CHAPTER 1

INTRODUCTION AND OVERVIEW

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Natural disasters like earthquakes, typhoons, wildfires, floods, volcanic eruptions, can have consequences far beyond physical and economic damages leading to disruptions on communities, societies and peoples' lives and livelihood options. In current times, since we live in a highly globalized world where the lives, livelihoods and businesses of peoples, communities, and nations are deeply interconnected, natural disasters' adverse consequences can be profound on multiple fronts — with cross cutting implications over regions, time and sectors. One of the implications of a global economy is that major catastrophic events can disrupt economies far beyond the local ones in terms of global infrastructure, since worldwide businesses can also be impacted due to their interconnected supply chains and markets following the aftermath. As an example, the 2011 Japan earthquake and tsunami and the 2011 Thailand floods demonstrated to the world that although the events seemed to cause relatively localized damage to individual countries, they had far wider indirect economic implications through market disruptions caused by supply chain reactions, among others.

More recent events have shown that economic losses resulting from natural disasters have been continuously growing. Disaster literature frequently appears with disturbing news indicating for

the most part that globally, economic damages and losses from natural disaster events have been increasing. For instance, the 2015 Global Climate Catastrophe Report stated that “in the 10 years since Hurricane Katrina, the world has seen an annual average of 260 major natural disasters, with average annual economic losses of US\$211 billion and 76,000 lives lost”; while another report highlighted that the three major earthquakes in April 2016 — driven by two tremors in Japan’s Kumamoto region and one in Ecuador — clearly stood out in their capacity to inflict vast economic damage as well as human suffering, ended up causing nearly \$35 billion in economic losses (Aonbenfield, 2016b).¹ According to the 2016 Annual Global Climate and Catastrophe Report, globally, in 2016, a total of 315 natural disaster events caused total economic losses equivalent to USD210 billion, an amount estimated as 21% above the 16 year average of USD174 billion (Aonbenfield, 2017). To reiterate, besides the obvious economic damages, the potential chain reactions of negative economic impacts of natural disaster events can spill over to countries around the globe due to an intricately globalized supply chains and interlinked market environments, thereby threatening the adverse impacts to persist over a much longer time period.

Asia-Pacific has been labelled as the most disaster-prone region in the world where natural disasters have been more frequent, intense and disaster risk is out pacing resilience, according to the 2017 Asia-Pacific Disaster report (UN-ESCAP, 2017). The region has consistently been one of the hardest hit in the world, for instance, over the last decade, out of the top five countries that are most frequently hit by natural disasters, four are in Asia, namely, China, India, Indonesia and the Philippines (other than the United States) (CRED 2017). Furthermore, future natural disasters are likely to have greater destructive potential, for example, between 2015 and 2030, forty percent of global economic losses from disasters will be in Asia and the Pacific, while the region accounts for around 36 per cent of global GDP (UN-ESCAP, 2017).

¹Aonbenfield (2016).

As such, not surprisingly, the complexities surrounding a comprehensive picture of disaster impacts are so immense that both their immediate and longer-term impacts are often far too difficult to fathom, which, in turn, compounds and complicates the tasks and processes of devising disaster management policies and plans to address the underlying issues. At the same time, it is becoming ever more important not only for businesses to understand the financial risk that catastrophes pose to their supply chains and markets across the region and beyond, and develop robust disaster plans to reduce the potential impact, but also for policymakers and development actors to devise and implement effective disaster risk reduction policies and strategies designed to mitigate risks and minimize potential disaster threats and build resilience.

This book aims to contribute to existing literature on economics of crises and disasters and further our knowledge of some of the complexities associated with understanding of disasters' impacts and consequences, and also, the policy implications aimed at disaster risk reduction. First, we begin with impacts and consequences of natural disasters, using a number of case studies based on some of the major disaster events in the Asia-Pacific region. Next, we provide a broad discussion of some of the key policy measures employed by the national governments in the region to translate their understanding of disasters into respective policy agenda to pursue a sustainable development path aimed at risk reduction and resilience building highlighting the associated issues and challenges.

