Chapter 1
Introduction: Disaster Risk Reduction in Indonesia: Progress, Challenges, and Issues

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Abstract Indonesia is amongst the countries with the highest disaster risk globally. This risk is driven by the country's high exposure to a range of geophysical and hydro-meteorological hazards, combined with grave vulnerabilities resulting from population growth, unequal economic development, urbanization, a lack of social and environmental considerations within development processes, and other drivers. Disasters caused by environmental hazards are becoming increasingly costly and severe in Indonesia. While efforts to manage disaster impacts and reduce disaster risk have long been considered, the 2004 Indian Ocean tsunami transformed the way disasters are viewed and how the risks are managed and reduced. Internationally, the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters was adopted in 2005 and succeeded by the Sendai Framework for Disaster Risk Reduction 2015–2030. In order to document the transformations that have taken place in disaster risk reduction (DRR) in Indonesia, this book presents the progress, challenges and issues concerned with DRR governance and practices. It aims to answer the following questions: *Which advances in DRR have been made? Which roles do different actors have? Which remaining challenges and emerging new issues need to be addressed in order to enable more sustainable DRR in Indonesia?* This introduction presents the rationale, objective and structure of the book.

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1.1 Overview and Rationale of Study

Indonesia is the world's largest archipelago and straddles the equator, between the continents of Asia and Australia. Its major islands include Sumatra, Java, Kalimantan, Sulawesi, Maluku and Papua (Fig. 1.1). The country is considered one of the most disaster-prone countries, given its high exposure to a range of natural and climatic hazards as well as considerable social vulnerabilities (UNU-EHS and ADW 2014). The interaction between an increasing population, largely uncontrolled urbanization and economic development in high-risk areas without proper consideration of the social and environmental impacts, has led to high disaster and climate-related vulnerability and risk in Indonesia (Djalante 2013; Firman 2016).

It is the fourth most populous country in the world at more than 255 million people (BPS 2016b). More than 145 million of these people live on Java, the most populous island, and its capital city, Jakarta, is home to more than 10 million people (BPS 2016b). Indonesia has more than 300 ethnic groups, 700 dialects and is also the largest Islamic country in the world (World Bank 2016b). Politically, it is the second largest democratic nation in the world, and largely decentralized with 34 provincial and 514 local governments (BPS 2016b). Economically, it is the largest country in South East Asia and part of the G-20, and is classified as a lower middle income country by the World Bank with a Gross Domestic Product (GDP) of 862 billion US Dollars (World Bank 2016a). Despite these political and economic advances, inequality within the country is still high, with a Gini ratio of 0.40 (1 being total inequality) in urban areas and 0.33 in rural areas (BPS 2016a). There are

Fig. 1.1 Map of Indonesia (UNU-EHS 2016)

still 28 million (12%) people who live below the poverty line, and 40% of the population are still vulnerable to falling into poverty (World Bank 2016b). The country houses some of the largest tropical forests in the world, as well as large deposits of minerals, oil and natural gas. However, poor enforcement of environmental law has led to rampant deforestation, illegal logging, forest and land conversion as well as forest and peatland fires (Korhonen-Kurki et al. 2013; Obidzinski and Kusters 2015). The livelihood sources of the majority of people are small-scale farming, fishing and work and trade (World Bank 2016b). These sectors are climate dependent and the future negative impacts of climate change could threaten the livelihood sources of those who work in them (Cinner et al. 2012; Kirilenko and Sedjo 2007).

Disasters caused by environmental hazards are becoming increasingly costly and severe in Indonesia. Hydro-meteorological hazards (floods, typhoons, droughts, etc.) are the most frequent examples and affect the greatest number of people, whilst geophysical hazards have caused the most deaths in Indonesia (EM-DAT 2016). Located between the tectonic plates of Asia and Australia, the country lies in a zone of high tectonic activity which frequently results in earthquakes and tsunami (Hsu et al. 2006). Furthermore, rows of mountains and active volcanoes spread across the islands, which form part of the Pacific Ring of Fire (Suppasri et al. 2012). Taken together, volcanic eruptions, tsunami and earthquakes are the deadliest hazards in Indonesia (EM-DAT 2016). The 8.9 magnitude earthquake, which caused the Indian Ocean Tsunami in 2004, was one of the deadliest disasters to strike Indonesia and other countries in the region (EM-DAT 2016). In addition, floods are increasingly becoming more frequent, and affect the most number of people, especially those living in urban areas (EM-DAT 2016). As an archipelago, Indonesia has many low elevation coastal zones and the majority of people live within 100 km of the coast and under 100 m above sea level (Kusuma-Atmadja and Purwaka 1996). Future sea level rise due to climate change therefore poses a great risk to the country (Nicholls 1995; McGranahan et al. 2007). It is therefore extremely important for Indonesia to reduce disaster risks and build disaster resilience amongst the nation and its communities (Djalante et al. 2013; UNISDR 2016; BNPB 2015).

