swiss Re, 2019), and micro-insurance solutions (e.g., Lloyd's, and Micro Insurance Centre, n.d.; International Association of Insurance Supervisors, 2012; Microinsurance Network, 2018a, 2018b, 2018c).

A key lesson through all the examples presented in this chapter is that many issues including climate change are becoming too big for a single stakeholder to manage on their own. Effective collaboration of stakeholders with direct stakes in

the risk (Jóhannsdóttir, 2012; Jóhannsdóttir et al., 2012; UNEP Finance Initiative, 2015) is an effective way to protect more people and help reduce the disruptions to our economies and societies. Insurers can help play a vital role in assessing the risk, pricing the impacts, and providing critical parts of the solution to protect the general public from weather and catastrophe related crises (e.g., Flood Re, 2018; GOV.UK, 2016; UNEP Finance Initiative, 2015). The discussion in the chapter also ties into the underlying rationale that developing countries are the most exposed to natural disasters and have the most to gain through mitigation measures and of which insurance plays a role, rather than being reliant on aid (UNISDR, 2015). However, it also ties to the issue of underinsurance such as in case of high flood risk and most exposed people in the United Kingdom (Crick et al., 2018; Flood Re, 2018; GOV.UK, 2016), and natural disasters and safety of Australian people (IAG, n.d.).

What the discussion also brings forth is the concern that in case of economic losses people are often left without private or public insurance, as they only—if available—cover parts of the loss (Michel-Kerjan, 2008) drawing the attention to the insurance protection gap which harms resilience (Geneva Association, n.d.; Schanz, 2018). Therefore, the fourth P (people, communities, and NGOs) is of importance in the PPP relationship models and should be included in the discussion as well (Kumaraswamy et al., 2015). It also reveals that owing to the complexity related to the natural disasters and local conditions one-size-fits-all solution does not exist. There is a need for the various types of collaborative systems, a portfolio of solutions (UNEP Finance Initiative, 2014), for crisis management, customized to different circumstances in different locations around the globe. Synthesizing information about available solutions can be a stepping stone towards identifying such a portfolio of available solutions.

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