Chapter 2 ("*The Empirical Literature on Poverty and Natural Disasters*", by Azreen, Karim and Ilan Noy) begins with a comprehensive review of empirical literature on natural disaster impacts. The last few years have seen an explosion of economic research on the consequences of natural disasters due to a growing awareness of the potentially catastrophic nature of these events, which is also a result of the increasing recognition that natural disasters are social and economic events, despite the fact that they are triggered by a natural hazard: their impact is shaped as much by the structure and characteristics of the countries they hit as by their physical attributes. The chapter argues that in addition to the growing

interest in the social and economic aspects of natural hazards, increased awareness of climatic change is playing an important role. Consequently, much of the discourse in the past few years has focused on potential changes in the pattern and intensity of future events due to human-induced climate change.

Chapter 2 stresses that while recent research projects on impacts of natural disasters have evaluated the impact on various aspects like growth in the short and medium-to-long terms; government budget and debt (for various time horizons); international trade and financial flows; populations (in terms of migration and fertility choices); human capital, the importance of political economy in shaping the aftermath of the disasters; and others; there is little research on the impact of natural disasters on the poor and on income distribution. These intersecting themes of disasters, climate change, and poverty are only becoming more prominent as seen through the new DRR treaties including the Sendai Framework for Disaster Risk Reduction (signed in March 2015), the Sustainable Development Goals (a successor to the Millennium Development Goals; August 2015), and Climate Change Prevention, Mitigation and Adaptation (the Paris Agreement; December 2015²). Chapter 2, therefore, contributes to these discussions by surveying the existing literature on the impact of natural disasters on poverty and the poor, discussing some of the limitations associated with this literature, and outlining a future agenda of investigation that can contribute to better-informed policymaking.

How does existing literature have to be approached to understand and estimate disaster impacts particularly in terms of disaster components, disaster datasets and quantification methodologies? Since major disasters tend to cause great damage, destruction and human sufferings, estimating the associated economic losses is crucial, as this information supports decision-making not only in the immediate follow-up period of disaster events, but also for the development of longer-term risk reduction and mitigation

²Falkner, R (2016).

strategies. Along this line, Chapter 3 (*“Economic Losses from Natural Disasters: Quantification Approaches and Developments in Asian Countries,”* by Jonathan Kamp and Jonathan Neo) sets out with three objectives, namely, to identify and classify those components that enable to assess the full societal impacts of natural disasters; to present associated economic quantification approaches and their limitations; and to analyze statistics on natural disasters for countries in East, South, and South-East Asia during the period from 1990 to 2015.

To achieve the objectives, Chapter 3 provides an overview of assessment approaches through a quantitative analysis of economic losses from natural disasters in East, South and South-East Asia during the time period 1990 to 2015 along with data on socio-economic factors such as population density or level of economic development into the analyses in order to allow for better informed comparisons of results. Furthermore, Chapter 3 discusses various issues and limitations related to data and methodologies in impact estimation emphasizing that as a consequence, trade-offs need to be made between what is theoretically desirable and what is practically feasible.

At the forefront of disaster impact analysis, researchers and practitioners frequently encounter a range of factors at interplay — from physical, to economic, to social and psychological — responsible for contributing to and/or resulting in the observed consequences of a disaster. Chapter 4 (*“An analysis of exposure risk to extreme events in nature”*, by Lopamudra Banerjee) studies the common factors that determine people’s susceptibility to extreme natural events, and explores how geographic hazards and social conditions determine the chance of disaster exposure.

Based on datasets from Bangladesh, Indonesia, and Tanzania, Chapter 4 observes that while a household’s chance of experiencing exposure depend on the type of hazard (viz., flood, drought, volcano and tsunami) and its level (viz., low to high), certain common social factors that determine the household’s everyday living conditions (viz., occupational mode, household size, and regional poverty), also, determine its susceptibility in exceptional times of disasters.