In the face of such risks, there have been transformational changes in the way disaster risks and disaster impacts have been dealt with in Indonesia. The 2004 Indian Ocean Tsunami was a definitive turning point in risk reduction and management internationally and also in Indonesia. The adoption of the Hyogo Framework for Action (HFA) in 2005 has influenced a fundamental change towards disaster risk reduction and management (UNISDR 2005a). The HFA contains five Priorities for Action, namely: (1) DRR governance, (2) risk assessment and early warning, (3) knowledge and education, (4) reducing the underlying risk factors, and (5) disaster preparedness and response (UNISDR 2005a). The HFA provides a monitoring and review mechanism by which national governments can measure their level of progress towards the HFA Priorities for Action, from 1 (minor), 2 (relatively small), 3 (not substantial), 4 (substantial) and 5 (comprehensive achievements) for DRR (UNISDR 2005a). Indonesia has transformed from a focus on emergency response after disasters to a more comprehensive and preventive approach to DRR (BNPB 2015). As a result, the country moved gradually from a score of 3.0 in implementing the HFA Priorities for Action, to 3.7 (out of five) during the period of 2013–2015

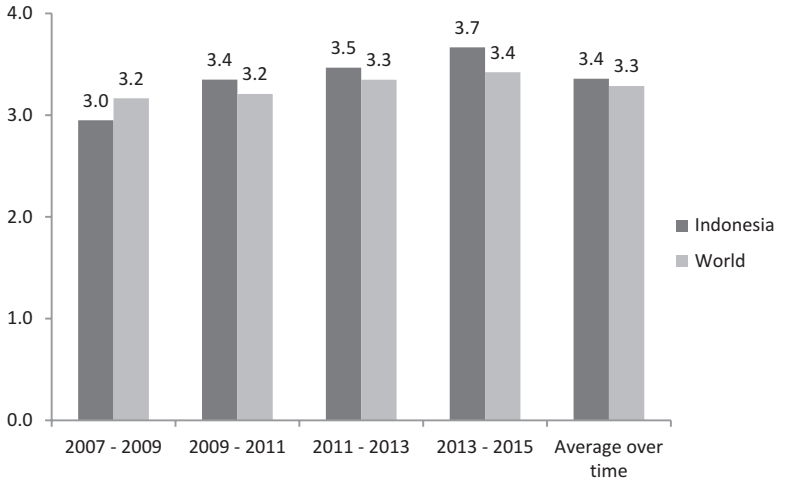

Fig. 1.2 Indonesia's level of progress in HFA priority areas (out of five) compared to the rest of the world (Modified from BNPB 2011a, 2013, 2015, PreventionWeb 2016)

(BNPB 2011a, b, 2013, 2015) (Fig. 1.2). Over the years, Indonesia's level of progress has been slightly higher than the rest of the world.

This progress was in part due to the establishment of regulatory and institutional frameworks for DRR, marked noticeably by the adoption of Law 24/2007 on Disaster Management, as well as the formation of National and Local Disaster Management Agencies (BNPB and BPBDs) (BNPB 2015). These newly formed agencies have more power and mandates along with the financial and technical capacity to plan and implement DRR strategies. Many policies, strategies and plans were developed to guide DRR (BNPB 2015). For instance, hazard early warning systems, along with national and community preparedness, have been progressively developed and maintained (BNPB 2015). In line with the decentralization in the development and planning approach, the responsibility for DRR and DRM is shared across different levels of government, from heavy reliance on national governments to greater responsibility of local governments (Lassa 2013). Non-government organizations (NGOs) and local governments have important roles especially to increase preparedness and resilience to disasters at the local and community level (Djalante 2012; Kusumasari et al. 2010).

While many of these changes have been transformative and bring enormous change to the way DRR is governed, after 12 years since the tsunami, it is apt to examine how these institutions and regulations have evolved. In particular, how plans and strategies at the policy level are being implemented in practice (at the local and community level), how local level organizations have increased their capacity and capability, what challenges in terms of institutional configurations encourage or hinder progress, which actors and organizations have been involved, how future climate risks are perceived, and finally, what emerging issues need attention and will influence the future pathway for DRR in Indonesia.

1.2 Objective of the Book

This book aims at answering the following questions: *Which advances in DRR have been made? Which roles do different actors have*? *Which remaining challenges and emerging new issues need to be addressed in order to enable more sustainable DRR in Indonesia*?

It provides an overview of the ways in which DRR is conceived, planned and implemented by a variety of governmental organizations at various governance levels, and by other actors from civil society, the business sector and academia. It also examines the multiplicity of regulatory frameworks and financial mechanisms that orchestrate DRR in Indonesia and how they have been mainstreamed within important sectors such as infrastructure, spatial planning, education and the environment. Apart from the larger frameworks, particular interest is paid to exploring the multitude of resilience building initiatives at the community level, both formal and informal. The book also examines how hazards, risk and resilience can be quantified.

Whilst there is a wealth of knowledge available on DRR in Indonesia, it mainly exists in the form of organizational reports, government documents, journal articles and news items. This book adds to this breadth of knowledge, through collating, reviewing and discussing trends in hazards and disasters, as well as plans, strategies and activities in DRR, and the latest research from key research institutions and DRR practitioners at the science-policy interface. The process of developing the book is meant to be a transdisciplinary co-production of knowledge between academic and non-academic communities, which is a prerequisite for research aiming at more sustainable development paths (Pohl et al. 2010; Jasanoff 2004). Sustainability challenges such as addressing and dealing with the multitude of factors which cause vulnerability to natural hazards and disasters, call for new ways for knowledge production and decision making. Perspectives from different organizations are presented from government, non-government, scientific and community-based organizations, as well as woman's collectives. Academic scholars collaborate with government officials to review policy and practice of DRR, while others utilize authors' direct experiences of implementing DRR activities. Involvement of multitudes of actors is crucial to help integrate available knowledge, reconcile values and preferences, and also create ownerships for problems and solutions (Lang et al. 2012).

The book addresses key questions of institutions and governance. Topics discussed range from the linkage between DRR with education, spatial planning, infrastructure, law and regulation. The resultant discussions encompass different spatial levels from the national, to the sub-national and local level, and include novel topics such as the role of culture, religion, psychology and the media in DRR. The hazards and disasters discussed include forest fires, floods, tsunami, earthquakes and windstorms. While half of the chapters look at Indonesia as whole, specific localities are also explored on Aceh, Padang, Jambi, Bandung, Jakarta and Kalimantan.

The studies were developed using a variety of methods from desk-study data collection and modeling and utilization of statistical data to case studies, field research and interviews with private sector firms and authorities, as well as focus group

discussions and surveys at the community and household levels. These multitudes of research methods are strategically chosen to help understand and consider multiple approaches to advance DRR understanding for its current and future states. As Lang et al. (2012) suggest, transdisciplinary, community-based, interactive, or participatory research approaches could be considered an appropriate way to help understand real-world problems and also meet the goals of sustainability science.

This book is timely and innovative since there have been many transformational changes that have occurred in the governance of DRR in Indonesia, especially on how DRR has been implemented from the national to local level, the progress in mainstreaming DRR at different important sectors, and the impacts of future climate change risks in Indonesia. This book is innovative since it presents perspectives across the scale, from different organizations and identifies emerging issues from psychology, religion and culture, and their implications for future DRR, and finally, on how future DRR can be aligned with other related international agendas.

1.3 Target Readers

The book targets both readers from academics and policy realms. It is specifically intended for researchers and students in disaster, environmental and governance studies, who want to gain a comprehensive understanding of the nature and variety of environmental hazards and risk patterns affecting Indonesia, the vulnerability and resilience to these risks, and how these disaster risks have been managed and governed over time. This book is also beneficial for policy makers, especially in government, that are related to various aspects of DRR. Part A and B in the book focuses on the analysis of progress and challenges for DRR and the roles of different organisations in DRR. Policy makers from government organisations such as BAPPENAS and BAPPEDA (national and local planning agencies) and also BNPB and BPBDs (the national and local disaster management agencies) will benefit from reading the analysis on how the agencies have been progressing over time. This book can also inform practitioners in DRM on what have been the latest activities to strengthen community resilience to natural hazards and disasters.