Focusing on the hazard and vulnerability conditions of households across various geographic regions to examine the latent factors that generate disaster risks, specifically, Chapter 4 prescribes two major findings. First, while disaster risks are higher when higher levels of hazards are present in a household's habitat, certain categories of hazards (viz., flood and tsunami hazards) entail greater risks than others (viz., drought or volcanic hazards). Second, while the chance of experiencing disaster conditions is obviously greater for households if the region is afflicted by a natural extreme, probability of exposure is lower for households that have relatively secured prior access to resources under normal conditions (i.e., in absence of disasters).

Regardless of the level and type of hazard present, findings based on Chapter 4 indicate that certain attributes of households, which ordinarily determine their access to resources under normal conditions, such as, occupation of the household head, play an important role in determining their resilience under exceptional conditions of disasters. Presumably, households that have relatively stable livelihood conditions and relatively steady flow of income have greater material ability to cope with the adverse situations generated by a disaster event. Thus, these households have greater chances of avoiding losses and bear lower risks. Risks are also lower for investment of public resources to deploy buffers may entail construction and maintenance of irrigational canals to mitigate the effects of drought and floods, that of embankments and dams to control floods, and that of roads public transport systems to facilitate evacuations in the case of volcanic eruptions and tsunamis. Investment of private resources, for instance, may entail installation of pump and well irrigation systems to cope with drought, access to vehicles to assist evacuation in the case of volcanic eruptions, and so forth. Smaller household sizes entail, on one hand, lower consumption expenditures and greater access to ready savings to tide over a period of crisis, and, on the other, greater mobility for the family when the crisis situation arises. Thus, these households have greater ability to remove themselves from a potentially dangerous situation.

Chapter 4, therefore, concludes that in a divided society, where resource entitlements are conditional upon social and economic

statuses of households, any deficits in the social and economic determinants of a household's material conditions under ordinary circumstances additionally constrain the household's ability to obtain private goods, and weaken its claim over public goods, in an emergency situation. These deficits generate the latent vulnerability conditions for the households, which are brought into surface when a violent environmental event occurs. The results in this chapter, obtained in context of three rather (socially and economically) dissimilar countries of Bangladesh, Indonesia and Tanzania, universally, highlight this phenomenon. They indicate that risk of disaster is neither exogenous nor indiscriminate. Rather, disaster risk can be associated with prior deterministic conditions that are already always generated through the functioning and organization of a social system, long before a violent event occurs in nature.

Chapter 5 (*"After the Thrill is Gone: Impact Analysis of the 1995 Kobe Earthquake and its Reconstruction"*, by Yasuhide Okuyama) investigates the economic effects of the 1995 Kobe earthquake — occurred in the second largest economic region of Japan — based on the empirical data using econometric technique and structural analysis method. The results indicate that the event had created statistically significant deviations from the pre-earthquake growth path of Kobe. The economic damages of the event were estimated around 10 trillion yen while in addition, the damages from the earthquake and the subsequent reconstruction activities led to significant structural changes in the regional economy, which further affected Kobe's long-run growth trend.

Through investigating the total effects of the Kobe earthquake using econometric models and structural analyses, Chapter 5 presents findings that the economic recovery from the 1995 Kobe earthquake initially surged for a few years, but declined subsequently since then. The decline was quite severe and persistent for the City of Kobe, and it appears the case that the substantial efforts and budget allotted for recovery and reconstruction were still insufficient to bring about full recovery from the event. It is, therefore, observed that both the Hyogo Prefecture's and Kobe's reconstruction plans were not intended to recover the regional economy to the