1.4 About the Contributors

Contributions in terms of authorship of the book were made by four editors, with a total of 80 authors and other additional contributors. The authors are affiliated with combinations of international research organizations and government, academic and non-government organizations from Indonesia. The majority of the authors have research expertise in the field of human geography, environmental

management, governance and hazard and risk assessment, while others have worked in the field of media and religious studies. While most of the authors represent universities and research institutions, there are also collaborations from members of national governments, local governments and non-government organisations. The authorships are comprised of one third female authors, half Indonesians and half early career researchers. This is a significant development to strengthen capacity for academic writing and international publishing for researchers from Indonesia. Several studies have shown that female researchers and writers are in general less visible (Lewison 2001; Lewison and Markusova 2011; Aksnes et al. 2011). A study by Djalante (2016), who did a systematic literature review on research related to hazards, disasters, risk reduction and climate change in Indonesia, finds that non-Indonesian authors strongly dominate the number of researchers, female authorship is very low, and international collaborations took place only by limited Indonesian scientific organisations and authors.

1.5 Structure of the Book

The book is organised into four thematic parts, comprising a total of 25 chapters. We structure the book so that Part A starts with more general reviews of disaster risk reduction governance at different levels and progress and challenges for integrating DRR into other development sectors. In part B the chapters contribute to a novel discussion on the roles of organizations that are not largely discussed in the literature such as those of the media, manufacturing firms and traditional institutions. In part C, the chapters discuss innovative and emerging issues in DRR research and practice. Identifying these emerging issues is important since they need to be dealt with and can influence the future course and pathways of DRR in Indonesia. Finally, in Part D, the last part of the main discussion in the book, looks at various methods for measuring and quantifying hazards, risk and resilience. In this part, some chapters focus on approaches to measuring institutional and community resilience while others present analyses of risks and vulnerability assessments of different hazards at different spatial scales.

1.5.1 Part A: Disaster Risk Governance from National to Local Level and Its Integration into Development Sectors

This part has eight chapters and discusses changes in the regulatory and institutional framework for DRR and further outlines how changes at the national and local levels have evolved. It further examines the progress of integration with key development sectors, with examples of regulatory analysis, education and spatial planning. Finally, it outlines important future issues to be considered to enhance DRR planning and implementation.

Chapter 2 is written by Djalante and Garschagen who review the trends in disaster occurrences and impacts, as well as the history of institutional responses to these disasters in Indonesia from 1900 to 2015. The author reviews disaster events and impacts and assesses the effectiveness of governance and institutions in responding to disasters in the past and for reducing future risk. The study finds that most disasters are caused by hydro-meteorological and geophysical hazards and that six distinct periods for DRR can be defined, marked by changes in presidential leadership and in the socio-economic situation in Indonesia, from ad-hoc response to victims of wars and disasters by natural hazards, to a more comprehensive approach to DRR and increased recognition of climate change and environmental risks in urban areas.

Chapter 3 is by Mardiah et al. who present and discuss the regulatory framework and institutional network for DRR in Indonesia. The authors find that the Law 24/2007 on Disaster Management has some contradictory contents in terms of determining the level of disasters which has strong implications for budget allocation and the cooperation between local regions, as well as identification of vulnerable groups. They argue that the law needs to be revisited to focus more on the mainstreaming of DRR into development policies and programs, and identify the two agencies for disaster management (BNPB and BPBDs) and development planning (BAPPENAS and BAPPEDA) are at the frontline for development mainstreaming. They recommend that strategies for more inclusive, locally based and community focused DRR strategies should include better consideration of climate risks, strengthen the capacity of local institutions and make comprehensive efforts to reduce vulnerability and build community resilience.

Chapter 4, by Das and Luthfi, discusses the implications for DRR at the subnational and local level in Indonesia. The authors review the complementarity and incongruence between institutional structures and frameworks for decentralization and DRR, and how this will likely impact DRR implementation. The most important findings include that disaster management agencies at the national and local level (BNPB and BPBDs respectively) have greater authority and financial capacity than similar agencies in the past, and that the new disaster management regulation is about sharing responsibility and authority between national and local governments. Recommendations proposed include giving greater responsibility and authority to provincial governments which have better financial and technical resources (rather than the current decentralized situation in which local governments tend to have more implementing power), increasing the capacity of local government through trainings, equipping technical persons from outside the local government, and finally, increasing the role of non-state actors in disaster management that have the capability to help local governments.

Having discussed the governance of DRR at different levels in the previous parts, Chap. 5, by Anantasari et al., discusses the DRR capacity and capability of six local governments in Indonesia, through adopting the Local Government Self-Assessment Tool for DRR and developing a subsequent scoring system. There are nine categories with 34 indicators used to measure the capacity and capability of local governments for planning and implementing DRR strategies. They find that while community development, funding and networking generally scored higher, there is

a need for improvements in understanding hazards and risks, risk reduction activities, regulations, strategic planning, building development and controls, and education and training.

The remaining four chapters discuss the integration of DRR into key sectors of the legal framework, spatial planning and education.

In Chap. 6, Nurhidayah and Djalante discuss the adequacy of Forest Fire Risk Governance at the national and local level, utilizing a disaster risk management approach to assess progress and challenges in managing land and forest fires during the prevention and mitigation, emergency response and post-fire rehabilitation and recovery phases. They find that the institutional and regulatory framework for managing land/peatland fires (LFFRM) is not integrated with that of forest fires. Moreover, progress for fire management is still focused on the emergency response phase and there is slower progress at the lower governance level for different stages of LFFRM, whilst community livelihood has failed to be integrated into the process.

Thereafter follow two chapters that discuss the interlinkages between DRR and education. In Chap. 7, Bisri and Sakurai assess Disaster Education and School Safety Governance following the 2004 Indian Ocean Tsunami. They find that disaster education and school safety is not the exclusive domain of disaster management policy. Necessary policy instruments that are needed to ensure city-wide implementation of disaster education and school safety include ministerial-level regulation in the education sector, combined with a local regulation (Perda) or mayor regulation, which can ensure the use of public budget for disaster education.

In Chap. 8, Nurmalahayati et al. look at the progress, challenges and opportunities for integrating DRR and CCA into school curricula, comparing those from national policy to local implementation. They first identify topics related to DRR and CCA in the Indonesian curriculum, progress at the policy level, opportunities and challenges at school level, and then propose policy and practical recommendations. Whilst there has been major progress nationally, the adoption is hindered by a lack of teacher capacity, practical guidance and financial/policy supports. Recommendations to improve the integration include supporting teachers, providing handbooks for teaching about DRR and CCA and providing financial and policy support.

Finally in Chap. 9, Nurrohman et al. discuss the current and potential integration of DRR and CCA into spatial planning in Indonesia. They state that effective spatial planning can help to minimize vulnerability to disasters and climate change since it serves as a guideline to ensure the allocation of zones and areas that are suitable for development in the short, medium and long term by examining the potential and limitations in physical, ecological and socioeconomic aspects. The authors propose an integrative approach through a combined vulnerability and risk assessment that can serve the need of DRR and CCA analysis within the spatial planning process.

1.5.2 Part B: Roles of Different Actors for DRR

Part B examines one important part of governance: the interface of formal and informal organisations and institutions involved in DRR. Specifically, it analyses the roles of organisations that are not largely discussed in the literature such as those of media, manufacturing firms and also traditional institutions. It draws from different case studies in different parts of Indonesia that were affected by different types of disasters. There are eight chapters in this part.

In Chap. 10, Hayat and Amaratungga assess the roles and capacity of local government in maintaining post-disaster road reconstruction assets following the 2004 Indian Ocean Tsunami in Aceh. It finds that the reconstructed road assets, although of high quality, are generally poorly maintained by the local governments. Their capacities for maintenance are affected by social, political, institutional and technical factors, since maintenance is not prioritized in the government budget and there is a lack of technical capacities for carrying it out.