pre-event state. Rather, they aimed to pursue the pre-existed long-range development plans proposed before the event and to lead to a sustained growth path with the promotion of high value-added industries and through economic structural changes to service industries. As found in Okuyama (2014 and 2015b), the production levels of these high value added and service industries fluctuated widely after the event and did not result in a consistent growth pattern, whereas most of manufacturing industries decreased the production level due mostly to the underlying hollowing-out process. Perhaps, the local governments of Hyogo and Kobe believed that this event could have accelerated this transformation to a sustained economic growth through the enormous reconstruction activities. The chapter argues that from a planning perspective, sustaining the long-range plans, even after a catastrophic event, seems legitimate, but utilizing the reconstruction from the event as a springboard to accelerate the development process is rather questionable. In the mean time, the underlying long-range development plan of Kobe assumes the target year of 2025. It might be the case that Kobe would soon return to the original development path and could reach their planned and desired targets by 2025 through the continuing and persevering reconstruction process, while the Kobe earthquake hampered the local economy's long range development plan.

Chapter 5, consequently, highlights that the long-run analysis of disaster effects provides an important lesson — solely analyzing the short-run impact and recovery would lead to the inaccurate conclusions about reconstruction process. After the Kobe earthquake, underlying structural changes have been somewhat accelerated by the reconstruction activities. The resultant structural changes were significant and extensive as seen in this chapter. Therefore, when the long-run effects of a disaster are investigated, the study should include the effects from and the process of the reconstruction activities, since reconstruction activities are the consequences of the disaster process and considerably influence the long-run trends of the regional economy. As a policy implication, in order to hinder the acceleration of or to slow down the pace of underlying structural

change during reconstruction period, it is important to promote and support regional inter-industry linkages so that the ripple effect of injected reconstruction demand can be predominantly retained within the region.

Furthermore, given that population changes have had a marked influence on the decline of the regional economies, Chapter 5 stresses that the decreased population led to decreased consumption demand and, in turn, to a lower level of economic activities. While the population was restored to the pre-event level in 1999 for Hyogo and in 2004 for Kobe, the per capita income recovered in 2001 for both Hyogo and Kobe but still lagged noticeably behind the national average trend despite attempts made to promote high value-added industries. Additionally, Chapter 5 suggests that the uneven population recovery in Kobe, partly resulted from the uneven reconstruction progress over space, could become a deep-rooted problem over time. Hence, it is important and interesting to analyze the rapid changes in population compositions (age and income distributions) after the event and during the reconstruction period over time and space in order to reveal the demographic-economic interactions and their impact on regional economies after a disaster.

One of the most prominent casualties of a natural disaster is the property market. As seen through recent devastations caused by major disasters around the world, the private and social costs from such events typically run into millions of dollars. To investigate disaster impacts on property market, Chapter 6 (*“Impact of Natural Disasters on Residential Property Values: Evidence from Australia”*, by Athukorala, Clevo Wilson and others) uses a dataset on residential house prices following a hedonic property (HP) values approach.

Specifically, Chapter 6 uses datasets pertaining to before and after both wildfire and flood events, which affected Rockhampton in central coastal part of the state of Queensland, Australia. The data is unique because one of Rockhampton’s suburbs was affected by wildfires and another by floods. For the analysis, three suburbs namely Frenchville, Park Avenue and Norman Gardens are used. Frenchville was significantly affected by wildfires in the latter part of 2009 and to a lesser extent in 2012, while Park Avenue was

affected by floods at the end of 2010, January 2011, 2012 and 2013. Norman Gardens, which was relatively unaffected, is used as a control site. This enables to examine the before and after effects on residential property values in the three suburbs. The results confirm that in the aftermath of a natural disaster property prices in affected areas decrease even though the large majority of individual houses remain unaffected. Furthermore, the results indicate that while prices in largely unaffected suburbs may gain immediately after a natural disaster, this gain may disappear if natural disasters continue to occur in the area/region due to a flood prone stigma being created.