Chapter 11 is by Neise et al. who discuss the role of manufacturing firms as stakeholders within collective adaptation to floods in Jakarta. They propose a concept of integrative adaptive regional development (IARD), defined as outcomes of individual and collective adaptation to reconfigure prevailing risk-prone situations and hence affect future pathways for adaptation, which range from resistance to resilience, transformation or collapse. They find that manufacturing firms' production processes are heavily disrupted by floods and their adaptation strategies, individually and collectively, do not contribute towards IARD. Recommended strategies for achieving IARD include improving cooperation amongst firms and with government authorities, as well as strengthening law enforcement.

Chapter 12 is by Musaruddin who reviews the role of media representation of disasters using visual discourse analysis, in particular following the Mount Merapi eruption in Yogyakarta in 2010. The author argues that media representation is rooted in a modern scientific discursive formation of Mt. Merapi and its eruptions, which is mainly sponsored by the state, and promotes opposing claims. In particular, the author finds that Mt. Merapi is depicted as a powerful, sacred subject, while people affected by the eruption are seen as helpless. The evacuation process is also depicted as a scene of despair, in contrast to the positive representation of capable government relief efforts. In this representation, the role of community volunteers is largely ignored by the media. Consequently, the author underlines the importance of ethics in disaster journalism and makes recommendations that coverage should be aligned to public interest, accurate, and gives a voice to the voiceless.

Villeneuve et al. in Chap. 13 review the role and capacity of disabled people's organizations (DPOs) as advocates for disability-inclusive DRR in Indonesia, with case studies from Yogyakarta, Central and West Java. They suggest that, as the Sendai Framework for DRR (SFDRR) now recognizes persons with disabilities as key stakeholders, there is a need to broaden knowledge on the role of DPOs in DRR. Through capacity building initiatives, they have been able to increase collaboration

between disability and DRR actors and provide a practical model for supporting DPOs as policy advocates in other regions and countries.

In Chap. 14, Boyland et al. discuss the role of *Panglima Laot* (sea commander) in Aceh in the 2004 Indian Ocean Tsunami. *Panglima Laot* is a customary fisheries institution in Aceh which consists of 200 coastal community leaders and coordinating bodies at district and provincial levels. The authors find that *Panglima Laot* leaders and the institution had important roles in the recovery of Aceh's coastal fishing communities. The *Panglima Laot* institutions are trusted by communities, act as mediators between communities and others and were involved in planning, implementing, monitoring and evaluating livelihood recovery programmes.

Chapter 15 is by Mulyasari and Shaw on the role of faith-based organizations (FBOs) in Bandung, West Java, as risk communicators for strengthening community resilience. Mulyasari and Shaw propose a social, economic and institutional resilience activities (SIERA) framework with a scope of 45 activities covering three different disaster periods (before, during and post disaster). They find that the roles of FBOs involve dissemination of information about disaster risks during prayer sessions, utilization of community networks and resources when sending out emergency warnings to reach wider neighborhoods and the establishment of disaster early warning mechanisms with local government.

Chapter 16 by McNamara et al. assesses the performance of a Caritas-funded disaster recovery project in Salam village after the May 2006 earthquake. Through focus group discussions, they find that although the social, economic and environmental outcomes indicated that the project was perceived by beneficiaries as 'high benefit and low risk', a number of weaknesses also emerged that complicated the potential growth and long-term sustainability of the project.

The last chapter in this part, Chap. 17, is by Rafliana who discusses the role of scientific organizations in Indonesia, in particular the Indonesian Institute of Science (LIPI), in helping to translate science into practice. The author draws on her own experience as the coordinator of the Community Preparedness (COMPRESS) programmes from 2005 to 2014. The chapter shares key highlights of communicating science, as well as instrumental challenges in sustaining science communication in Indonesia, due to a number of social factors.

1.5.3 Part C: Emerging Issues in DRR Research and Practice

Part C discusses emerging issues in DRR research and practice. There are three chapters in this part and the discussion ranges from ecosystems, culture, to psychology and religion, and the interlinkages with disaster mitigation, recovery, and resilience. Identification of these emerging issues is important since they need to be addressed and can influence the future course and pathways of DRR in Indonesia.

In Chap. 18, Triyanti et al. discuss the opportunities and challenges for ecosystem-based DRR (Eco-DRR) in Indonesia. The eco-DRR approach is promoted as a compatible approach to endorse community inclusiveness and participation, and is

shown to be cost efficient, socially friendly and sustainable. The potential for its adoption in Indonesia is extremely high and preferable considering the geographical conditions of the low-lying coastal country and the high percentage of people dependent on natural resources provided by coastal areas. Taking the case study of Demak and Kuwaru in Java, they identify challenges to the adoption of Eco-DRR including the differing natural and physical magnitude of hazards, the issue of exclusion and inequality within the community and also the lack of coordinated strategies with other approaches.

In Chap. 19, taking the case of urban coastal communities in Jakarta, Surtiari et al. propose that unpacking and knowing particular elements of culture and its influence on the progression of resilience can lead to better understanding of how vulnerable communities build their own resilience. They find that reciprocal support is culturally preconditioned and makes for one of the central components of a community's capacity to cope with a disaster. Communities self-organize through rearranging social structures, dividing tasks amongst family members and assigning local leaders to manage relief programs. Furthermore, to assist with the long term recovery process, the communities utilise their networks within similar ethnic groups for socio-economic support. Finally, the ability to learn to adapt from the impacts of past floods is found to be mainly influenced by people's strongly held belief that, because they have survived past floods, they can do so again in the future. However, their findings suggest that such beliefs could also represent a barrier to preparation for future disasters.

In Chap. 20, Rahim et al. provide an account on narratives of how the Acehnese interpret and heal trauma following the 2004 Indian Ocean tsunami. They argue that little is known about how Islam, as the prominent religion in Indonesia, perceives disasters, death and loss due to disasters and the role of faith in recovery. They recommend that future post-disaster mental health programs need to respect the religious perspectives of the victims in counseling and discussions; future programs needed to be supported by religious figures, incorporate the use of prayers as a means of coping and healing and integrate mental health programs with livelihood programs to help victims rebuild their lives.

1.5.4 Part D: Measuring Hazards, Risks and Community Resilience

Part D is the last part of the book. There are five chapters in this part, which discuss different approaches, entities and methods to measure and quantify hazards, risks and resilience. The first two chapters analyse flood and forest/land fires while the last three chapters focus on approaches to measuring institutional and community resilience.

In Chap. 21, Budiyono et al. discuss flood risk in polder systems in present day Jakarta and in the future. The authors assess the benefits and costs of the polder

system in Jakarta under current conditions and under future scenarios of climate change, land use change and subsidence. The results show that cost-benefit ratios greater than 1 exist at one third of the polders which reduce a quarter of risk under current conditions. In the future, half of all polders will reduce more than half the risks and polders with very high net benefits are located away from the coastline.

Chapter 22 is by Thoha et al. who present a study on measuring the hazard level of forest and land fires in Kapuas District, Central Kalimantan Province. The authors analyze variables that affect the level of risk of land and forest fires, develop a spatial hazard model, and determine the distribution of forest and land fires. Highly hazardous areas were mostly distributed in deep peat areas, found under a land cover class of secondary swamp forest and shrub swamp and in close proximity to the road. They recommend that to develop time-series forest and land fires hazard maps in the future should include socio-economic variables in the model.

In Chap. 23, Adiyoso and Kanegae review methods to integrate religious factors into risk information, in order to help strengthen tsunami preparedness. They utilize tsunami preparedness indicators comprising a tsunami early warning system, 'emergency plan' and 'capacity' and measure preparedness at the individual, family, community and societal levels. They find that information containing Islamic messages increases preparedness at the group level, while religious leaders can help preparedness even at the individual level.

Chapter 24, is by Dokhi et al. who review the Social Resilience Module of the 2014 National Socio Economic Survey to determine the role of social capital in strengthening disaster preparedness. They find that social capital positively influences knowledge of disaster preparedness. Persons with a high level of trust, tolerance, social networks and collective action tend to have a higher knowledge of disaster preparedness. Tolerance and social-networking are the most influencing factors, while the effect of trust and collective action tend to be moderate but still statistically significant.

Chapter 25, the last in this book, is by Anwar et al. who propose a framework for community resilience which incorporates factors including community capitals (social, cultural and economic), disaster risk governance and spatial planning. Taking a case study of Yogyakarta, they conducted household interviews, focus group discussions and in-depth interviews to determine the level of resilience of the community. They find that experiences of large scale disaster which lead to large scale reconstruction following the Mt. Merapi eruption, greatly improved the awareness and capacity of local governments. Local communities, through their existing networks that have long been established, and also the role of *Gotong Royong* (working together), created supporting tools that are utilized during normal and emergency situations.