The results based on Chapter 6 have several important policy decisions and welfare implications. What the results show is that affected suburbs have lower property values. This means that in the case of wildfires, any avertive action taken (which lead to decreased wildfires) will result in increased property values of the suburb. Avertive action can include back burning for which a council levy for affected suburbs can be charged. Similarly, flood Levees could be constructed (have been recommended for Rockhampton) to minimize the damage from floods. Insurance companies could contribute towards mitigation efforts. What this means is that residents clearly discount the possibility of their properties being affected or they believe that they have adequate insurance, have undertaken actions to self-insure and are effectively making the trade-off to pay more to live in close proximity to green space at the risk of wildfires affecting their properties. Hence, in the absence of a wildfire insurance policy, residents will continue to pay more to live closer to natural disaster areas such as wildfires.

In the case of flooding and wildfires it is also important to weigh the costs and benefits of rebuilding. For example, in the case of flooding it might be best to convert identified areas subject to frequent flooding into green spaces. Another important policy implication stemming from the study is the importance of disclosing natural disaster affected areas to potential buyers so that the purchase price reflects the true costs of living in natural disaster prone areas. Currently, no such mandatory requirement exists but

rather relies on the principle of *caveat emptor*. Given the high degree of information asymmetry that exists (and hence market failure) this is an area that is worthy of government intervention.

How effectively do the impact analyses of natural disasters contribute to policy implications such that national governments and disaster practitioners are able to reflect those into their respective planning, policy and development agenda aimed at risk reduction and resilience building? Chapter 7 ("*Disaster Risk Reduction and Disaster Management in Government Planning and Policy Agenda*", by Suman K Sharma) aims at contributing to this discussion with a broad assessment of national governments' planning and policy agenda based on disaster risk reduction and disaster management while highlighting the associated issues and challenges commonly encountered during the implementation phase.

In recent times, countries are seen to be increasingly vulnerable to natural hazards and disasters arising from a range of socio-economic factors and other anthropogenic drivers reflecting complex linkages between those all of which, in turn, complicate the task of impact estimation. Consequently, the undertaking of policies and actions — measures considered essential — to mitigate risks and threats to hazards and disasters, can also get disrupted considerably. With the goal of highlighting issues and challenges involved in translating a development agenda driven by disaster risk reduction, Chapter 7 discusses how well the national governments fare in addressing challenges and risks associated with disaster risk management: focusing for instance on questions like: have they identified regulatory and legislative measures to mandate disaster risk reduction concerns in their planning and development agenda?; and if so, how far they have progressed? Based on the available disaster literature, Chapter 7 observes that in most countries in the region, DRM policies and frameworks are in place but at the operational level the existing policies and planning agenda are at the most partially implemented depicting a very slow progress.

Along with the broad assessment of DRR based development agenda and the national governments with reference to the Asia-Pacific region, Chapter 7 discusses planning and policy agenda

in the context of Indonesia and the Philippines, based on which several issues and challenges are identified considered relevant in mainstreaming the DRR development agenda in practice. Furthermore, Chapter 7 highlights the significance of resilience building essential for a successful DRR based development approach as well as the complexities associated with operationalizing the resilience concept into practice. Chapter 7 concludes with the discussions on the role of communities in disaster management followed by the issues and challenges involved in a community based disaster management model.

Although national governments in the region have employed various measures to translate their understanding of disasters into respective policy agendas and pursue a sustainable development path aimed at risk reduction, available evidences indicate that despite making significant progress, for example, in terms of identifying satisfactory level of DRR focused development programs and policy agenda, most governments still lack severely in terms of translating effectively the DRR development agenda into practice due to various issues and challenges that require immediate attention. Along this line, going forward, Chapter 8 (Disaster Risk Reduction and Sustainable Development: Going Forward by Suman K. Sharma) briefly weighs in our outlook on the status of DRR development agenda in practice, particularly, in view of our understanding of disasters and the issues and challenges, involved in operationlizing the agenda, and provides some thoughts and reflections on how best to mobilize our efforts and address the challenges through building on available supportive environments.

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