1.6 Conclusion

Strengthening DRR governance has shown great advances in Indonesia, especially in the development and adoption of laws, regulations and institutions. Integrating DRR into development agendas is the key prerequisite in addressing the underlying causes of national and community vulnerabilities to natural hazards. The paradigm for dealing with disasters and their impacts has started to move from emergency response and prediction to addressing the root cause of disasters and efforts for more comprehensive DRR.

The first part of the book has shown that greatest progress for DRR governance tends to happen at the national level. Local governments are still lacking in their capacity to reduce disaster risks, respond to disasters and recover from the impacts. We call for strengthening the role of local governments in various stages of disaster management. Strengthening risk governance at the local and community level should be done through strengthening institutions and equipping them with the necessary economic and technical skills to plan and implement DRR.

It has also been shown that Law 24/2007 on Disaster Management (GoI 2007b) and Law 23/2014 on Decentralization (GoI 2007a) are the foremost legal basis for addressing disaster management and clarifying the roles of national and most importantly, local governments, in DRR. In line with these regulations, the roles of BAPPEDA and BAPPENAS as the two key agencies for development planning, and BNPB and BPBDs, as the two key agencies for disaster management, are the foremost organizations at the national and local level respectively, which hold the greater responsibility, mandate and also roles for mainstreaming DRR into development agendas.

There is increasing calls for engagement of more diverse stakeholders at different levels of governance. This means that Indonesia needs to identify, work with, and maintain relationships with more diverse stakeholders. While some groups of stakeholders such as governments and international NGOs have long been involved in DRR, others have been overlooked and underutilized, especially for increasing preparedness at the local and community level. The roles of new actors in DRR, beyond those normally identified, are heavily discussed in this book. The roles of media, civil society organisations, private companies, faith-based organisations, women's groups, community leaders, religious leaders, and even scientific organisations, are those who act as connectors, creating shadow networks and informal forums by which communities can express their needs and also potential roles, identify priorities and help develop intervention actions from outside. Indentifying, working with and nurturing these already existing networks in the community and society at large is important if we want to strengthen community resilience in Indonesia.

There is also an increasing call for action on disaster preparedness and emergencies. Increasing populations, environmental destruction, urbanization and climate change all contribute to an increase in disaster risk. Indonesia needs to strengthen preparedness to earthquakes and tsunami as these two hazard types cause the high-

est deaths in Indonesia (EM-DAT 2016). Moreover, there is a heightened emergency and humanitarian crisis felt around the world and Indonesia needs to also be prepared for cross-border disaster emergencies. Cross-border humanitarian emergencies, either triggered by natural hazards or other causes could be expected to increase. Strengthening implementation of these legal frameworks, through collaborative strategies and sharing of resources, is the key to such cooperation.

In this book, the rehabilitation and reconstruction approach has been critically analysed to see whether long term sustainability could be addressed through the ´Build back better´ approach, which has been strongly advocated following the 2004 Indian Ocean Tsunami. Indonesia needs to use and be prepared to use disasters as opportunities to implement strategies which substantially reduce future vulnerabilities to disasters.

Furthermore, this book has presented different methods in not only assessing hazards and risks, but also the resilience of communities. While there have been plenty of assessments focusing on geophysical hazards such as earthquakes, volcanic eruptions and tsunamis (Djalante 2016), more research and assessments are needed on those caused by hydro-meteorological hazards, biological hazards and those caused by man-made and technological hazards.

Finally, the year 2015 and 2016 mark significant timelines on global human and environmental changes. Several international agreements were adopted, the SFDRR (UN/ISDR 2015) superceeding the HFA, the sustainable Development Goals (SDGs) (United Nations 2015b) and the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) (UNFCCC 2015), and in 2016, the New Urban Agenda (UN Habitat 2016). The discussion in this book has shown that increased complexities in DRR need to be faced with expanded tools, approaches and actors in Indonesia. In doing so, it is hoped that within the 15 year period of implementing the SFDRR, Indonesia will be able to substantially reduce disaster risk and losses and achieve the specific aim of sustainable development goal number eleven, to make cities and human settlements inclusive, safe, resilient and sustainable.

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